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Multilingualism and Augmentative Alternative Communication: A Review of the Literature

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NORTHERN ILLINOIS UNIVERSITY

Multilingualism and Augmentative Alternative Communication: A Review of the Literature

A Capstone Submitted to the University Honors Program

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By

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Abstract

Purpose: Individuals from culturally and linguistically diverse backgrounds who use Alternative and Augmentative Communication (AAC) are often offered English-only AAC systems that do not meet their language needs. Devices that host multiple languages often only offer one at a time.

Method: The authors reviewed the literature by searching relevant databases using a variety of search strings. Following our inclusionary and exclusionary criteria, 15 articles were yielded for analysis.

Results: Authors found that more than half of the included articles were discussion-based papers on AAC delivery, barriers to AAC and multilingualism, and codeswitching using AAC. The included interview studies aimed to summarize the perceptions on AAC services—their impact, facilitating and limiting factors in communication, and the importance or relevance of using an AAC device. Only two intervention studies were included, and those authors investigated expressive language production based on the effects of aided AAC modeling between two languages in bilingual children, and bilingual children’s ability to differentiate between two languages on an aided AAC device.

Conclusions: Practitioners have an obligation to support multilingual clients who use AAC across all languages they speak at school, at home, and in the community. Much of the literature supports encouraging multiple languages, but limited access to bilingual AAC systems are available. There is also a dire need for empirically based studies and more perspectives by way of interviews or surveys.

Keywords: augmentative alternative communication, bilingual, speech-language pathology, special education

Multilingualism and Augmentative Alternative Communication; A Review of the Literature

Approximately two million individuals living in the US have complex communication needs and are currently using augmentative alternative communication (AAC) to support their communication (United States Society for Augmentative and Alternative Communication (USSAAC), 2022). AAC includes any method of communication outside of the primary dependence on vocal speech and takes on two forms, unaided (e.g., gestures, drawings) and aided AAC (e.g., symbol boards, speech-generating devices). Aided AAC ranges from high-tech speech-generating devices (e.g., iPad with communication apps), middle-tech (e.g., switch buttons that play recorded messages) to low-tech options (e.g., letter boards or pictures) (American Speech-Language-Hearing Association; ASHA, n.d.). When opting to use a high-tech aided system, individuals can select a voice that best represents their vocal preference, as opposed to unaided or low-tech systems that require more interaction from the communication partner to decipher meaning (e.g., American sign language would require an interpreter, picture exchanging might lose meaning without proper sentence structure). High-tech aided AAC offers the most natural solution to augment someone's language. However, these high-tech systems are only accessible if the user and the communication partner speak and understand the same language. Individuals with complex communication needs rely on a spectrum of devices to supplement or augment their speech; without them, they would have limited opportunities to interact with those in their environment.

Individuals with complex communication needs who speak more than one language require a dynamic AAC system that can toggle between languages. Over 67 million Americans

are multilingual according to the U.S. Census (Dietrich & Hernandez, 2022), and there are 5.1 million students in US schools who are classified as English Language Learners (ELL), making up about 10.4% of all students in schools (National Center for Education Statistics, 2022).

According to the Pew Research Center, most children report Spanish as their native language.

Still, data indicate that there are over 400 languages spoken in the homes of these students (Bialik et. al, 2018). The term ELL originated from the phrase “English as a second language” (ESL). However, ELL is an all-inclusive term acknowledging that not all students learn English as a second language. Hereafter we will refer to these children as being multilingual.

Of the 7.2 million students in the US who received special education services during the 2020–2021 school year, 19% were eligible with a speech or language impairment, 12% under the category of autism, 7% with developmental delay, 6% intellectual disability (National Center for Education Statistics, 2022). Although schools do not report which of these learners are impacted to the degree that they require AAC to support their communication, researchers can glean, based on these numbers, that many students with these eligibility labels do require some level of communication support. However, as recently as 2006, Binger and Light reported that approximately 12% of preschoolers who received special education services required AAC. It is also likely that many learners with complex communication needs are multilingual. Kovacs (2021) stated that 20% of speech and language pathologists reported delivering AAC services in English and another language. These data indicate the palpable need for support from practitioners such as teachers certified in ELL or bilingual education, and speech-language pathologists to address the unique communication and language needs of multilingual children with complex communication needs.

Findings from research indicate that communication interventions should include both the individuals' home language and elements of their culture (American Speech-Language-Hearing Association; ASHA, n.d.). The goal of interventions should be to generalize communication skills across settings. For multilingual communicators, having access to multiple languages does just that by fostering communication opportunities with the family and in the community (Hodgins, 2019). Culturally responsive teaching practices also call for having both languages freely and readily available for multilingual children (Snyder & Fenner, 2021). Culturally responsive teachers intentionally implement strategies to engage culturally diverse students, especially those who struggle academically (Meyer, 2022).

Incorporating a student's native language in lessons or allowing technology (i.e., tablets, eReaders) in the classroom is crucial in providing a supportive learning environment relevant to a multilingual student (Darling-Aduana & Heinrich, 2018). Culturally responsive teaching also addresses the needs of those with complex communication needs through what San Francisco State University calls "culturally responsive AAC" (San Francisco State University, n.d.). This framework does not call for viewing or responding to the child as the individual parts of their background. Instead, it calls for educators to create an environment where the child is viewed holistically, has access to their languages in all forms, and celebrates their cultural practices. Although best practice indicates that all languages should be used across interventions and environments, many high-tech aided AAC devices have a narrow English focus (Dukhovny, 2015), leaving a desperate need for devices that offer access to multiple languages.

Huer, Parette, and Saenz (2001) found that many Mexican American families (i.e., mothers, fathers, other female family members) believed their child's AAC device was more applicable outside the home than in the home with family, and all agreed the device had

strengthened their child's communication within the community. This might be because all participants could reliably understand their child's verbal communication. They believed it was essential to continue using spoken language in the home while promoting the device in public. In addition, most responding family members felt more comfortable relying on signs and verbal communication because their child's device did not support Spanish. Huer and colleagues also found that although some participants reported having an AAC system programmed in Spanish, this became a limitation when encouraging communication in the community with English-speaking communication partners. These children required, but did not have, a device that supported multiple languages to ensure they could communicate with anyone they encountered.

Brock and Thomas (2021) attempted to remediate the challenges associated with multilingual children who use AAC. They sought to learn more about the effectiveness of AAC modeling through aided and unaided expressive output for bilingual children living in Belize. Their research included three bilingual participants with complex communication needs who had not previously used aided AAC. English was loaded on the AAC devices, even though it was not the participants' first language. The researchers reported that the participants showed gains and showcased how aided AAC devices, in general, can significantly impact bilingual children's ability to communicate and interact with their environment. The clinicians could not fully utilize dual language boards because they were only fluent in English. Other limitations noted were the lack of generalization or maintenance probes, baseline stability, as only two of the three participants' data included baseline measures, and the uncontrolled parent involvement and its effect on participant outcomes.

King et al. (2021) may have addressed the limitations outlined by Brock and Thomas (2021), by asking if Spanish-English bilingual children could differentiate or code-switch

between English and Spanish vocabulary layouts with an AAC device. They compared two groups of children ages 4–6, one group was neurotypical without complex communication needs, and the other had varying degrees of language difficulty. Both groups of children were bilingual and were provided two iPads with speech output—one with English vocabulary and one with Spanish. The results suggested that both groups could switch between the two language layouts without complication. This shows that bilingual children might be able to differentiate between languages using aided AAC when provided the opportunity. This finding is promising and indicates that language code-switching through an aided AAC system is possible among children. Limited work has addressed the disconnect between AAC for multilingual individuals. Thus, there is a need to review the literature to identify best practices surrounding AAC access for multilingual children to develop practical recommendations for practitioners to meet the unique needs of this population. Authors of this review aimed to describe the research published in this area, define any emerging best practices for multilingual AAC access, and highlight gaps in the literature that exist to ensure equal language access for all learners.

Method

Inclusion criteria

We included articles that focused (at least 50% of the article) on topics surrounding aided AAC and multilingualism, and that was published in English with no date restriction. Articles were excluded if they were a) books or chapters, b) a review of the literature or a meta-analysis, c) a dissertation or thesis paper, d) focus on unaided AAC, e) a discussion of issues and intersections of multilingualism made up less than 50% of the manuscript or f) was concentrated on an app or technology development without discussing applied topics.

Search strategy

We began by searching through an array of databases (i.e., Cinahl, PubMed, Psych Info, ERIC via EBSCO, LLBA, and MLA) using phrases [“augmentative and alternative communication” AND “multilingual”] or [“augmentative and alternative communication OR Augmentative Communication”] AND (“Multilingualism OR Bilingualism/ or Bilingual Education”), contingent on the wording required explicitly for that database. This initial search, completed in September of 2022, returned 382 articles. Zotero was then utilized to remove duplicates, upon which 359 remained. See Figure 1 for a flow chart of the search procedures.

Of the 359 articles, 333 were excluded after a review of each title and abstract for being outside of the inclusion criteria. The remaining 25 articles were pulled for a full manuscript review, of which 12 were removed, bringing the total to 13 articles identified for analysis. We then conducted a hand search of the top three represented journals: Perspectives of the ASHA Special Interest Groups, American Journal of Speech-Language Pathology, and Augmentative and Alternative Communication. Following a title and abstract review, two articles were identified for analysis. Zero were ascertained during the process of forward-searching and backward searching. This process ultimately yielded 15 total articles for analysis.

Data Extraction

Initially, each article was coded and separated by methodology: discussion style, intervention, or qualitative. Discussion papers were classified as such because of the absence of participant or experimental data and their focus instead on sharing best practice research in AAC and multilingualism and recommendations to the field. Intervention studies included experimental designs and the intent to alter or monitor multilingual participants’ use of AAC. Qualitative papers were classified as using interview strategies to gain perspective on multilingual AAC and its benefits amongst essential stakeholders.

All articles were coded for type, the journal where it was published, year it was published, languages discussed (i.e., specified language, bilingualism in general), and the AAC devices or applications used or discussed. Intervention-based studies were coded across 12 items: a) the number of participants, b) the age of participants, c) the disability of participants, d) the research question, e) the intervention used, f) the dependent variable measured, g) the design used, h) author reported results, i) future directions suggested by authors, j) maintenance measures taken, k) generalization measures taken, and l) social validity measures taken.

Discussion style papers were coded across six items: a) topic discussed, b) recommendations for intervention, c) recommendations for assessment, d) recommendations for future research, e) recommendations for AAC companies and their products, and f) overall takeaway. Qualitative papers were coded across five items: a) the number of participants or groups of participants, b) the participants (e.g., bilingual individuals using AAC, SLPs), c) the type of method used for analysis (e.g., focus group, grounded theory), d) the aim of the study, e) author reported findings. A copy of the coding documents used are available by contacting the first author.

Intercoder Agreement (ICA)

Throughout each phase of the review process, three coders examined the articles separately, then came together to discuss their decisions. During the initial search procedure, an agreement was 99% (following a disagreement among three articles during the initial title and abstract review). All disagreements were thoroughly discussed and resolved. The lead coder was an associate professor in special education with extensive research in AAC and complex communication needs. The second and third coders were researchers in an undergraduate speech-

language pathology program. Each article was coded twice; the ICA agreement across all 15 articles was 100%.

Results

All articles

Across 15 included articles, 10 were discussion-based (67%); three were interview-style (20%); and two were intervention studies (13%). Most articles came from the journals: *Perspectives of the ASHA Special Interest Groups* (6, 40%); *Augmentative Alternative Communication* (5, 33%); and *American Journal of Speech-Language Pathology* (2, 13%). The remaining articles (13%) came from separate journals: *Journal of Communication Disorders* and *Perspectives on Communication Disorders and Sciences in Culturally and Linguistically Diverse Populations*. All articles were published between 2004–2022; six (40%) were published in 2018. Ten articles (67%) discussed bilingualism and AAC as an overall topic, and five (33%) touched on specific languages and AAC devices or applications.

Intervention Based Studies

Two studies (13%) included 61 bilingual participants ranging from 4 to 6 years old. Most participants (35, 57%) were neurotypical, and less than half of the participants (26, 43%) had a disability (i.e., Down Syndrome, autism, developmental language disorder, cleft palate). Brock & Thomas (2021) investigated expressive language production based on the effects of aided AAC modeling. These authors used a retrospective case series design and followed the Binger and Light (2007) modeling protocol for their intervention. In comparison, King and colleagues (2021) investigated predictors of ability in differentiating between two languages (i.e., Spanish, English) in bilingual children to determine if there were any cognitive costs when switching

between two languages on an AAC device. They used an experimental language differentiation task design and a cued language-switching paradigm.

The dependent variable measured in both studies was response production on the AAC device (i.e., one- and two-symbol message production, aided and unaided requests, and correct responses); see Table 3. Brock and Thomas reported that participants made substantial gains regarding message production. King et. al found that children ages 4–6 could differentiate between languages as presented in the study (i.e., two AAC devices). Both groups of authors discussed the need for larger sample sizes, and neither took maintenance or social validity measures. However, King et. al reported fidelity measures taken across 20% of sessions to verify and evaluate their interobserver agreement.

Interview-based Studies

Three studies (20%) included 98 participants, including service providers, teachers, parents, and children. The authors aimed to summarize the perceptions on AAC services—their impact, facilitating and limiting factors in communication, and the importance or relevance of using an AAC device; see Table 2. Participants believed AAC and its use were beneficial and important. Specifically, McCord and Soto (2004) conveyed that even though Mexican American families felt their child’s AAC device was valuable in educational settings, they found that the families preferred oral speech and sign language, citing that the device did not support their language and cultural preferences. Tonsing and colleagues (2018) aimed to gain perspective from AAC service providers in South Africa about the practices they provided to multilingual clients. They determined that multilingual AAC services were not always provided, even though they generally saw clients with that need. This lacking support was due to many factors—single-language AAC devices, devices programmed only in languages other than English, or the service

provider's beliefs that multilingual AAC devices placed too big a cognitive load on their client. Pickl (2011) found there to be two facilitating factors in communication intervention—the level of the child's teacher comfort with other cultures and languages and knowing how to implement AAC use, and parent-teacher interactions (i.e., the more communication that happens between parent and teacher, the better each party can provide for the child).

Discussion-based Studies

Ten studies (67%) discussed three overarching themes: AAC delivery (7, 70%); barriers in AAC and multilingualism (2, 20%); and codeswitching using AAC (1, 10%).

The seven articles related to AAC included suggestions for practitioners when supporting multilingual learners and how bias, family input, or cultural characteristics affect AAC delivery; see Table 1. Authors from all articles with this theme provided a variety of recommendations for intervention; five out of the seven articles described best practices when supporting clients by utilizing multiple languages during the intervention. For example, Mindel and John (2018) and Ogletree et. al (2018) agreed that client and family perspectives paired with cultural characteristics or practices must be considered when providing intervention. In addition, each of the seven articles recommended being culturally aware while conducting an assessment. To do this, Dukhovny and Betsy (2015) and Wofford et. al (2022) recommend collecting a thorough background of the family's language, culture, and beliefs and observing the client across several environments. Yu (2018) argued that more research is needed on bilingual AAC use with children on the autism spectrum. Soto and Yu (2014) found a need for research in bilingual AAC systems and how to expand and build bilingual individuals who use AAC effectively.

Two articles related to barriers to delivering multilingual AAC interventions and supports were included. The authors of these studies discussed barriers to AAC use and access for

multilingual individuals. McNamera (2018) explained that the negative belief that individuals with complex communication needs do not have the capability and capacity to be bilingual, along with other societal barriers, marginalizes this population and yields inequitable access to AAC and bilingualism. Wagner (2018) stated that another barrier some families face is being misinformed by pediatricians or other professionals who tell them it is best to wait to introduce AAC, based on the belief that a child needs to have certain skills to utilize an AAC device. Both articles presented that multilingual clients with complex communication needs should continue to be supported in all languages, both in assessment and intervention. The authors argue that a monolingual approach is not the answer when addressing individuals with complex communication needs. Wagner also recommended that the practitioners involve families in the intervention process and provide a robust communication system that supports all the client's needs.

Switching between languages while using an aided AAC system can be challenging. King and Soto (2022) recommended that the focus of intervention should not solely be on the client's dominant language or to encourage monolingualism; again, every language the child has exposure should be supported in both assessment and intervention. King and Soto called for more in-depth research regarding codeswitching using AAC with diverse clients. They argue that practitioners need to understand the effect of psycholinguistic variables on codeswitching (e.g., age, cognitive abilities, language proficiency).

Discussion

Multilingual individuals with complex communication needs who use AAC must be surrounded by practitioners and family members who are keenly aware of these individuals' unique dual language access barriers. Approximately 20% of speech and language pathologists

reported delivering AAC services in English and another language (Kovacs 2021). Yet, few empirical studies have been conducted to validate best practices for this unique population of communicators. Access to multilingual AAC systems is rare, even though researchers have stated it is best practice to support each of a client's languages (e.g., Dukhovny & Kelly, 2015; Soto & Yu, 2014; Wofford et. al, 2022). Although the usability of each AAC system varies, several AAC systems do offer multiple languages (see Table 4). We reviewed 15 articles published with a multilingual and AAC focus on describing the studies published, defining any emerging best practices for multilingual AAC access, and highlighting existing gaps in the literature to ensure equal language access for all learners.

Over two million individuals in the US have complex communication needs and are currently using AAC to support their communication (United States Society for Augmentative and Alternative Communication (USSAAC), 2022), while another 67 million Americans were reported as being bilingual (Dietrich & Hernandez, 2022). Bilingual individuals with complex communication needs comprise 20% of the SLP caseload (Kovacs, 2021). However, most articles retrieved in this review were discussion-based, while empirically validated studies only comprised 13% of the articles. This highlights the need for more empirical work done in this area. Practitioners must support all languages in a client's repertoire; monolingualism is not the goal of intervention and should not be encouraged through assessment or treatment.

Upon preliminary research, the authors of this review put together a table of AAC apps that offer access to multiple languages other than English. We cannot guarantee that it is fully comprehensive. However, we note that although these apps offer access to multiple languages, this is not to say multiple languages can be used at once or that they are easy to navigate between

languages if a multilingual user is offered (see Table 4 for a list of systems available in multiple languages).

Multiple suggestions for practitioners were provided across studies on what best practice assessment, treatment, and intervention strategies are best for multilingual learners who use AAC. Practitioners should utilize all languages throughout the assessment and intervention phases of AAC acquisition and development. This ensures that each child is evaluated by culturally aware practitioners who are open to considering dual language interventions. Therefore, not all assessments will look the same. Dukhovny and Betsy (2015) and Wofford et. al (2022) recommend collecting a thorough background of the family's language, family, and beliefs and observing the client across several environments. This will aid practitioners in understanding the client and what their eventual goals will be an intervention.

Mindel and John (2018) and Ogletree et. al (2018) agreed that client and family perspectives paired with cultural characteristics or practices must also be considered when providing intervention. Regarding providing AAC intervention, Dukhovny and Betsy stated that it must be family centered. Family-centered intervention involves the family throughout the many processes of AAC implementation (i.e., vocabulary selection across settings, maintenance). Bailey et. al (2006) noted that without family involvement, the chances of device abandonment grow substantially. Wagner (2018) also stated that practitioners should provide a robust communication system that supports all the client's needs. It is not enough to support a client's language during assessment and intervention; we must also provide them with a system able to be utilized across all environments a client frequents, including at home and in the community.

The existing gaps in the literature are apparent in that most work published in this area is discussion-based. Although these authors provided robust discussions and suggestions, these articles lack empirical verification and thus must be considered with caution. Only two intervention-based studies directly investing in the relationships between multilingualism and AAC were included in this literature review (Brock and Thomas, 2021; King et. al, 2021). Although Stewart (2017) was not included in this review given their unpublished status (i.e., dissertation), this author provided empirically based suggestions. Stewart, investigating bilingual AAC intervention, asked how AAC use is affected when an individual is introduced to bilingual options in both the home and intervention. Stewart provided a case study with a 13-year-old who spoke Spanish at home and English at school. During the intervention, the participant received services in both languages, and the researchers intentionally included the participant's family. Following the intervention, the participant displayed an increased communication rate with lower cueing levels and an increased length of utterance. The family reported that using and interacting with their child's AAC device significantly increased following training.

Only a few articles investigated the perspectives of those most affected by the lack of access to multilingual AAC—families and other stakeholders. Binger et. al (2021) completed a survey study on AAC needs in schools and found that high-quality AAC services are a desperate need based on the significant number of school-aged children with highly intelligible speech currently not receiving this service. Andzik et. al (2019) and Fäldt et. al (2020) interviewed special educators and parents, respectively, related to AAC implementation but did not include additional discussion about barriers related to multilingual access. Salisbury (2022) defended their thesis by investigating speech-language pathologists' perspectives and reported on their current bilingual AAC practices in northeastern Spain. This unpublished work helps fill a large

void in our understanding of what is already being implemented and how we can further these practices. It is our obligation to amplify multilingual voices, and we must further discuss what is being done to help these individuals within our field.

Limitations

This review has limitations, and readers should consider the following as they review our findings. First, the inclusion criterion did not include grey literature, meaning empirical studies may exist but were not included, given the lack of peer review. Our search string, although comprehensive, may not have been entirely inclusive, and we cannot guarantee we captured every related article. There is also the possibility that more research was published after we completed our search in September 2022.

Practitioners have an obligation to continue to support multilingual clients who use AAC across all languages they speak at school, at home, and in the community. Much of the literature supports encouraging all languages of a multilingual individual, but limited access to bilingual AAC systems to deliver these services is a significant barrier in our field. Although we note a preponderance of discussion articles published on this topic and a need for empirically-validated studies, the many authors publishing in this area is promising for our field in continuing our support of these individuals.

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Table 1*Discussion Papers*

Author	Year	Theme	Recommendations
Dukhovny & Kelly	2015	AAC Delivery	During the assessment you should collect a thorough language history; AAC intervention should be family-centered; Important to support all the client's languages
Kempka Wagner	2018	Barriers	Support all the client's languages; Include families in the intervention.
King & Soto	2022	Codeswitching	Need to investigate code-switching and -blending using a variety of AAC modalities; Need to better understand cognitive processes involved in aided AAC use.
McNamera	2018	Barriers	Support bilingualism in AAC use; Societal barriers yield inequitable access to AAC and bilingualism.
Mindel & John	2018	AAC Delivery	Families should be part of both assessment and intervention practices; Need for cultural awareness and responsiveness; Support all the client's languages
Ogletree, McMurry, Schmidt, & Evans	2018	AAC Delivery	Need for cultural awareness and competence; Possible need to streamline AAC assessment.
Soto & Yu	2014	AAC Delivery	Professionals should understand bilingual language acquisition; Support all a client's languages. Family should always be involved.
Tonsing & Soto	2020	AAC Delivery	Client and family perspectives should always be considered in AAC intervention.
Wofford, Ogletree & De Nardo	2022	AAC Delivery	Theoretically, AAC services should support the personal, social and cultural identity of the client.

Author	Year	Theme	Recommendations
Yu	2018	AAC Delivery	AAC practitioners should provide culturally and linguistically responsive services; Family perspectives should always be considered; AAC systems should include culturally relevant symbols.

Table 2*Interview Papers*

Author	Year	Number of Participants	Participants	Aim of Study	Findings
McCord & Soto	2004	4	Bilingual individuals who use AAC and their families	To gain family perspectives regarding the impact, importance, and relevance of using an AAC device	Family members perceived AAC devices as being mysterious and complex, and not always accessible for home use; Service providers should include families in the process.
Pickl	2011	79	Parents and Special Education teachers	To highlight facilitating and limiting factors in effective communication intervention	Parent-teacher interaction was most meaningful for satisfactory support of the child's needs.
Tonsing et al	2018	15	Service Providers	To obtain perspectives of AAC service providers about their practices and intervention to clients from multilingual backgrounds	Even though there is need for multilingual AAC access, service providers did not always provide such to clients, due to conflicting extrinsic and intrinsic factors

Table 3*Intervention Papers*

Author	Year	Number of Participants	Disability of Participants	Dependent Variable	Author Reported Results
Brock & Thomas	2021	3	2, Down syndrome; 1, autism.	Message production	All children made substantial gains.
King, Romski, & Sevcik	2021	58	35, neurotypical; 20, developmental language disorder; 2 autism; 1 cleft palate	Number of correct responses	All participants correctly selected at least one of the 13 target vocabulary

Table 4*AAC systems available in languages other than English*

AAC system	Languages Available	Website
Proloquo2go	English, Spanish Crescendo user: English, Spanish, Dutch, French	https://www.assistiveware.com/support/proloquo2go/bilingual/add-second-language#:~:text=Proloquo2Go%20supports%20bilingual%20communication.,user%20as%20a%20second%20language.
Proloquo4text	English, Arabic, Catalan, Czech Danish, Dutch, Finnish, French, German, Greek, Italian, Norwegian, Polish, Portuguese, Russian, Spanish, Swedish, and Turkish	https://www.assistiveware.com/products/proloquo4text#:~:text=Proloquo4Text%20lets%20you%20be%20you,Spanish%2C%20Swedish%2C%20and%20Turkish.
Avaz	French, German, English, Hindi, Tamil, Kannada, Malayalam, Telugu, Marathi, Gujurati, Bengali, Sinhala and Tamil	https://www.avazapp.com/
CoughDrop	English, Spanish, German, Arabic, Dutch, Portuguese, French, Catalan, Czech, Danish, Swedish, Norwegian Nynorsk, Greek, Italian, Japanese, Korean, Chinese, Polish, Russian, Turkish	https://coughdrop.zendesk.com/hc/en-us
LAMP	English, Spanish	https://lampwflapp.com
TouchChat	English, Spanish, Hebrew, Arabic, French, Canadian French	https://touchchatapp.com/
SmartBox	Afrikaans, Arabic, Basque, Bulgarian, Catalan, Croatian, Czech, Danish, Dutch, English, Finnish, French, German, Greek, Hebrew, Italian, Norwegian, Portuguese, Polish, Russian, Slovak, Spanish Swedish, Welsh	https://thinksmartbox.com/
TD Snap (Tobii DynaVox)	Chinese, Czech, Danish, Dutch, English, French, German, Icelandic, Italian, Japanese, Norwegian, Portuguese, Spanish, Swedish	https://us.tobiidynavox.com/pages/td-snap
Hong Chi Association	English, Cantonese, Simplified and Traditional Chinese	https://apps.apple.com/hk/app/匡智溝通易/id645391615?l=en&fbclid=IwAR12bDnZK3RVWuMs_wEYmWjJSi_i_TRwT8ngxA0rsVOb_S2Su40ow2ISd-4

AAC system	Languages Available	Website
GoTalk NOW	English, Arabic, Czech, Danish, Finnish, German, Greek, Italian, Japanese, Polish, Portuguese, Simplified Chinese, Spanish, Swedish, Turkish, Ukrainian	https://apps.apple.com/us/app/gotalk-now/id454176457
Niki Talk 2 Pro	English, Czech, Danish, Dutch, Finnish, French, German, Greek, Hungarian, Italian, Norwegian Bokmål, Polish, Portuguese, Romanian, Russian, Slovak, Spanish, Swedish	https://apps.apple.com/us/app/niki-talk-2-pro/id1566543803
Lil Requester	English, French	https://apps.apple.com/us/app/lil-requester/id1488416772
LetMeTalk	English, Spanish, French, Italian and German, Chinese, Portuguese, Brazilian Portuguese, Dutch, Arabic, Russian, Polish, Bulgarian, Romanian, Galician, Catalan, Basque	https://apps.apple.com/us/app/letmetalk/id919990138
MyTalkTools Mobile	English, Danish, Dutch, French, Hebrew, Italian, Polish, Spanish, Traditional Chinese	https://apps.apple.com/us/app/mytalktools-mobile/id324286288
Predictable	Arabic, Chinese, Czech, Danish, Dutch, Finnish, French, German, Greek, Hebrew, Hindi, Hungarian, Indonesian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Romanian, Russian, Slovak, Spanish, Swedish, Thai, Turkish	https://apps.apple.com/us/app/predictable/id404445007
Grid Player	English, Arabic, Catalan, Czech, Danish, Dutch, Finnish, French, German, Greek, Italian, Norwegian Bokmål, Polish, Portuguese, Spanish, Swedish	https://apps.apple.com/gb/app/grid-player/id456278671
NovaChat	English, Spanish, French	https://salthillo.com/products
Accent 1000	English and Spanish	https://store.prc-salthillo.com/accent-1000
TapSpeak	English and Italian	https://apps.apple.com/us/app/tapspeak-sequence-standard/id379541810

Figure 1

Flowchart of search procedures

