

Augmentative and Alternative Communication

Components of Social Communication

Social communication allows individuals to communicate or interact with others within a societal framework. Social communication encompasses (**social interaction, social cognition, pragmatics, and language processing**). Variations for societal norms exist across and within cultures. Analysis of social communication considers the norms that are relevant to an individual in their communication environment(s) as opposed to imposing a singular set of standard social norms.

Clinicians engage in culturally responsive practice to learn more about the individual's communication needs. Cultural variability is balanced by a universal goal of having social communication effectively meet the individual's goals or developmental needs (Rose-Krasnor, 1997).

1. **Social interaction** is communication that occurs between at least two individuals. Rules of social interaction may vary significantly across cultures, communities, and physical environments. The following variations may occur:
 - in speech style and context
 - within and across cultural groups
 - in gender communication differences
 - in language transfer (influence of one language on another)
 - in power relationships (e.g., dominance or deference)
 - in rules for linguistic politeness
 - in nonverbal communication (gestures, tone of voice, facial expression, proximity, and body postures)
2. **Social understanding** involves acquiring social knowledge about one's and others' mental actions (social cognition) and using this knowledge to plan, guide, and flexibly respond (executive function) to social interactions within a cultural or societal context (Carpendale & Lewis, 2006; Lewis & Carpendale, 2014).

Key abilities related to social cognition include the following:

- theory of mind (ToM)
 - identifying and understanding the mental states that others have (knowledge, forgetfulness, recall, desires, and intentions)—and understanding that they may differ from one's own
 - ability to connect emotional states to self and others
 - ability to take the perspective of another and modify social behavior and language use accordingly

- executive functioning (e.g., organization, planning, attention, problem solving, self-monitoring, future and goal-directed behavior)
 - implicit and explicit memory
 - joint attention (e.g., social orienting, establishing shared attention, monitoring emotional states, and considering another's intentions)
3. **Pragmatics** is an area of social communication that focuses on goal-consistent language use in social contexts (Nelson, 2010). It is the set of rules that individuals follow when using language in conversation and other social settings. Culturally responsive practice seeks to understand pragmatic norms specific to the student, client, or patient. Pragmatics includes both verbal and nonverbal communication.
- a) **Verbal Communication** is interpersonal communication that includes oral communication, written communication. Verbal [communication](#) relies on words to convey meaning between two or more people It includes:
- speech acts (e.g., requests, responses, comments, directives, demands, promises, and other communication functions)
 - communicative intentions (communicative acts) (Hoff, 2014)
 - prosody
 - discourse (style—conversation, interaction, turn-taking, communication breakdown and repair...)
 - scripts
- b) **Nonverbal Communication** encompasses a whole host of physicalized nonverbal cues that convey emotional states and complement verbal messages. Nonverbal human communication involves many different parts of the body and can be either conscious or subconscious on the part of the communicator. There are many different types of nonverbal communication:
- body language (posture and positioning)
 - gesture
 - facial expression
 - eye contact
 - gaze (gaze shifts)
 - proxemics
 - deictic gestures—gestures related to time, place, or person (e.g., pointing, reaching)
 - representational or symbolic gestures (e.g., waving “hi” and “bye”)
4. **Language Processing** is an area of social communication that regards internal generation of language (expressive) as well as understanding and interpretation of language (receptive). It

is the transfer of thoughts and feelings into a means of expressive communication (i.e., spoken, written, signed) and the understanding and interpretation of language.

- spoken and written language expression and comprehension.
- morphology (word forms).
- syntax (word order).
- semantics—general and discipline-specific vocabulary (e.g., science, math, social studies).
- phonological skills for spelling and reading decoding.

Augmentative and alternative communication

Augmentative and alternative communication (AAC) is an area of clinical practice that supplements or compensates for impairments in speech-language production and/or comprehension, including spoken and written modes of communication. AAC falls under the broader umbrella of assistive technology, or the use of any equipment, tool, or strategy to improve functional daily living in individuals with disabilities or limitations.

AAC uses a variety of techniques and tools to help the individual express thoughts, wants and needs, feelings, and ideas, including the following:

- manual signs
- gestures
- finger spelling
- tangible objects
- line drawings
- picture communication boards and letter boards
- speech-generating devices

AAC is **augmentative** when used to supplement existing speech, **alternative** when used in place of speech that is absent or not functional, or **temporary** as when used by patients postoperatively in intensive care (Elsahar et al., 2019).

AAC Populations

Individuals who use AAC have an impairment or a limitation in speech, language, reading, and/or writing. These can be the result of **congenital disabilities**, **acquired disabilities**, or **neurological differences** such as autism.

Examples of congenital disabilities that may benefit from AAC include

- cerebral palsy,
- developmental apraxia of speech,
- developmental disability,

- genetic disorders, and
- intellectual disability.

Individuals with congenital disabilities may continue to acquire language while using AAC. AAC may also serve as a tool to aid in expressive and receptive language acquisition and literacy development in this population. AAC needs may vary and change over time.

Examples of acquired disabilities that may benefit from AAC include

- cerebrovascular accidents (i.e., stroke);
- traumatic or acquired brain injuries;
- neurodegenerative diseases, such as
 - ALS,
 - supranuclear palsy,
 - primary progressive aphasia, and
 - apraxia;
- disability following surgeries (e.g., glossectomy, laryngectomy); and
- temporary/intermittent conditions for
 - patients in critical care settings (e.g., intubated patients) and
 - patients with acute laryngitis.

AAC needs for individuals with acquired disabilities vary and may change over time, depending on language and cognitive status at the time of injury as well as on disease onset and progression

Incidence and Prevalence

It is difficult to estimate the prevalence of AAC users due to wide variability across this population in terms of diagnosis, age, location, communication modality, and extent of AAC use. Overall, the more severe an individual's communication deficit, the more likely the individual would benefit from AAC support (Brown et al., 2021; Funke et al., 2018; Iacono et al., 2016; Kristofferson et al., 2020).

- Beukelman and Light (2020) estimated that approximately 5 million Americans and 97 million people in the world may benefit from AAC.
- In the United States among students who need support when communicating, a national survey of special educators across all 50 states reported that 18.2% of their students use a form of AAC for their communication mode: 6.9% use gestural modes, 6.5% employ pictorial supports, and 4.8% use a speech-generating device (SGD; Andzik et al., 2018). According to the 2009–2010 National Survey of Children with Special Health Care Needs, 4% of U.S. children with developmental disabilities and 10.5% of children with special health care needs did not have their assistive technology (AT) communication needs met (Lin et al., 2017).

- In the United Kingdom, Creer et al. (2016) estimated that 0.5% of the population requires the use of AAC based on the prevalence of conditions associated with the use of AAC in the United Kingdom. The largest populations of individuals who could benefit from AAC had diagnoses of Alzheimer's/dementia (23%), Parkinson's disease (22%), autism spectrum disorder (ASD; 19%), learning disabilities (13%), and stroke (11%). A survey of U.K. service providers conducted by Judge et al. (2017) reported an average of 0.0155% of individuals known to be using powered communication aids (e.g., voice output communication aids).
- Across specific pediatric populations, Iacono et al. (2016) estimated that 25%–30% of Australian children with autism have limited speech skills and would benefit from AAC. Kristoffersson et al. (2020) found that 44.4% of Swedish children with cerebral palsy used a form of AAC either exclusively or to supplement their speech. Brown et al. (2021) identified 6.9% of U.S. children with cleft palate or craniofacial anomalies as AAC users.
- A review of medical records at the University of Iowa Hospitals & Clinics found that 33% of intensive care unit (ICU) patients met the AAC candidacy criterion, whereas 3% of non-ICU patients met the AAC candidacy criterion (Zubow & Hurtig, 2013). Similarly, in the ICU setting, an Australian cohort study found that patients were unable to communicate verbally 17% of the time and staff reported difficulty communicating with patients 35% of the time. Despite these communication breakdowns, ICU patients used alternative modes (e.g., gestures, mouthing, personal electronic device) during only 11% of their time in the ICU (Freeman-Sanderson et al., 2019).
- Among adults with amyotrophic lateral sclerosis (ALS) in Scotland, Elliott et al. (2020) found 17.3% of ALS patients acquired AAC equipment for speech augmentation, speech replacement, or written communication support. In Germany, 46% of patients demonstrated the need for AAC, yet 39% failed to access an AAC device (Funke et al., 2018)

AAC Systems

An **AAC system** is an integrated group of components used to enhance communication. These components include **forms** of AAC (described below), **symbols**, **selection techniques**, and **strategies**.

The design of an AAC system should incorporate individual strengths and needs. It considers the individual's full communication abilities and may include existing speech, vocalizations, gestures, and/or some form of external system (e.g., SGD).

An individual may use multiple modalities or many forms of AAC in combination, allowing for change based on context, audience, and communicative intent. A well-designed AAC system is flexible and adaptable. It allows for changes to vocabulary and mode of access as the individual's language and physical needs change over time.

1) Forms

AAC is typically divided into two broad categories.

- i. **Unaided**—do not require an external tool. Unaided forms require some degree of motor control. Unaided forms include the following:
 - body language

- facial expressions
 - finger spelling
 - gestures
 - manual signs
 - vocalizations
 - verbalizations
- ii. **Aided**—require some form of external tool, either electronic or nonelectronic. Nonelectronic aided forms are often referred to as “light-tech” or “low-tech.” Electronic forms may be referred to as “high-tech.”

Low-tech/light-tech options include the following:

- communication boards/books
- objects
- pictures
- photographs
- visual schedules
- writing

High-tech options include the following:

- computer/tablet/smartphone
 - communication apps, such as AAC software that enables dynamic symbol/language representation
 - text-to-speech features
 - texting
 - drawing/writing using a tablet
- single-message devices and recordable/digitized devices
- SGDs

An individual may use one form of AAC alone or utilize a combination of unaided AAC, low-tech/light-tech aided AAC, and/or high-tech aided AAC forms.

People who use AAC should always have access to their communication tools or devices. Concerns about the overuse of screen time, particularly for young children, do not apply to the use of screens as part of an AAC system.

SGDs often have different voice output options to allow users to select a voice based on the following:

- age
- ethnicity
- gender
- language(s) used
- race

However, voice output options may be limited and may not accurately reflect an individual's culture. SLPs should be mindful that work continues to be needed to develop AAC treatment and assessment that is culturally responsive (Mindel, 2020).

These devices use synthesized speech output, digitized speech output, or both.

- **Synthesized speech** is electronically produced. Phonemes and allophones of the target language are used to generate digital speech signals that are transformed into intelligible speech. Newer technology uses parameters and vocal characteristics of the speaker's former or residual speech. Through **voice banking**, an individual can record a large inventory of speech, which is then used to create a synthetic voice that approximates their natural voice (Costello, 2011/2016). Voice banking should be completed when a communicator's energy and skills are sufficient to generate clear speech.
- **Digitized speech** consists of natural speech that has been recorded, stored, and reproduced. Nonspeech sounds, such as laughter or the sound of a car horn, can also be recorded. Through **message banking**, an individual can use their own voice or a proxy voice to digitally record and store messages, which may include words, phrases, sentences, and sounds using natural voice, inflection, and intonation. Those messages are then stored on, and reproduced by, the AAC device (Costello, 2011/2016)

Comparison of Synthesized and Digitized Speech Output

Synthesized Speech	Digitized Speech
Less "natural sounding"	More "natural sounding"
Requires less device memory storage	Requires more device memory storage
Allows for generation of speech in multiple languages	Allows for recording of speech in an individual's voice, reflecting their language(s) and dialect(s) used
Allows for novel message generation	Limited novel message generation (number of possible utterances is limited to recorded items)

SGDs should also have customization/individualization options for users to select icons, vocabulary, and languages/dialects that meet their unique needs.

Additional Augmentative Supports

In addition to AAC, other support systems exist for individuals with differences in expressive or receptive communication. These include additional augmentative supports and hearing AT systems. These devices are considered AT but do not fall under AAC, because they do not require skilled SLP intervention prior to use.

Supports include the following:

- amplification
 - hearing aids
 - cochlear implants
 - Hearing Assistive Technology Systems (HATS)
 - personal amplification devices
 - text telephones
 - Telecommunications Device for the Deaf
 - Teletype
- Braille
- voice amplifiers and artificial phonation devices
 - electrolarynx devices
 - intraoral devices
 - speech valves (for individuals with tracheostomies or ventilators)

HATS may aid communication among individuals who are not able to communicate via sign language or choose not to do so.

2) Symbols

Symbols are used in AAC to represent objects, actions, concepts, and emotions. They can include the following:

- facial expressions
- gestures
- objects

- photographs
- drawings
- auditory symbols (e.g., spoken words)
- orthography (i.e., alphabet-based symbols)
- 3-D symbols or tactile symbols

Symbols may not have the same meaning or relevance across different languages and cultures. Responsive practices consider what is meaningful for each device user.

Iconicity is the association made between a symbol and the item for which it stands (referent; Schlosser, 2003). Iconicity is classified depending on how easily the meaning of a symbol can be guessed.

- **Transparent** symbols are readily guessable in the absence of the referent, such as a photograph or written word.
- **Opaque** symbols are not readily guessable even when the meaning of the symbol is known, such as an individualized gesture.
- **Translucent** symbols lie between transparent and opaque symbols. The meaning of the referent may not be obvious, but the relationship between symbol and referent is more obvious when additional information is provided (Fuller & Lloyd, 1991).

Iconicity directly affects the communicator's efficiency and effectiveness, especially with untrained or unfamiliar communication partners. **High iconicity** refers to displaying a symbol along with a written word and can help communication partners learn and interpret symbols, particularly if no voice output is available (Wilkinson & McIlvane, 2002).

A person's spoken vocabulary will change based on their age, communication partner, language development, environment, mood, and context. The symbols used in an AAC system should allow for the same changes and flexibility. Symbols are not universal across cultures. It is important to include symbols that are relevant to the individual and their community.

Symbol selection is also based on the person's ability to access, recognize, and learn each symbol's meaning. For example, a person with visual deficits may need a symbol that is modified to be viewable or is accessible via other sensory modes such as listening or touch.

Symbol Display

The **display** relates to the way in which symbols are presented on an AAC system. Different encoding options (e.g., alphanumeric, numeric, iconic, alphabetic, and color) are sometimes used to organize displays. Displays can be **static** (fixed), **dynamic** (changes based on user actions), or **hybrid** (a combination of static and dynamic)

Display Types

Static/Fixed	Dynamic	Hybrid
<ul style="list-style-type: none"> • Symbols remain in a fixed location. • Most common in communication boards or low-tech SGDs. • There are a finite number of symbols/messages. • Users may have multiple fixed displays (e.g., multiple pages in a communication book). 	<ul style="list-style-type: none"> • Electronic—selection of one symbol automatically activates change in symbol set. • Often arranged by large category first and then broken down to more specific vocabulary items. • With use of multiple-meaning icons, selection of one icon may prompt display of other related icons. 	<ul style="list-style-type: none"> • Static/fixed display with dynamic component (e.g., alphabet board or keyboard with word prediction; grid display that opens new page following user selection of a symbol).

A **visual scene** is a photo or video that represents situations, routines, places, or events. Elements within the visual scene may trigger message output when selected, also known as “hotspots.”

Visual scenes may be easier to learn and use than grid displays for beginning communicators (e.g., young children or older individuals who are at early-functioning communication stages). There is also utility for people with acquired communication needs such as aphasia (Dietz et al., 2020).

Symbol Organization

Symbol organization on an AAC system affects the individual’s ability to communicate effectively and efficiently. Symbol organization should be appropriate to the user’s language level and address the user’s needs and capabilities as well as those of the communication partners (Beukelman & Light, 2020). Organization strategies may change over time based on changes in skills and contexts.

Most AAC systems, with the exception of visual scenes, are presented in a grid format. The organization of vocabulary, symbol size, and number of symbols on the grid is individualized and determined by the type of display; the type of symbol; and the visual acuity, communication and cognitive skills, integrated sensory system, and motor control of the individual. These systems do not have to be accessed via touch; selections can be made via eye gaze, head pointing, or scanning methods.

Inclusive Vocabulary Selection

Selection and inclusion of functional, personalized, and meaningful vocabulary within an AAC system can lead to greater intervention success and decreased likelihood of abandonment (Moorcroft et al., 2019) of AAC supports. The SLP considers the individual’s needs for communicating with family members and other communication partners (e.g., in social contexts, academic settings, medical

settings, vocational settings, etc.). The vocabulary selected is commensurate with peers, relevant to the individual's language, dialects, culture, and personal identities. Our personal lexicons shift over time. AAC devices should provide users with opportunities to grow and speak about their personal relationships with their loved ones. Nouns tend to dominate vocabulary sets for AAC users (Dark & Balandin, 2007); however, the inclusion of verbs and other parts of speech can increase AAC acceptance and use (Adamson et al., 1992).

Vocabulary is often divided into two categories: **core** and **fringe** (or “extended”). **Core vocabulary** consists of high-frequency words that make up about 80% of the words used by most people every day (Quick et al., 2019). Core vocabulary contains mostly pronouns, verbs, descriptors, and question words (Witkowski & Baker, 2012). English language learners use a comparable amount of core vocabulary as do native English speakers (Boenisch & Soto, 2015). **Fringe vocabulary** consists of lower frequency words—mostly nouns—that tend to be context specific. Combining core and fringe vocabulary can increase the frequency of AAC use (Beukelman et al., 1991; van Tilborg & Deckers, 2016; Yorkston et al., 1988).

3) Selection Techniques

Selection techniques are the ways in which messages or symbols are accessed by the AAC user. There are two main selection techniques.

Direct selection—The AAC user selects the desired symbol directly from a selection set. Direct selection can be

- electronic or nonelectronic,
- done with direct physical touch (e.g., body part or other object), or
- done with a generated movement or signal (e.g., via joystick, eye gaze, trackball, traditional or head mouse, brain–computer interface technology, light indicator).

Indirect selection (scanning)—Each item from a selection set is presented sequentially until the desired item appears and is selected by using a previously agreed-upon motor movement or vocalization or by using a switch.

- Presentation of items in the selection set can be auditory, tactile, or visual.
- Items on the screen are presented one by one, in a row, column, or quadrant.
- **Partner-assisted scanning** is an indirect selection technique in which the communication partner presents messages or letter choices in a sequential fashion (visually or auditorily) to the individual, and the individual then makes their selection using a previously agreed-upon motor act (e.g., blinking, grunting, nodding, raising a hand, etc.). Partner-assisted scanning
 - is used with individuals who have severe motor, visual, and/or communication impairments;
 - may be used with individuals who do not yet have established means of alternative access; and

- may be used as an alternative when the primary system is unavailable or not functioning.

Comparing Direct and Indirect Selection Techniques	
Direct Selection	Indirect Selection
<ul style="list-style-type: none"> • Less load on working memory of user and listener • Can be used with high-tech or low-tech/light-tech systems • Requires more precise and accurate motor movements • One-to-one relationship between the motor act and message generation • Requires greater visual and/or auditory acuity 	<ul style="list-style-type: none"> • Greater demand on listener's and user's working memory • Can be used with high-tech or low-tech systems • Requires less fine-motor control • Requires intermediary steps between the motor act and message generation • Can be used by individuals with significant visual and/or auditory deficits

Communicative Competence

Communicative competence is an individual's ability to freely express ideas, thoughts, and feelings to a variety of listeners across contexts. It provides the means to achieve personal, educational, vocational, and social goals (Calculator, 2009; Light & McNaughton, 2014; Lund & Light, 2007). Individuals must achieve communicative competence whether they use natural speech or AAC, but their paths may vary (Light et al., 2003).

Communicative competence for AAC users consists of the following five individual competencies (Light et al., 2003; Light & McNaughton, 2014).

- **Linguistic competence** includes knowledge of and the ability to use the language(s) spoken and written in the individual's family and community as well as knowledge of and the ability to use the linguistic code (symbols, syntax, grammar) of the AAC system.
- **Operational competence** requires skill in the technical operation of AAC systems and techniques, including
 - having the motor movements needed for unaided approaches,
 - using selection techniques for aided approaches,

- navigating in and between systems,
- turning an electronic device on and off and charging it, and
- operating electronic equipment and/or navigating pages in a low-tech system.
- **Strategic competence** is the ability to use available features to convey messages efficiently and effectively, including
 - asking for choices due to vocabulary limitations,
 - using word/phrase prediction to enhance efficiency,
 - using an introductory (pre-stored) statement to explain AAC to unfamiliar communication partners, and
 - asking one's communication partner to write or type messages to aid in understanding and to repair communication breakdowns.
- **Social competence** is knowing what, where, with whom, when and when not to, and in what manner to communicate. Social communication skills include
 - turn-taking,
 - initiating and terminating communication,
 - topic maintenance, and
 - code-switching.
 - requesting attention;
 - requesting or providing information; and
 - pragmatic skills, such as
- **Psychosocial competence** is the ability to manage the demands and challenges of daily life, maintain a state of mental well-being, and demonstrate adaptive and positive behavior during communication (World Health Organization [WHO], 1997). Psychosocial competence for AAC users includes
 - being motivated to communicate,
 - having a positive attitude toward the use of AAC,
 - having confidence in one's ability to communicate effectively in a given situation, and
 - being resilient—persisting in the face of communication failures

Assessment

The goal of an AAC assessment is to determine the system component that will optimize communication for the user. AAC assessment is an ongoing process; ongoing evaluation and decision

making are required, even after an AAC system has been selected. Elements of [dynamic assessment](#) and other informal assessments are used to supplement standardized assessment data.

Exposing individuals to symbols and systems prior to assessment may ensure more accurate assessment results. This can be accomplished by providing core and fringe vocabulary supports in the home and day environment (e.g., classroom) and by introducing visually represented language using a variety of communication display forms and sizes prior to the formal assessment process.

Assessment considers the needs of the individual. Needs may include one or more of the following:

- augmentative means of communication to facilitate natural speech;
- alternative means of communication to replace verbal speech, writing, or expressive language;
- temporary or permanent need for AAC; and/or
- means of communication to facilitate more appropriate alternate behaviors.

Primary, secondary, and tertiary components of the AAC system are also considered during assessment.

- **Primary components** are those that perform the functions of natural language and have the greatest impact on communication performance (e.g., symbols, vocabulary, methods of utterance generation).
- **Secondary components** relate to the way the individual uses and interacts with the system (e.g., user interface, selection method and output).
- **Tertiary components** are often external to the system itself but affect long-term use and ongoing success with the system (e.g., switches, portability, mounts, training and support; Hill & Corsi, 2012).

SLPs and OT also collaborate and engage with family members and caregivers during the assessment. These individuals can often report consistent behaviors and current means of communication beyond what the SLP may directly assess/observe. Lack of family involvement in the AAC process is cited as a significant factor in device abandonment. Therefore, incorporating family members into the AAC process is crucial (Bailey et al., 2006; Moorcroft et al., 2019). **Abandonment** of an AAC system is used here to mean that an individual has stopped using an AAC device even though one is still needed. Abandonment occurs in approximately one third of cases (Zangari & Kangas, 1997), even if the system is well designed and functional (Johnson et al., 2006).

The assessment should be conducted in the language(s) needed by the AAC user. Unique characteristics, linguistic background, and cultural variables that affect communication style and use are considered and reflected in assessment and treatment plans. Interpretation services may be needed.

If the individual (and/or communication partner) wears hearing aids or prescription eyeglasses, these should be worn during the assessment. Hearing aids should be inspected prior to the assessment to ensure that they are in working order. SLPs should obtain documentation of hearing and vision evaluations or make referrals as appropriate.

Environmental modifications should be made to accommodate vision or hearing deficits and any other physical difficulties. These modifications may include the following:

- special lighting
- physical positioning of the individual relative to their communication partner
- volume of the SGD
- additional personal amplification, if needed
- modifications of physical space to accommodate wheelchairs or other specialty seats

Consistent with the WHO's International Classification of Functioning, Disability and Health (ICF) framework (ASHA, 2016; WHO, 2014), a comprehensive assessment of individuals with AAC needs is conducted to identify and describe

- **impairments in body structure and function**, including underlying strengths and weaknesses in speech sound production, verbal/nonverbal communication, and gross and fine motor skills for writing and accessing an AAC system;
- **comorbid deficits**, such as apraxia of speech, dysarthria, ASD, intellectual disability, and neurodegenerative disease;
- the individual's **limitations in activity and participation**, including functional status in communication, interpersonal interactions, and learning potential;
- **contextual (environmental and personal) factors** that serve as barriers to, or facilitators of, successful communication and life participation; and
- the impact of communication impairments on **quality of life** and functional limitations relative to premorbid communication status (where applicable).

Comprehensive Assessment for AAC: Typical Components

Many components of the comprehensive assessment may already be documented in an individual's records (i.e., medical or school records). The components listed below may be completed if not addressed in these records.

Case History

- medical status and history, education, occupation, and linguistic backgrounds
- history and current use of AAC systems, including motivation to use AAC
- prognosis and potential for disease progression, when applicable

Ecological Inventory

- current communication skills and needs
- communication skills in relation to similarly matched peers
- communication skills in relation to the environment

Self-Report

- functional communication success
- communication difficulties and impact on individual and family/caregiver
- contexts of concern (e.g., social interactions, work activities)
- language(s) used in contexts of concern
- individual's goals and preferences

Sensory and Motor Status

- **vision**—ability to see symbols/text on the AAC system
- **physical/motor status**—means of access to the AAC system (positioning, fine motor, gross motor)
- **integrated sensory system**—ability to regulate and ready the body for communication

Hearing Screening

Speech Sound Assessment

Expressive and Receptive Language Assessment

The SLP should complete a comprehensive speech and language assessment relative to an individual's needs. An SLP should evaluate expressive and receptive skills, including

- an individual's method of expressing communicative intent;
- current means of communication and their effectiveness (verbal and nonverbal);
- vocabulary size and word types used and understood;
- word combinations and grammatical forms used and understood;
- the ability to follow commands;
- the ability to respond to yes/no questions; and
- the ability to correctly point to objects, words, and pictures given an auditory stimulus.

Written Language Assessment (Reading and Writing)

Social Communication Assessment.

Cognitive Communication Assessment

Memory, attention, problem-solving, and executive skills in the context of functional AAC use.

Symbol Assessment

Ability to use various symbol features to meet current and future communication needs, including

- type of symbol (e.g., objects, pictures, letters, printed text),

- symbol size,
- field size (e.g., number of symbols in a display), and
- organization of display.

Based on individual skills and needs, determine appropriate AAC system features, including

- the ability to facilitate written communication,
- the capability to allow a range of communication functions,
- capacity for use in varying environments and with different partners,
- type and number of symbols,
- type of display and display features (e.g., color vs. black and white, static vs. dynamic, hybrid),
- input type (i.e., direct vs. indirect selection),
- output (i.e., type of speech, voice),
- options for physical positioning and need for accessories (e.g., mounts or switches),
- portability,
- the capability to be modified to allow for changes in communication abilities and needs,
- AAC user preference,
- the ability to motivate use by an individual, and
- affordability and ease of maintenance.

Identification of Contextual Facilitators and Barriers

- **Facilitators** such as
 - the ability and willingness to use AAC systems,
 - family support,
 - motivation to communicate, and
 - technological knowledge/abilities of the user and family.
- **Barriers** such as
 - reduced confidence in communication,
 - cognitive deficits,
 - visual and motor impairments,
 - lack of acceptance of disability and/or AAC use,
 - limitations in the capability of the AAC system, and

- seating and positioning limitations across environments.

Assessment Considerations

AAC assessments may be time consuming, and if all questions are unanswered, continued assessment may progress alongside treatment. Trials of specific devices are often a component of AAC treatment, and an individual's success with a specific device may not be effectively determined upon initial assessment.

Treatment

The goal of intervention is to maximize the efficiency and effectiveness of communication for individuals who are unable to communicate via verbal speech. Whenever possible, intervention takes place in a naturalistic environment in order to promote generalization and functional use. Potential areas of focus for treatment include using AAC to

- improve functional communication,
- increase language and literacy skills,
- improve speech production and comprehensibility with the use of multiple modalities,
- decrease challenging behaviors, and
- improve social communication.

AAC interventions address the development of adequate, functional communication skills to support individuals with complex communication needs in developing, rebuilding, or sustaining communicative competence to express needs and wants, develop social closeness, exchange information, and participate in social etiquette routines (Drager et al., 2010; Light & McNaughton, 2014).

AAC intervention requires ongoing collaborative decision making and training to promote communicative competence and language and literacy development, as well as modifications to AAC systems to support changes in communication needs over time. For individuals using aided approaches, intervention may include customization of vocabulary, rate enhancement features that allow users to produce language with fewer keystrokes, and updates to software for high-tech devices.

Preferred practice for AAC intervention incorporates multiple communication modalities so that the user is not restricted to aided or unaided approaches but can use a combination of communication modalities, depending on the environment, listener, and intent of the message.

Working With Other Professionals

SLPs often collaborate with other professionals to improve the success of AAC intervention.

- Occupational therapists assist with positioning and selection methods for AAC users.
- Vision specialists assist in determining the best ways for an individual to process and understand symbols and to reduce visual barriers to symbols.
- Rehabilitation engineers or AT professionals help SLPs and AAC users with programming, accessibility, and efficient use of the AAC device.

- Special education and classroom teachers can help the SLP incorporate curriculum-related vocabulary into the AAC system and facilitate the use of the AAC system in the classroom.
- Behavior specialists assist in identifying communicative intent and embedding AAC systems into daily activities.
- Vocational rehabilitation specialists provide education to employers regarding workplace accessibility and inclusion of the AAC user in vocational activities.
- Members of the medical team include nurses, doctors, case managers, and social workers to assist with medical management and transition planning.

Communication Partner Involvement and Training

Communication partners are integral to the assessment and treatment process. Family, friends, and caregivers bring an important and unique understanding of the strengths, challenges, and needs of the individual who uses AAC. In addition to helping the individual identify goals and objectives for treatment, they often have input into the type of AAC system used, daily communication needs, and vocabulary incorporated into the system. This helps ensure carryover and functional use of the system in everyday life. Partial or complete abandonment of AAC can occur when partner input is not considered during AAC intervention (Angelo et al., 1995; H. P. Parette et al., 2000; P. Parette et al., 2000).

Communication partner training facilitates effective communication and incorporates instruction in the following skills:

- using active listening strategies;
- increasing wait time for conversational turn-taking;
- using augmented input to facilitate communication (e.g., visual and environmental cues);
- helping the user take advantage of rate enhancement features;
- understanding the operational aspects of high-tech devices (e.g., turning the device on and off; charging and storing the device; programming; and troubleshooting); and
- supporting the communication of the person who uses AAC across contexts, and communication partners.

The SLP trains multiple communication partners, including other professionals who work with the AAC user.

Inadequate training of communication partners has been identified as a barrier to device use in addition to limitations of the AAC device itself and insufficient involvement in device selection (Bailey et al., 2006). For example, communication partners are more likely to ask yes/no questions instead of open-ended questions, dominate the conversation, or fail to respond to the individual's communication attempts when communicating with children who use AAC (Kent-Walsh & McNaughton, 2005).

Successful integration of AAC devices depends on the consistency of use. For instance, a device may not be maximally effective if it is used only at home but not in other situations (e.g., school or the workplace).

Treatment Approaches

Treatment selection depends on a number of factors, including the individual's communication needs, the presence and severity of co-occurring conditions (e.g., cerebral palsy, apraxia of speech, aphasia, or progressive neurological diseases), and the individual's communication needs, including language(s) used and consideration of belief systems and other cultural elements.

Once an AAC system is selected, intervention will initially focus on training the individual and their family/caregivers in how to use the device and/or system components (i.e., operational competence). Interventions should incorporate use of the AAC system into a naturalistic environment and address using the system to target broader communication goals such as language and literacy development and social interaction.

SLPs consider strategies, target areas and goals they use in other areas of language treatment as they select and implement AAC treatment approaches. SLPs use AAC system components to address these areas. Additionally, SLPs consider the type and frequency of prompting they use during AAC intervention and training, including fading prompts to facilitate independence.

Below are brief descriptions of both general and specific treatment approaches and instructional strategies for AAC intervention. Some are prescribed interventions with specified procedures, and some are more general approaches to language organization and/or system presentation.

Augmented input—also called “natural aided language,” “aided language stimulation,” or “aided language modeling”—is a receptive language training approach in which the communication partner provides spoken words along with AAC symbols during communication tasks (e.g., partner points to the AAC symbols while simultaneously talking).

Augmented input is based on the concept that language input provides a model for language development. This approach can lead to increased symbol comprehension in young AAC users and in users with severe cognitive or intellectual disabilities (Binger & Light, 2007; Drager et al., 2006, 2010), as well as increased symbol comprehension and production (Binger & Light, 2007; C. Goossens, 1992; M. D. Harris & Reichle, 2004). In fact, this approach can be effective for participants of many differing ages/disabilities/language skills (O'Neill et al., 2018).

Behavioral interventions are used to teach desired behaviors and are based on behavioral/operant principles of learning (i.e., differential reinforcement, modeling, prompting, and fading). Behavioral methods involve examining antecedents that elicit a behavior and the consequences that follow that behavior. Adjustments are made to increase desired behaviors and/or decrease inappropriate ones. Behavioral interventions range from one-to-one discrete trial instruction to naturalistic approaches.

Discrete trial training (DTT) is a one-to-one instructional approach that uses behavioral methods to teach skills in small systematic steps. The teaching opportunity is a discrete trial with a clearly identified antecedent and consequence (e.g., reinforcement in the form of praise or tangible rewards) for desired behaviors. DTT is most often used for skills that (a) learners are not initiating on their own;

(b) have a clear, correct procedure; and (c) can be taught in a one-to-one setting. It may be difficult to generalize learning via DTT beyond the setting in which a skill is learned.

Milieu therapy includes a range of methods—including incidental teaching, time delay, and mand-model procedures—that are integrated into a child’s natural environment. It includes training in everyday environments and during activities that take place throughout the day, rather than only at “therapy time.” Milieu language teaching and other related procedures offer systematic approaches for prompting children to expand their repertoire of communication functions and to use increasingly complex language skills (Kaiser et al., 1992; Kasari et al., 2014).

Incidental teaching is a teaching technique that uses behavioral procedures to teach elaborated language. Naturally occurring teaching opportunities are provided, based on the individual’s interests. The clinician reinforces the individual’s attempts to communicate as these attempts get closer to the desired communication behavior (McGee et al., 1999). The individual should initiate contact, which begins a language teaching episode. If the person does not initiate, an expectant look and a time delay might be sufficient to prompt language use. The clinician can prompt with a question (e.g., “What do you want?”) or model a request (e.g., “Say: I need paint.”).

Time delay is a method of teaching that fades the use of prompts during instruction. For example, the time delay between initial instruction and any additional instruction or prompting is gradually increased as the individual becomes more proficient at the skill being taught. Time delay can be used with individuals regardless of cognitive level or expressive communication abilities.

In **Core Vocabulary Approach** the clinician teaches the individual an initial set of core vocabulary that often consists of common words used across contexts. This approach considers vocabulary used by typically communicating peers and any additional words needed by the user based on input from members of the community (e.g., family members, teachers). Often, words from the initial set remain in the same location to minimize demands on memory and motor planning as more words are added to the AAC display; however, the extent to which this can happen varies depending on the AAC system. The variety of word types (pronouns, verbs, descriptors, question words, etc.) used in a core vocabulary approach allows the individual to complete various communicative functions, such as asking questions, requesting, rejecting, protesting, commenting, and describing.

Core vocabulary is likely represented by symbols or symbols combined with written words for individuals with congenital disabilities who use AAC. The core vocabulary may consist of only written words, depending on premorbid and current literacy level for those with acquired disabilities. A foundation of language skills based on core vocabulary is crucial if a focus of AAC intervention is to develop oral and written communication skills (Witkowski & Baker, 2012). Core vocabulary is reflective of all language(s) used.

Development of **functional communication skills training** (e.g., expressing wants and needs, gaining attention, indicating preferences, and protesting) is often the first focus of linguistic intervention for the AAC user. For example, individuals can be taught to make requests by using symbols, objects, or words to indicate desired objects or actions (Johnston et al., 2012). Functional communication skills help minimize communication breakdowns and reduce the occurrence of challenging behaviors (Carr & Durand, 1985; Mirenda, 1997).

Language Acquisition Through Motor Planning (LAMP) is a therapeutic approach based on neurological and motor learning principles that uses a high-tech AAC system to provide the child with opportunities to initiate activity, engage in communication around activities of their choice, and access consistent motor plans to locate vocabulary (Potts & Satterfield, 2013).

The LAMP approach teaches the individual to independently select words and build sentences on a voice output AAC device using consistent motor plans to access vocabulary. LAMP's emphasis on motor planning may reduce the cognitive demands of choosing from a symbol set and may result in more automatic and faster communication (Autism Spectrum Australia, 2013).

Mentoring programs pair young, newly proficient AAC users with older, more experienced users, with the intention of providing positive role models; teaching higher level sociorelational skills; and improving self-confidence and desire to achieve personal, educational, and professional goals. In addition to improving self-confidence and sociorelational skills in the newly proficient AAC user, mentors also benefit from the training experience that prepares them for participation in mentoring programs (Light et al., 2007).

Picture Exchange Communication System (PECS) is a low-tech intervention program for individuals with ASD and other developmental disabilities that is intended to shape a child's expressive communication abilities using prompting and reinforcement strategies. PECS is a specific approach with specific implementation parameters. PECS is based on applied behavior analysis. PECS training consists of six progressive instructional phases:

1. How to Communicate—exchanging single pictures for desired items/activities
2. Distance and Persistence—generalizing picture exchange to different situations and communication partners
3. Picture Discrimination—selecting from two or more pictures (typically stored in a communication book) to request items/activities
4. Sentence Structure—constructing simple sentences by adding a picture of the desired item to a sentence strip that begins with an “I want” carrier phrase
5. Answering Questions—using a picture to request an item/activity in response to the question, “What do you want?”
6. Responsive and Spontaneous Commenting—using pictures to respond to a variety of questions (e.g., “What do you see?” “What do you have?” “What is this?”) to introduce commenting behavior

PECS requires the facilitator to prepare pictures on and the user to accept and have the ability to transport a communication board or book (Flippin et al., 2010)

Total communication (TC) is a holistic approach to communication that promotes the use of all modes of communication, including sign language, spoken language, gestures, facial expressions, and environmental cues such as pictures and sounds. TC has also been used with populations such as individuals with ASD (e.g., Nunes, 2008; Wong & Wong, 1991).

Video-based instruction (also called “video modeling”) is an observational mode of teaching that uses video recordings to provide a model of a desired communication behavior. Video recordings of such a

behavior (e.g., appropriate use of an AAC device) are watched and imitated by a learner. The learner's attempts to incorporate learned communication behaviors can also be videotaped for later review.

Visual prompting strategies use visual cues (e.g., pointing or gesturing) to help individuals maintain attention, understand spoken language, sequence events, organize environments, or increase independence with task completion (Hodgdon, 1995). Visual prompts can be general (e.g., gesturing toward the communication system) or specific (e.g., pointing to a specific display location).

Visual prompting strategies can help increase an individual's ability to independently initiate tasks, sustain participation in an activity, perform multistep tasks, and participate in an increased variety of activities.

The use of visual prompting strategies that incorporate the same symbols from an individual's AAC system or that are incorporated into the system itself can help the AAC user understand, anticipate, and communicate about daily routines and can also help decrease challenging behaviors (Drager et al., 2010). Visual prompting strategies can create opportunities to increase aided language input or augmented input.

Visual schedules are a common method of visual prompting. Visual schedules use objects, photographs, drawings, written words, or other symbols to cue or prompt individuals to complete a sequence of tasks or activities. Symbols on the display are presented horizontally or vertically in the sequence of occurrence and can represent activities within a day or week (or longer period) or the steps within a particular activity. Visual schedules that initiate or sustain interaction are called **scripts**. Scripts are often used to promote social interaction but can also be used in a classroom setting to facilitate academic interactions and promote academic engagement (Hart & Whalon, 2008).

Visual schedules can be used to

- improve understanding of routines and expectations,
- increase engagement time,
- ease transitions from one activity to the next,
- provide opportunities to make choices, and
- increase an individual's control over their daily life (Mechling, 2007)

Acute Care Setting

In the acute care setting, the SLP works as part of a team that often includes doctors, nursing staff, physical and occupational therapists, case managers, family members, and caregivers. Many acute care facilities have AAC tool kits for use in acute care settings, and clinicians are encouraged to consult with the treating facility or to consider creating a tool kit..

Important considerations for this population include

- fluctuating physical, cognitive, and linguistic abilities due to medication side effects, pain, arousal/alertness, and acuity of illness;
- positioning and access to AAC from hospital bed;

- vocabulary that allows the individual to participate in their medical care by expressing basic wants and needs, indicating refusal or rejection, advocating for basic needs, and expressing preferences related to medical care;
- motor deficits (temporary and chronic); and
- education of SLPs in the acute care setting to provide this service and educate doctors, nurses, and other allied health professionals.

Barriers to AAC Use and Implementation

The following factors may serve as barriers to AAC use (Johnson et al., 2006; Light et al., 1996; Moorcroft et al., 2019; Pape et al., 2002):

- frustration due to lack of AAC knowledge on the part of the professional,
- negative attitudes toward persons with disabilities and the stigma associated with AAC,
- AAC potentially symbolizing disease progression,
- slow rate and low frequency of communication,
- equipment breakdowns,
- lack of relevant vocabulary,
- failure to consider cultural differences in AAC system design,
- lack of support for device use on the part of caregivers or belief that they can communicate effectively without the device,
- lack of motivation by the user and family members or caregivers, and
- accessibility due to physical limitations.

Barriers can be reduced if

- the AAC system serves the communication needs of the individual and can be updated when these needs change;
- there is a good match between the device and the user's language, physical, and cognitive abilities;
- there is collaboration with the AAC user, their family, and a multidisciplinary team to incorporate their needs and values during selection of the device;
- the clinician provides realistic timelines regarding progress and use of the device that are understood by the user;
- the AAC user experiences communication success with the system;
- the AAC user values the system and has a sense of ownership;
- thorough training is conducted with both the AAC user and the family/caregiver after receipt of the device; and

- ongoing training, including theoretical and practical experience, is conducted for new communication partners (e.g., new staff at a vocational setting).

Increasing AAC Awareness

There are many misconceptions about AAC that may deter an individual or a family member from AAC use. Advocacy and/or counseling efforts are critical to informing these potential AAC users, as well as professionals key to AAC implementation (e.g., SLPs, teachers, applied behavior analysis therapists). Potential AAC users may believe that AAC reduces motivation to improve natural speech and delays language development. However, AAC use may help improve natural speech when used in a multimodal approach (Millar et al., 2006; Sedey et al., 1991).

Consumers and professionals may think that young children are not ready for AAC until they reach school age. However, early AAC use can help develop speech and language (Lüke, 2014; Ronski et al., 2010; Wright et al., 2013) and can increase vocabulary for children with developmental delays aged 3 years and younger (Ronski et al., 2015). AAC use in preschool-age children may also increase use of multisymbol utterances and grammar development (Binger & Light, 2007; L. Harris et al., 1996; see Ronski et al., 2015, for a review), and AAC may improve receptive vocabulary in young children (Brady, 2000; Drager et al., 2006).

Caregivers and professionals may think that cognitive skills such as demonstrating communicative intent and understanding cause and effect are prerequisite to AAC use. However, impaired cognition does not preclude communication (Cress & Marvin, 2003). AAC may help children with complex communication needs develop functional communication, cognitive, literacy, and social communication skills (Drager et al., 2010).

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