Augmentative and Alternative Communication

Models and Applications for Educators, Speech-Language Pathologists, Psychologists, Caregivers, and Users

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Contents

Introduction

Human communication is amazing. It is fast, it is well-organized (and complicated), and it can take on many forms (it is flexible). Augmentative and alternative communication (AAC) is a testimony of the resilience of the human capacity to communicate, as well as of the natural tendency to adapt and adjust when typical forms of communication are not working as well. AAC is the field that describes and explains the methods, tools, and theories of the use of nonstandard linguistic and nonlinguistic communication by and with individuals without or with limited functional speech (see Chapter 1).

Today, AAC is used by an ever-growing group of individuals of all ages, each with their own personal and communication needs. For communication, some people use gestures or manual signs, while others use graphic symbols to get their messages across. Today many AAC users operate speech-generating devices, and everyday there are more who use smart phones or electronic tablets (McNaughton & Light, 2013).

This book is an attempt to describe AAC comprehensively and to offer a framework that helps to understand what AAC intervention does (and does not) in the process of communication. Some AAC interventions help a person to formulate their thoughts into an utterance, while other interventions are geared to find an alternative way to natural speech. Which intervention may be effective depends on the needs, the condition, and the prognosis of a person's development.

AAC comes in many shapes and forms. Some people use AAC for just a few utterances, while others use AAC of lectures, and for almost nonstop communication with their partners during every waking moment. Is it even possible to find a commonality between all the forms? We believe that there is: it essentially comes down to the principles of interactive human communication, and the principles of personal message generating.

PRINCIPLE OF INTERACTIVE HUMAN COMMUNICATION

In the summer of 1991, during a 1-month research visit at Purdue University, I was working on explanatory models for AAC. My host Lyle Lloyd convinced me that it would be a mistake to try to grasp AAC as if it is essentially different from typical communication. Both the typical communicator and the AAC user are essentially human minds processing and exchanging information. There is no reason to believe that these processes follow different channels or different laws. This view has helped me in my endeavors to paint a comprehensive picture of AAC. Just as typical communication, it is about externalizing thoughts in a form that can be captured by a communication partner. The forms can vary: they can be spoken or written words, whistles, eye winks, gestures, coughs, facial expressions, text messages, or photographs. Anything works.

This is sometimes called *multimodality.* Very often, people use a combination of forms: most people gesture while they speak, and many throw in an emoticon when they e-mail. In AAC, we often seek for the most efficient and effective combination of communication forms, just as any human communicator does.

Another characteristic of human communication is speed (Reed & Durlach, 1998). Rate of information production needs to be within a range of comfortable information processing to work within live communication setting (i.e., where sender and receiver are present and engaged in interaction). In other words, information exchange should neither go too fast or too slow in order to allow both sender and receiver to process, anticipate, and remember the messages and the flow of conversation. The use of AAC does not always permit to keep conversation within the comfortable range. I believe this is one of the major challenges that we still face in AAC.

PRINCIPLE OF PERSONAL MESSAGE GENERATING

Multimodality is not only a social principle; it is also an *individual* phenomenon. It means that the different modes of communication are part of a person's own repertoire of communication forms. It implies that communication forms are "stored" in the person's mental system in such a way that they can be retrieved and activated for production (or for recognition). Within AAC, "alternative" symbols are often used (e.g., pictures or photographs, graphic symbols). Does the user have a mental representation of these that is similar to words in an internal lexicon? And how do internalized alternative symbols relate to words? Will they facilitate access to words?

Today's psycholinguistic models attempt to analyze speech and automaticity in communication: how is it possible that most people, when speaking, have little trouble finding the words to say? And how is it that these words seem to fall automatically into syntactic patterns? It is clear that fast internal processes precede the articulation of words. The most used model to describe the microgenesis of speech is Levelt's blueprint of the speaker (1993). This model proposes that the speaker finds the words in an internal lexicon and places them in a syntactic structure or template before actually starting speech. Similarly, AAC users will need to "navigate" their device to find the words or phrase they want to activate. This navigation can simply consist of visually scanning a communication board, but it can also involve different steps through pages on a device to find the symbol that is looked for. Here lies another major challenge for AAC: can AAC compete with the fast lexical access of typical communicators? How can we accelerate access?

THE FUTURE OF AAC

In the past few years (and probably in the near future), applications of AAC have multiplied thanks to more affordable, and faster technology (especially mobile computing and tablet technology). These developments are to be welcomed and encouraged as they make AAC available to more individuals with fewer financial costs. It also "normalizes" AAC more as it blurs the distinction between disabled and nondisabled people since they both

use the same type of devices for communication and information storage and processing.

However, these new developments do not fundamentally alter the framework within which AAC is defined: AAC essentially remains an approach of facilitation of information processing and information exchange.

The future of AAC appears to be exciting (Light & McNaughton, 2012). Besides (and partially because of) the increased availability of AAC solutions, a number of other developments are remarkable. Expectations are likely to be higher than ever: if we have more and better tools, we should have better results. Also, the fact that more individuals use AAC solutions, makes it more possible to compare outcomes, which leads to evidence-based practice (Schlosser & Raghavendra, 2004). Finally, I believe that AAC will become more than just an applied discipline. It tells us something about the potential of humans to go beyond standard forms of information exchange in communication. Natural speech will probably remain the standard and the norm of direct human communication. But alternatives to natural speech are just as normal and a testimony of human resilience. The study of AAC use is potentially a very promising data source to understand how people process and structure information that is brought to them through a combination of different modalities.

THE STRUCTURE OF THIS BOOK

This book is organized in 13 chapters, each focusing on a topic that is important to understand AAC. With the exception of Chapters 6 (prelinguistic communication) and 8 (AAC in individuals with acquired disorders), the information is not organized around a typology or classification of disorders. The structure of the book tries to be consistent with the view that a communication and message generation model should be the basis to understand the possibilities to communicate. In other words, it would be misleading if it were suggested that there are typical or different forms of AAC that apply to individuals with autism spectrum disorders, or other groups. We believe that a carefully analysis of the communication needs as such, together with the possibilities of learning and growth that will determine the nature of the AAC intervention.

Chapter 1 is the introductory chapter in which some of the basic concepts and terminology are explained.

Chapters 2 and 3 present the reader with the issue of access. The chapter employs the blueprint of the speaker, a model proposed by Levelt (1993). This model indicates how speech is the result of a parallel multicomponential process of word and sentence activation. The model is useful to pinpoint where in the process elements are different when nontypical communication (such as manual signs or the activation of a speech-generating device) occurs. Chapter 3 describes where in the process technological prostheses could be inserted to perform parts of the communication process.

Chapter 4 discusses the symbols. Symbols are the units of meaning within a communication system. Spoken or written words are clearly symbols. Specific to AAC, probably the best-known symbols are graphic symbols (pictures, or a graphic representation of an object or idea based), but manual signs, eye-blinking, or other behaviors can also serve as symbols.

Chapter 5 can be seen as an extension of the previous chapter. It focuses on the question how symbols are organized in a coherent way. In spoken and signed languages, words are part of lexicons that are internally organized in such a way that they can easily be accessed. The challenge for AAC is to ensure that the alternative lexicon (graphic symbols, manual signs) is as functional as possible and as easily accessible as words are for a speaker of a spoken language.

Chapter 6 is about prelinguistic development and how AAC techniques can be used to help launch early communicative behaviors, which are typically displayed by children in the first 2 years of life. AAC techniques offer some possibilities to facilitate early communication and the transition from early nonlinguistic to linguistic communication (i.e., use of symbols in a basic grammatical structure).

Chapter 7 addresses questions of language learning and acquisition. In this chapter, we touch on an important discussion: does the use of an "alternative" form of communication lead to a form of structuring information that is different from the structure of spoken language? AAC increases a person's opportunities to express language (and its structures). This allows the environment to respond to the person's utterances and "teach" structures of grammar.

Chapter 8 deals with the issue of needs for alternative forms of communication in individuals with have acquired disorders. This implies that the persons have previously functioned without any need for an alternative mode. How can AAC meet the sudden or gradual changes in language and communication needs?

Chapter 9 discusses the importance and the issues related to literacy development on people who use AAC. Literacy is one of the keys that allows individuals to participate and self-develop. Interest in the importance of literacy for children who use AAC only emerged in the 1990s. Previously, AAC implementation was focused on giving the child the tools for direct face-to-face communication. The chapter analyzes the questions whether young AAC users may be at a disadvantage (or not) in acquiring reading and writing skills.

Chapter 10 addresses the relation between the use of AAC and natural speech. Since I started my professional career in the 1970s, I have been confronted with this interesting and recurring topic. Should we not discourage manual signing, or any use of an alternative form, as it might reduce a person's investment in natural speech. I believe that underlying to this question lays an idea of incompatibility—a strange but widespread opinion in a world with a majority of bilingual people, in a world where everybody uses different ways to express himself or herself. Especially speaking and writing—if I suggested that you should not learn to read and write because it would decrease your motivation to speak, you would think I am crazy. Nevertheless, that is exactly what is often feared. Unfortunately, it has frequently prevented children (and adults) to be offered AAC, while it would most likely have been a help for them.

Chapter 11 focuses on AAC assessment, both as a theoretical and an applied issue. Can AAC performance be measured, and what should be the norms of measurement? Can results of AAC be predicted? Isn't communication, and certainly AAC, idiosyncratic?, Does this mean that communication performance cannot be compared with communication standards? Maybe, what we need in assessment is not so much a measurement

of the communication at the time of assessment, but a measurement of the *potential* to use and adapt new forms (alternative and augmentative) of communication.

In Chapter 12, the relation between AAC use and the community is explored. Communication, by definition, is a social activity. Communication is always shared by at least one other person. As a social process, communication is key to participation. Communication (or lack thereof) can reveal much of how people are valued, perceived, and awarded opportunities in communication. Communication also can show equalities and inequalities in how individuals interact. Through the nature of their communication, people who use AAC are not always given and encouraged to participate fully.

In Chapter 13, the focus is on the AAC experience from the perspective of the AAC user. Throughout the chapters, it should have become clear that complex communication needs must have a strong impact on a person's perception of life. Not being an AAC user myself, I felt most hesitant to write about these perspectives as they are, by definition, very personal and can be hardly reported by a third person.

Why are there 13 chapters? After I had been teaching AAC courses for almost 10 years, I was asked to teach an online course. I suddenly realized how much I had relied on the face-to-face contact in the classroom where I can tell students what is important, how I see things, and what I want them to remember. That is when I started to write pages and pages of lecture notes and gave them to the students to study and to solicit their feedback. Thirteen weeks in a semester, 13 chapters in this book. I hope that it offers a framework and can be used as course materials by others.

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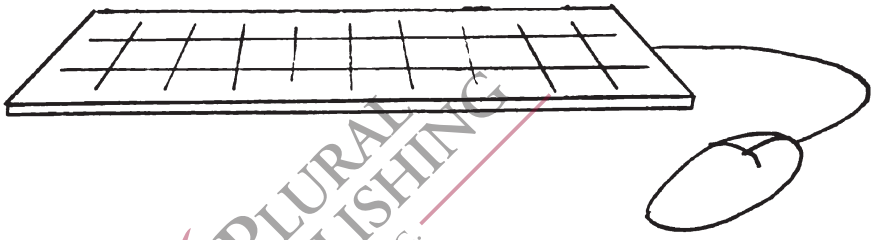
CHAPTER 3

Nontech, Low-Tech, High-Tech, and Mobile Computing



The two words of "assistive technology" are equally important. It is "technology"—the use of techniques, materials, and tools to improve an individual's functioning in the world. However, it is also "assistive," its use—or at least its introduction—needs to have a component of helping, teaching (training if you will) in order to make sure that the clients are integrating its use in their daily functioning. This requires information, training, modeling, counseling, and feedback. In other words, one doesn't just hand over the device (or tell them what the technique consists of) and expect that the clients (and their communication and life partners) will adopt it without any problem.

Within the field of AAC, the scope of choices has grown intensively. When should we use nontech approaches and when is high-tech (and everything in the middle) more appropriate? Very often, the range of devices and methods that exist within AAC overwhelms the practitioner. Clinicians frequently express uncertainty about their own knowledge of the field and the choices, and fear that they might not make the best decisions and recommendations. It is true that, with the general rapid development of information and communication technology (computers, miniaturization, and mobile computing), newer AAC devices become available every year, if not every month. Not only are there new devices, but applications (within the device) expand. From 2005 on, more models and types of AAC devices have been integrated within a computer platform—which enables the user in principle to integrate communication in other applications such as word processing and internet surfing. There are many applications possible and imaginable that imply a combination of direct message production (e.g., access symbols on a screen) with calling up pictures of

photographs, films, websites, prestored texts, and more. The more a person can integrate multiple functions, the more likely it is that communication will be effective and really interactive.

ASSISTIVE TECHNOLOGY

Assistive technology (AT) is the term used to indicate technological measures taken to facilitate a person's functioning. It is clear that AT plays an important role within AAC. The augmentation and the alternatives for the typical forms of communication often come from technology. AT can fulfill major contributions to AAC. In order to appreciate the contribution of AT, it is again helpful to take a look at the communication process and identify which components in the process can potentially benefit from AT. Figure 3–1 is an elaboration of Levelt's blueprint of the speaker (see Figure 2–1, Chapter 2) with indications where technology can play a role.

NONTECH, LOW-TECH, AND HIGH-TECH

The term "high-tech" is sometimes used to refer to the "higher end" AAC communication solutions, while "low-tech" is reserved to materials or systems that are "inexpensive, simple and easy to obtain" (Cook & Hussey, 1995, mentioned in Quist & Lloyd, 1997, p. 107). One of the fascinating phenomena of our times has been the increasing possibilities and presence in daily lives of electronic communication, in an ever faster, more flexible, more miniaturized, and accessible way.

Given the rate at which new technologies continue to become available, at reduced costs, often more miniaturized than in previous versions (allowing them to be used as handheld devices), terms like "high" and "low" technology are increasingly relative and should be considered on a dynamic continuum. We do not use this dichotomy, but rather focus on which functions, components, and processes within communication can be technologically supported.

STEERING TECHNOLOGY

For assistive technology, it is important to identify an interface that allows the user to direct a device. Devices are steered by (often a combination of) vision, audition, or touch (Karray, Alemzadeh, Abou Saleh, & Nours Arab, 2008). Vision-based (think of computer or device screens) devices are most often steered by a *switch-based input system*. Traditional keyboards are in fact structures that contain a set of switches. Within AAC and assistive technology, the steering can be reduced to the use of a single switch (or a combined use of a two or a few switches) that is connected with a computer (Figure 3–2).

Pointing-based input systems include the use of a mouse, a joystick, touchscreens, graphic tablets, and pen-based input forms. *Audition-based input systems* have become more prevalent as speech recognition technology has improved. Finally, *haptic input systems* respond to skin and muscle pressure (Ricciardi et al., 2010). Today's steering technology also includes *gestural steering* (Walkowski, Dörner, Lievonen, & Rosenberg, 2011) including the possibility to use manual signs to direct a computer (Jalab, 2012).

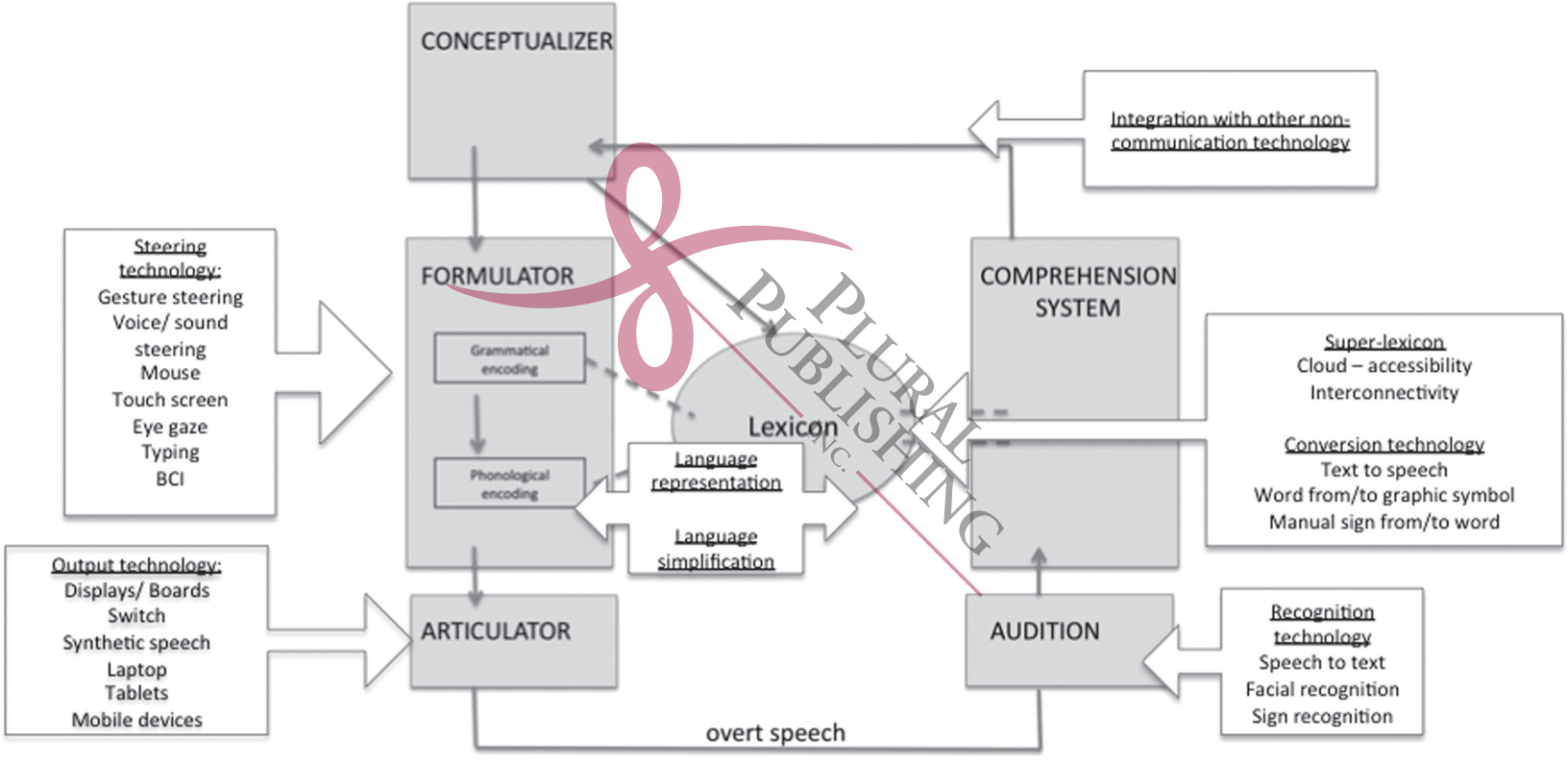


Figure 3–1. Technology and communication.

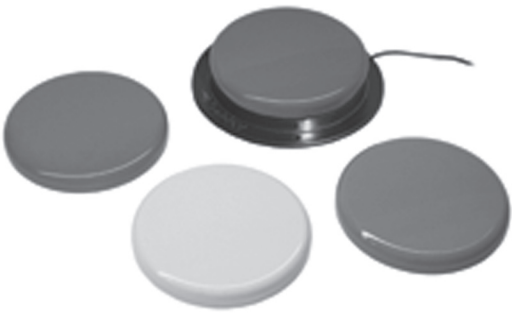


Figure 3–2. Big Red Twist—used with permission from Ablenet.

In the past 15 years, *eye-gaze steering* has developed from cutting edge applications to more affordable and relatively reliable systems used by a growing number of persons with limited mobility. Eye-track devices have been developed for a wide range of purposes, and AAC is just one of the applications. There is a strong interest from psychologists, especially as it provides a way to test the hypothesis that there is a strong connection between what a person focuses on and internal mental processes. This is sometimes called the "strong eye-mind hypothesis" (Just & Just, 1980). Eye tracking research has found applications in automobile driver security research (what are drivers looking at?), machine operation security (do people see what they should see when they are operating a machine?) and locomotion (walking—do older and younger walkers see where they put their feet? Do they notice and pay attention to barriers?), and—of course—the use of your eyes to direct a computer. Today, the systems are readily employed by a growing number of individuals with AAC needs and extremely limited mobility. The costs for the devices have come down, the technology has improved, the learnability has become less demanding, and the weight and size of the devices have been reduced.

Brain-computer interaction, also called direct neural interface or brain-machine interface, is now rapidly developing into a major group of applications within the field of "neuroprosthetics" (2013). Neuroprosthetics is the discipline that searches for substitutions for impaired motor, sensory, and cognitive functions through the use of a device that is controlled and directed by internal body operations. Possibly the best known neuroprosthetic device is a cochlear implant. The newer additions to neuroprosthetics are devices that are controlled by vision and brain activity. We already have studies that show that it is possible to command a computer by BCI and execute computer-generated speech. The applications for AAC continue to be very promising (Thompson, Blain-Moraes, & Huggins, 2013).

LANGUAGE REPRESENTATION TECHNOLOGY

Devices and tools can be used to help a user gain insight in language structure, or access words, letters, phrases, or semantic concepts. However, this implies that devices represent language at some level(s). A traditional typewriter or computer keyboard represents language at the phonological-orthographic level (i.e., by displaying the letters of the alphabet together with punctuation). It requires the users to go from there and put words, phrases, and sentences together, based on their spelling skills. The traditional keyboard is certainly highly generative: It allows the user to produce all possible linguistic combinations. Many AAC

devices come with the traditional keyboard, which is indeed often the preferred choice for all who possess spelling and composition skills (see Figure 5–1). However, most AAC displays typically show graphic symbols in some organization. In many applications, the graphic symbols are used as lexical units having single or multiple meanings. Developers of AAC software and their applications suggest generative uses of these lexical graphic items in such a way that they emulate typical generative linguistic use. For example, Van Tatenhoven (2005) proposes strategies for clinicians to enhance and stimulate a child's use and gradual expansion of linguistic functions in increasingly complex syntactic forms.

The way devices present and organize linguistic elements can facilitate specific uses: how fast and easy it is to "find" a symbol, combine it with other symbols, and express simple and complex combinations. MinSpeak is constructed to reinforce the development of a psychomotor-based (motor planning, see: Center for AAC and Autism, 2009) learning of linguistic units (words) by acquiring a code, partially based on an understanding of semantic networks (see also Chapter 2, including Figure 2–4). There are a number of derived applied programs that are focused on facilitating linguistic aspects of language (e.g., Unity, a set of MAPs, or Minspeak Application Programs; Semantic Compaction Systems). Implicitly, most of language representation software are applications of *computational linguistics*, the (mainly applied) discipline that explores how linguistic structures and linguistic behavior (especially word finding and sentence planning) can be emulated by computer software (Vetulani, 2011). In many applications, an algorithm accumulates preferred words, phrases, and structures by a person, accelerating the rate at which probable choices are proposed and can be activated.

WordPower is primarily a word-based system, developed by Nancy Inman. Users work from a limited lexicon of 100 core words that can be accessed and combined fast and easily in order to generate unique messages. Word access is facilitated through semantic organization and clustering that is based on the Fitzgerald Key. The FK is a visualization of syntactic patterns originally proposed by Edith Fitzgerald in 1929 to help deaf children recognize and structure syntactic patterns (Fitzgerald, 1969, 1949). WordPower uses this pattern-principle, together with word prediction and spelling software (Inman, 2013).

Gateway is a system developed by Joan Bruno to be used on dynamic display devices (i.e., devices that allow a user to navigate from screen to screen; from page to page). The system is also word-based. Core words can be accessed with a minimal number of keystrokes. The pages are targeted for different cognitive-linguistic developmental levels, in order to foster communicative-linguistic development (Bruno, 2013).

Proloquo2Go is a graphic symbols word program developed for use on tablets and mobile computing platforms. It combines graphic symbols with printed and device-generated speech output. It allows quick access to core words (Assistiveware, 2013; Hager, 2012).

Boardmaker is software that allows the construction of learning materials, communication boards, behavior supports, and other visualizations of Picture Communication Symbols (PCS; Mayer-Johnson, 2013).