Chapter 51
Augmentative and Alternative Communication Technologies

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ABSTRACT

Communication is a dynamic process that creates and conveys a mutual understanding between two or more people. Since this process is complex and not easily taught, there exist many communication disorders ranging from a physical limitation, such as ALS, to a cognitive language disorder, such as autism. Augmentative and alternative communication systems (AACs) help people with communication disorders by providing them substituted means for communicating. These systems range from non-technical solutions, such as a paper-based PECS (Picture Exchange Communication System), to elaborate technical solutions, such as a plasma picture communication table. Due to the increased attention to AACs, the Worldwide Health Organization (WHO) provides a framework to evaluate effectiveness. Using this framework as a basis, the authors identified barriers and support factors for AAC effectiveness and subsequently best practices for AAC designs. They conclude with a case study of adapting a paper-based picture-based communication system to mobile devices using open-source software development for use by children with severe autism.

INTRODUCTION

Augmentative and alternate communication (AAC) technologies present an opportunity to improve the quality of communications in real life situations for millions of people who experience communica-

tion disorders. Despite the opportunities that AAC solutions provide, these AAC solutions are often disparate and may not facilitate equal or effective communication with communication partners. Communication commonly combines verbal and non-verbal techniques to send a message from one person to another (Alant, Bornman, & Lloyd, 2006). Prior research has shown that multiple modes of

communication, such as gestures, spoken or written language, or symbols, are used by those with complicated communication needs. The mode of communication chosen relies on the person's skill, the context of the conversation, who they are communicating with and the intent of the message (Light & Drager, 2007).

In the United States, 42 million people (1 in 6) are estimated to have a communication disorder. Communication disorders affect the person's ability to send or receive messages using one or more modes of communication. They range from language disorders that inhibit the person's ability to use and understand language, such as autism or traumatic brain injury, to physical problems that impact a person's ability to speak or hear language, such as aphasia in stroke victims or hearing loss. Annual costs estimates in the United States are from $30 billion to $154 billion in lost productivity, special education and medical costs (ARHQ, 2002). Additionally, people with communication disorders face barriers to employment and community participation (Blackstone, Williams, & Wilkins, 2007). Although many low-tech systems exist to help lessen the impact of communication disorders, inexpensive hardware and software have led to an enormous increase in the use of digital and mobile devices for assistive communication. Technology provides the opportunity to improve the communication for individuals with communication disorders as well as the opportunity to improve therapies and community participation. This chapter focuses on such technology-based assistive communication devices.

The objectives of this chapter are to review research, designs, and common problems and successes related to augmentative and assistive communication devices. We discuss problems leading to unsuccessful AAC devices, designs improvements and research suggestions to increase their future success.

BACKGROUND

Language and communication are social in nature. Communication functions as a means for making requests as well as interacting socially (Banzhoff & O'Connor, 2009). Successful participation in communication suggests that participants should feel equal in the interaction and have access to the same resources and attention. Communication should be synchronized so that each participant can respond in a timely manner. The partners should each feel comfortable communicating accurately and genuinely. Active participation also requires shared comprehension to produce and understand messages (Alant, et al., 2006).

Augmentative and alternative communication systems (AACs) are meant to improve communication by providing devices that substitute or supplement communication. According to the American Speech-Language-Hearing Association, 8 to 12 people per 1,000 experience communication impairments that require AACs (ASHA, 2008). The two most important goals for AAC users are the ability to say what they want to say and to say it as fast as possible (AACI, 2008). AACs use symbols, pictures and text to communicate gestures, verbal and written communications (Figure 1). Several different types of AACs exist and they can be tailored to the intended user's limitations and needs, such as someone with a language disorder versus someone with a motor impairment. For example, hearing disorders can be augmented with written text. For those with cognitive and/or language processing disorders, pictures can be used as with the paper-based Picture Exchange Communication System (PECS). Teachers often use flash cards to communicate the daily schedule to a child with autism; an elderly stroke victim can use pictures to communicate a list of items needed to a caregiver. However, paper-based systems can limit vocabulary, spontaneity, communication partners, and communication situations. Electronic AACs can improve upon the non-technical solutions

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