Exchange

Values, Practice, Science, and AAC

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Abstract
The evolution of evidence-based practice in augmentative and alternative communication (AAC) has occurred via two different but related routes: the conventional research-to-practice route and the more common practice-to-research route. This article defines both routes with examples of each and discusses potential problems that may arise when practice precedes research, with associated solutions.

Keywords
augmentative and alternative communication, evidence-based practice, visual screen displays, iPad/iPod, candidacy models, AAC modeling

Augmentative and alternative communication (AAC) is an area of research, clinical practice, and educational practice that is aimed at compensating for severe impairments of speech–language comprehension and/or production. People who rely on AAC have complex communication needs that significantly affect their ability to use speech and/or written modes of communication in their daily lives. An individual’s AAC system is comprised of two basic elements—gestures/symbols and techniques/devices—that the person is taught to use through a combination of instructional strategies designed to achieve functional, independent communication.

Evidence-based AAC practices that are designed to support communication for individuals with both acquired disorders (e.g., acquired brain injury) and developmental disabilities (e.g., autism spectrum disorder, cerebral palsy) have evolved considerably since the 1950s (Zangari, Lloyd, & Vicker, 1994). This evolution has occurred via two different but related routes: the conventional research-to-practice route and the more common practice-to-research route. In this article, these two routes are described with examples of each, in an attempt to answer the following question: Is the practice-to-research route a problem, and if so, what are the remedies?

The Research-to-Practice Route
A number of AAC practices in current use were developed by researcher-clinicians via the conventional research-to-practice route. Within this framework, a researcher, motivated by a set of values and beliefs, (a) identifies an unmet communication need, (b) hypothesizes a solution, (c) develops a prototype or strategy to actualize the solution, and (d) implements the prototype or strategy while collecting data to measure its efficacy or effectiveness. In some cases, early research related to a novel AAC practice is designed to assess efficacy—that is, the impact of the practice when it is used by experienced interventionists who implement the practice with a high degree of fidelity in a context that is designed to eliminate or reduce confounding

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variables (Robey, 2004). In other cases, early research is designed to assess effectiveness—that is, the extent to which a practice or strategy “works” in real-life settings, under less-than-ideal conditions (Robey, 2004). Regardless, the researcher makes a data-based decision about whether or not to continue developing the practice and whether any modifications are needed; this iterative process continues until the practice is finally manualized and/or is made commercially available.

The development of AAC visual scene displays (VSDs) is a good example of the research-to-practice route. Ever since they were first used with individuals with aphasia and cerebral palsy in the 1950s (Zangari et al., 1994), communication displays that incorporate letters, pictures, or other types of symbols (e.g., Blissymbols) have been presented in a “grid” pattern, with vocabulary symbols organized semantically (e.g., people, places, things), grammatically (e.g., nouns, verbs, adjectives), or in some other way. Figure 1 provides an example of a simple grid display with vocabulary items for a birthday party, with people in the first column, objects/food in the second, and verbs (action words) in the third.

Until the late 1990s, grid displays were so ubiquitous in the AAC field that few researchers or clinicians ever thought about alternative arrangements that might place fewer learning demands on AAC users. However, in 1995, Howard Shane at Boston Children’s Hospital designed a computer program that displayed images of common everyday scenes (e.g., a kitchen, a playground), with spoken messages embedded in “hot spots” throughout (Blackstone, 2004). For example, in a playground scene, touching the swing might result in the spoken message, “I want to go on the swing” and touching the slide might produce the message “I love going down the slide—whee!” This innovation spurred researcher-clinician Janice Light to think about the learning demands made by conventional grid displays, especially when they were used by young children with developmental disabilities. Light and her doctoral students at the Pennsylvania State University initiated a series of studies that were aimed at identifying the most efficient way to access communication symbols on a display. Regardless of how vocabulary symbols were organized, grid displays presented significant learning challenges for young children, likely because of the decontextualized nature of the symbols (i.e., each symbol is separate from the others, rather than embedded in a context; Fallon, Light, & Achenbach, 2003). In contrast, they found that, when vocabulary items were presented in the context of visual scenes (such as those used in Shane’s computer program, described previously), the children were able to locate them more easily (Drager, Light, Speltz, Fallon, & Jeffries, 2003; Light et al., 2004).

Figure 2 shows an example of a digital VSD for a birthday party; each of the images on the display is associated with a message or sound (e.g., the birthday party song) that is produced when touched.

Around the same time, researcher-clinician David Beukelman and his colleagues at the University of Nebraska–Lincoln were attempting to provide meaningful AAC supports to adults who had severe, chronic aphasia following a stroke. They were committed to this endeavor because conventional AAC strategies and techniques had not proved to be especially useful for this group of individuals. One reason for this, as Beukelman and his team observed, was that many adults with severe, chronic aphasia had great difficulty learning the meanings of unfamiliar AAC symbols such as those used on the top of Figure 1. In contrast, they were readily able to recognize familiar photographic images, especially those that provided a lot of contextual information (e.g., a photo of a birthday party complete with various people, a cake, balloons, presents, and someone blowing out the candles; see Figure 2). They also observed that, even when familiar photographic images were arranged on a grid display, adults with aphasia—just like the beginning communicators with whom Light and colleagues were working—had difficulty using them for communication. They hypothesized that this was—at least in part—because of the unfamiliar nature of the grid arrangement itself, which required new learning. As a result, Beukelman and colleagues, in collaboration with some of the adults with aphasia who they were supporting, began to experiment with the use of highly personalized digital images that were arranged to take advantage of the adults’ residual visual–spatial skills. Based on the data they collected, over the next few years, Beukelman and his collaborators refined and eventually manualized evidence-based strategies for developing and using VSDs in both paper and digital (i.e., electronic) formats (see Beukelman, Hux, Dietz, McKelvey, & Weissling, 2015; Blackstone, 2004; McKelvey, Dietz, Hux, Weissling, & Beukelman, 2007, 2010; and http://cehs.unl.edu/aac/visual-scene-resources/).

VSDs are now a common feature of most AAC devices and also are available as iOS applications (e.g., Scene Speak: http://www.goodkarmaapplications.com/scene-speak1.html and Scene & Heard: http://www.therapy-box.co.uk/scene_and_heard.aspx). They evolved via the research-to-practice route, grounded by
Figure 1. Grid display for a birthday party.
Source. The Picture Communication Symbols ©1981-2011 by Mayer-Johnson LLC. All Rights Reserved Worldwide. Used with permission. Boardmaker® is a trademark of Mayer-Johnson LLC.

Figure 2. Visual scene display for a birthday party.
Source. Photo courtesy of Pat Mirenda.
Note. Hot spots (rectangles) show areas that speak a related message (e.g., from left to right: mom, present, candle, cake, dad, Joey blow, balloon, uncle, grandpa) when activated; hot spots are invisible on the actual display.
the belief that individuals who use pictures to communicate should have access to AAC options that require minimal learning and are maximally efficient. However, this is not, in fact, how most advances in the AAC field develop. Rather, innovative AAC techniques are almost always driven not by researchers but by clinicians, via the practice-to-research route, which is discussed in the following section.

The Practice-to-Research Route

Lori Frost and Andrew Bondy (2002) first developed and implemented the Picture Exchange Communication System (PECS) in 1985, in a preschool program for children with autism in Delaware. Although the first experimental studies examining PECS’ effectiveness were not published until many years later (Adkins & Axelrod, 2001; Frea, Arnold, & Vittimberga, 2001), PECS has now been established as an evidence-based AAC practice (Tincani & Davis, 2011) that is used around the world. PECS is but one example of AAC practices or strategies that were first developed by clinicians and are now in widespread use.

AAC innovations that follow this route begin in a way that is similar to those that follow the research-to-practice route: Motivated by a set of beliefs and values, a clinician (a) identifies an unmet communication need, (b) hypothesizes a solution, and (c) develops a related prototype or strategy. He or she then implements the solution with the individual(s) for whom it was designed and informally evaluates its effectiveness. If the new practice appears to be effective for a few clients, the clinician then begins to use it with additional individuals and share it with colleagues—who also try it out, and then tell others . . . and so forth and so on. Eventually, in most cases, one or more researchers learn about the practice or strategy and begins to conduct carefully controlled research studies to measure its efficacy or effectiveness. Regardless, this route can be viewed as a “cart-before-the-horse” approach that may be problematic.

Problems with the practice-to-research route can arise for several reasons. First, the underlying beliefs and/or values that drove the development of the novel practice or strategy might be questionable. Second, the research response might occur several months or even several years after the practice or strategy is introduced. Finally, clinicians may not be willing to attend to and learn from after-the-fact research examining a practice or strategy that they already use and favor. All three of these concerns are particularly problematic if research fails to confirm the efficacy or effectiveness of an intervention that is already firmly entrenched in clinical practice. A few examples will illustrate these potential situations in detail.

AAC Modeling Approaches

In AAC modeling approaches, a communication partner points to graphic symbols (i.e., pictures that represent words or phrases) during naturally occurring communicative interactions with a person who uses AAC. For example, a mother might say, “What did you do at school today?” to her child while pointing to symbols for WHAT, DO, SCHOOL, and TODAY on an AAC display. Or, a teacher might say, “Everyone line up for the library, please” while a teaching assistant points to symbols for LINE UP and LIBRARY on a display. The goal is to provide the AAC user with examples (i.e., models) of how he or she can use and combine symbols to communicate messages. The underlying logic is the same as for a child learning a second language—the more the child hears others speak that language, the more rapidly he or she will acquire it. For individuals who use aided AAC, their “second language” consists of the symbols in their AAC system—so, for them, seeing others “speak AAC” is (at least theoretically) important for language development.

Several variations of AAC modeling have been proposed since this approach was first introduced as “aided language stimulation” (ALgS) in a case study published in 1989 (Goossens’, 1989). The ALgS approach to AAC modeling was described and popularized in several books and manuals produced in the 1990s (e.g., Elder & Goossens’, 1994, 1996; Goossens’, Crain, & Elder, 1992, 1994). However, it was not until 1994 that empirical work on AAC modeling approaches began to appear (Romski, Sevcik, Robinson, & Bakeman, 1994; Wilkinson, Romski, & Sevcik, 1994), culminating in publication of a book describing the effectiveness of an approach called the System for Augmented language (SAL; Romski & Sevcik, 1996). In this study, the research team taught parents and educators to implement the SAL with 13 students with moderate–severe intellectual disabilities and severe expressive communication impairments over a 2-year period. Communication partners learned to operate the students’ portable voice output communication systems.
devices and used them to provide aided AAC modeling. Although this work provided support for the use of the SAL version of AAC modeling, it used a longitudinal design that lacked experimental control and thus left many empirical questions unanswered.

Over the next few years, several additional case study reports appeared in the published literature (e.g., a variation called “natural aided language”; Cafiero, 2001). However, the first true experimental study did not appear until 2004, a full 15 years after ALgS was first introduced. In that study, Harris and Reichle (2004) examined the impact of AAC-aided modeling with three preschoolers with moderate intellectual disabilities across three play activities per child. The results provided support for the approach with regard to both graphic and spoken language comprehension as well as production of graphic symbols by the children. This study was followed, in relatively rapid succession, by a series of single-case research design studies and one large, randomized group design study (Romski et al., 2010) that also documented positive outcomes of several variations of AAC modeling (e.g., “aided language modeling,” Drager et al., 2006; “aided AAC modeling,” Binger & Light, 2007). Most recently, Sennott, Light, and McNaughton (2016) summarized the existing research in a systematic review and concluded that “AAC modeling-based intervention packages [have] had a positive impact across a range of language domains for young children who are beginning communicators” (p. 11). They also identified numerous areas in which additional research is needed, including studies that examine the impact of AAC modeling with adolescents and adults and with individuals who require alternative AAC access (e.g., switch access, eye-control access).

The AAC modeling story exemplifies a situation in which an AAC strategy was widely adopted in clinical practice long before research examining its impact was available. Fortunately, in this example, research to date has provided support for use of the practice, at least with young children who are beginning communicators. However, this is not always the case, as illustrated by the next example.

**AAC Candidacy Models**

In their classic article documenting the history of AAC research and practice, Zangari et al. (1994) referred to the 1980s as “a decade of significant accomplishments highlighted by advances in our knowledge base . . .” (p. 41). Unfortunately, this also was the decade that saw the publication and adoption of assessment frameworks that were based on the belief that specific “prerequisite skills” had to be in place before an individual could be considered a candidate for an AAC system. For example, one widely used model specified that an appropriate candidate for AAC had to have a mental age of 18 months or higher, or the ability to recognize at least photographs accurately, among a number of additional criteria (Shane & Bashir, 1980). Another specified a “small initial receptive vocabulary” (p. 20) as one of the criteria and at least 1 year of appropriately intense speech therapy that had failed to produce functional communication, among other criteria (Owens & House, 1984). Candidacy models such as these effectively excluded many people with severe intellectual disabilities from receiving AAC services and supports for many years.

Eventually, research analyses of the assumptions and beliefs on which the candidacy models were based began to appear in the AAC literature. They made it clear that the so-called prerequisites for AAC use were not essential, and that it was inappropriate to exclude individuals who did not exhibit these skills from receiving AAC services (e.g., Kangas & Lloyd, 1988; Reichle & Yoder, 1985; Romski, Sevcik, & Pate, 1988). Research on this topic accumulated over the next few years, as reflected in a multidisciplinary document that provided “guidelines” for meeting the communication needs of persons with severe disabilities (National Joint Committee for the Communication Needs of Persons With Severe Disabilities, 1992). Unfortunately, these guidelines did not address the issue of candidacy models and eligibility criteria for AAC directly, and the result was the models continued to be used widely. Finally, in 2002 and 2003, the same National Joint Committee developed both a position statement and a technical report summarizing the research that challenged the use of candidacy models for AAC. Nonetheless, for almost two decades, practice-based, non-empirical candidacy model frameworks had significant negative effects on the communication lives of many individuals with severe intellectual disabilities. This example illustrates the problem that can arise when the belief or value that underlies an innovation is flawed from the outset.

The candidacy model example also illustrates the major, potential downside of the practice-to-research route: the adoption of practices that are not only unsupported by research but also may result in harm.
Perhaps the best example of this is facilitated communication (FC, aka supported typing; Biklen, 1990) and variations thereof (e.g., the rapid prompting method, RPM; Mukhopadhyay, 2008). Detailed histories of FC and arguments against its use were recently documented in special issues of the journals Evidence-Based Communication Assessment and Intervention (2014) and Research and Practice for Persons With Severe Disabilities (2014), and will not be repeated here; a similar analysis of RPM also is available (Tostanoski, Lang, Raulston, Carnett, & Davis, 2014). Based on a large body of research, some authors have argued that, unlike legitimate forms of AAC, FC “suppresses self-determination, usurps voices, and obstructs the development of a personal identity of people with disabilities” (Travers, Tincani, & Lang, 2014, p. 200). In addition, it can result—and has resulted in a number of cases—in considerable harm to both individuals with disabilities with whom it is used and their families (see Lilienfeld, Marshall, Todd, & Shane, 2014). Despite research evidence that does not support their use, the persistence of FC and variations thereof is a most unfortunate example of the major problem that can arise along the practice-to-research route.

Preloquo2go and AAC Mobile Technologies

One final example is offered to illustrate a situation that is “in between” the ultimately positive research outcomes for PECS and AAC modeling and the ultimately negative research outcomes for AAC candidacy models and FC. In 2007-2008, the Apple iPhone and iPod Touch were released into the marketplace, and were met with widespread enthusiasm. A few innovators immediately saw the potential of these small mobile devices as platforms for AAC. In particular, Sam Sennott, then a teacher in Massachusetts, “saw how [his] students with disabilities needed powerful, yet affordable and cool technology to help them communicate” (Savrock, 2010). He collaborated with David Neimeijer, a software developer from the Netherlands, to produce the first AAC communication app for Apple technologies, Proloquo2go, which was officially released in April of 2009. Then, in the spring of 2010, the first Apple iPad appeared—and changed everything. In a 2011 article, Sennott recalled that

the first major story about Proloquo2Go . . . was in USA Today. It was about a young boy with autism who was able for the first time to tell his mom that he loved Chinese food . . . . Then, the dam broke. A full color photo of a mom with ALS [amotrophic lateral sclerosis] and her young son with Down syndrome, both Proloquo2Go users, appeared on the front page of The New York Times . . . The world was talking about augmentative and alternative communication (AAC). (p. 3)

As these events unfolded, “It started to feel a bit like a revolution was happening” (Sennott, 2011, p. 3) in the lives of people with significant communication challenges. Not surprisingly, given the rapidity of these events, practice very much preceded research—but this time, research began to appear quickly. In 2010, the first clinical case study on the use of Proloquo2go on an iPod Touch with an adolescent with autism appeared in the literature (Kagohara et al., 2010). This was followed by a single-case research design study in which two adolescents and one adult with severe intellectual disabilities learned to make requests using this technology (van der Meer et al., 2011). Additional studies accumulated rapidly, to the extent that, in 2013, the first systematic review on the use of iPods and iPads to teach various skills to individuals with developmental disabilities included eight studies that were specific to communication (Kagohara et al., 2013). This was followed by a meta-analysis of 15 studies that focused on AAC with mobile devices (Alzrayer, Banda, & Koul, 2014) and a systematic review of 17 studies on the same topic (Lorah, Parnell, Whitby, & Hantula, 2015).

Of the 17 studies included in the Lorah, Parnell, et al. (2015) review, 12 (70.1%) focused exclusively on the use of the iPod Touch/iPad with Proloquo2go or another communication app for requesting (i.e., manding), and four more (23.5%) focused on requesting plus at least one additional skill (e.g., turning the device on and navigating to the correct screen, answering a question such as “What is your name?”). Only one study exclusively examined a communicative function other than requesting; in that study, two adolescents with autism were taught to label (i.e., tact) pictures in response to “What do you see?” and “What is it?” questions (Kagohara et al., 2012). Since 2015, additional research on the use of Proloquo2go and mobile technology for AAC has appeared, including one study in which children with autism were taught to answer
simple questions (Lorah, Karnes, & Speight, 2015) and another in which four children with severe motor speech disorders were taught to make comments and answer questions during story reading using two-symbol combinations (Tönsing, 2016). Nonetheless, it seems premature at this point in time to consider the use of mobile devices for AAC to be evidence-based, except with regard to requesting. As noted by McNaughton and Light (2013), “While there is some initial evidence of the potential positive impact of these devices…research must consider not just the effects on simple requests and labeling, but also the impact on a much broader range of communication purposes…” (p. 113). Contrary to popular opinion, there is still much work to be done in this most visible of all practice-to-research domains, although the empirical evidence to date is promising.

**Conclusion**

So, where does this leave us? Although the conventional research-to-practice route is certainly more desirable overall, few would argue against the importance of clinician-driven innovations that follow the practice-to-research route—with some qualifications. First, practice that precedes research must be firmly grounded in person-centered values such as those reflected in the 2016 TASH resolution on the right to communicate: “The right to communicate is both a basic human right and the means by which all other rights are realized. All people communicate, and are presumed to have an active interest in communicating their decisions and choices.” Second, research examining the effectiveness of a new clinical practice or strategy should be timely—that is, it should occur within months—not years—after introduction of the innovation. This is important to prevent the spread of practices that are not empirically supported as well as to identify the limitations and benefits of those that are. In addition, practitioners must be willing to heed the results of research, even when those results contradict their belief in or allegiance to an already-adopted practice or strategy. Finally, regardless of the route, the goal of AAC research—the goal of any intervention research—should be to provide guidance that ultimately helps advance practice and improve peoples’ lives.

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