Chapter 9
Systematic Review of Speech Generating Devices for Aphasia

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ABSTRACT
The purpose of this chapter is to integrate and synthesize, using a meta-analytic approach, the research literature on the effectiveness of augmentative and alternative communication (AAC) intervention using speech generating devices (SGDs) for people with aphasia. Many individuals with little or no functional speech as a result of severe aphasia rely on non-speech communication systems to augment or replace natural speech. These systems include SGDs and software programs that produce synthetic speech upon activation. Based on this quantitative review, the following conclusions are evident. The first is that the existing state of knowledge on whether AAC interventions using SGDs work for people with aphasia is seriously affected not only because of the lack of data but also because most of the available data are compromised because of serious internal validity concerns. Keeping in mind this first conclusion as a context, the second conclusion is that AAC intervention options that utilize SGDs seem to be effective in changing the dependent variables in the experimental contexts. However, the variability among dependent measures across studies and of results within and across studies precludes meta-analytic techniques. Thus, any statements as to the effectiveness of AAC interventions using SGDs for persons with aphasia cannot be made yet.

INTRODUCTION
Aphasia is a language impairment resulting from damage to areas of the brain that are responsible for comprehension and formulation of language. Many persons with aphasia demonstrate severe speech and language deficits, and their ability to use natural language is permanently and severely impaired (Koul & Corwin, 2003). Such individuals may benefit from augmentative and alternative
communication (AAC) methods. These include aids, techniques, strategies, and symbols for either augmenting speech and/or providing an alternative means of communication (Lloyd, Fuller, & Arvidson, 1997). AAC aids such as speech generating devices (SGDs), graphic symbols, and/or text-based software programs that turn computers into speech output communication devices have become increasingly available to persons with aphasia as a result of rapid advancements in computer technology (Beukelman & Mirenda, 2005; Garrett & Kimelman, 2000; Koul & Corwin, 2003; Koul, Corwin, & Hayes, 2005; Koul & Harding, 1998; Koul & Schlosser, 2004; Rostron, Ward, & Plant, 1996; Schlosser, 2003; Schlosser, Blischak, & Koul, 2003). Studies involving AAC intervention using either SGDs or graphic symbol software programs indicate that persons with chronic severe Broca’s aphasia and global aphasia are able to access, identify, and combine graphic symbols to produce sentences and phrases in experimental contexts (Koul, Corwin, & Hayes, 2005; Koul, Corwin, Nigam, & Oetzel, 2008; Koul & Harding; McCall, Shelton, Weinrich, & Cox, 2000; Weinrich, Boser, McCall, & Bishop, 2001; Weinrich, Shelton, McCall, & Cox, 1997). However, their ability to use these alternative forms of communication outside structured treatment contexts has been limited. Persons with chronic severe Broca’s aphasia have difficulty expressing themselves through speech. Their expressive speech is non-fluent and is comprised of few unintelligible words produced with significant effort. However, their comprehension is relatively intact. In contrast, persons with global aphasia demonstrate severe impairments across expressive speech, comprehension, reading and writing.

With the advent of evidence-based practice in AAC, it has become critical to evaluate the evidence before us. Schlosser and Raghavendra (2004) define evidence-based practice in AAC as “the integration of best and current research evidence with clinical/educational expertise and relevant stakeholders perspectives, in order to facilitate decisions about assessment and intervention that are deemed effective and efficient for a given direct stakeholder.” (p.3). In times of dwindling resources and increased accountability, funding agencies for assistive devices and services increasingly require documentation that interventions actually work. Similarly, many consumers are seeking evidence from professionals that communication interventions using assistive technology such as SGDs really work before they are willing to consider using that technology. Are sufficient data to that end available? Although several individual intervention studies using SGDs with persons with aphasia have been published over the last three decades, it is difficult to draw definite conclusions based on single studies. It is critical that this body of studies be synthesized in a systematic manner (Cooper & Hedges, 1994; Schlosser, Wendt, & Sigafoos, 2007). Only then can we draw more definitive conclusions concerning the efficacy of AAC interventions using SGDs. Thus, the primary purpose of this chapter is to conduct a systematic review of the extant research literature on the effectiveness of AAC interventions for people with severe aphasia. AAC intervention approaches for the purposes of this review include use of the SGDs and software programs that produce synthetic and/or digitized speech output upon selection of a symbol or a written text.

**METHODS**

**Inclusion Criteria**

To be included, studies had to meet the following criteria:

1. The intervention and/or measured outcomes of the studies related to the implementation of AAC using SGDs and/or graphic symbol or text-based software programs that turn
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