

Comparison of Voice Output Types for a Child Using AAC

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The current study addressed the effects of speech output on the communication responses of child with a developmental disability. Currently, there are two different types of speech output produced by speech generating devices (SGDs): synthesized speech and digitized speech. Synthesized speech output is the conversion of text-to-speech by approximating the fundamental frequencies, bandwidth, intensities, and voicing characteristics of phonemes and allophones (Venkatagiri, 1996). Digitized speech output is the actual recording of a person's voice. A process called quantization is performed on this recording which creates output close to the observed pressure levels of natural speech (Venkatagiri, 1996).

The current study analyzed how these differences in speech output will effect production of multi-symbol utterances. Schlosser (2003) discussed research that revealed increased production of one, two, and three-word combinations with an SGD with synthesized speech output compared to sign with a child with Down syndrome. Binger & Light (2005) researched the effects of modeling symbol combinations on an AAC system as well as providing verbal models. They found four out of five participant generalized production of multi-symbol utterances to new contexts and maintained these productions for two months.

Another type of communication response addressed in the current study is production of verbalizations. A narrative review by Blischak et al. (2003) discusses how various aspects of speech generating devices may foster natural speech production of SGD users.

The current study will address the effects speech output has on the production of one-symbol utterances, multi-symbol utterances, verbalizations, and use of the AAC system. The participant chosen for the study was a nine year-old female with severe speech sound difficulties and depressed scores on cognitive tests. Vision, hearing, and motor abilities were adequate for using SGD in the study. The participant was not currently using an SGD but had some exposure to AAC. The school speech-language pathologist (SLP) and the participant's guardian reported in a pre-test questionnaire that the participant had few intelligible one-word utterances.

Three baseline sessions were conducted using a static communication board with PCS during three different activities. Six treatment sessions were conducted beginning with the Dynavox MT-4 (synthesized speech output) and alternating with the Mini Mo (digitized speech output) during the same activities. Both devices were programmed with PCS and used a female voice. Naturalistic pausing and prompting were used to evoke targeted two-symbol responses. Verbal praise was provided for two-symbol utterances and verbal acknowledgment for gestures, one-word verbalizations, and one-symbol utterances (Schepis, 1996 & Iacono et al., 1993). The researcher also modeled targeted two-symbol utterances on the AAC system as well as provided verbal models (Binger & Light, 2005).

All sessions were videotaped and analyzed in the following areas. Number of opportunities was defined as the number of times researcher paused or provided a question prompt. Verbalizations were coded as the number of spontaneous on-task one-word and two-word intelligible utterances produced. On-task verbalizations were defined as those containing the targeted vocabulary for the activity. The number of times one symbol was pressed that was appropriate for the activity was coded as a one-symbol utterance. Multi-symbol utterances were defined as the number of times two or more symbols were pressed consecutively and appropriate to the activity regardless of syntactic order. The number of times the SGD or static board was touched and was a clear communicative response was coded as use of the AAC system.

Results revealed that overall both digitized speech output (50.5%) and the communication board (50.9%) yielded similar amount of verbalizations, where as, synthesized resulted in lower amount (14.3%). Comparison of one-symbol utterances to multi-symbol utterances revealed an overall decrease in

production of one-symbol utterances over time. More multi-symbol utterances were produced with synthesized speech output (67.6%) than with digitized speech output (45.8%) and the static communication board (29.4%). Also synthesized speech output was used more (71.4%) than digitized speech output (49.5%) and the communication board (67.4%). Results for individuals sessions and trends across these sessions will also be presented.

Treatment reliability was calculated by the percent accuracy of adherence to procedures using this formula: $\frac{\text{correct elements}}{\text{correct} + \text{incorrect elements}} * 100$ (Iacono, Mirenda, & Beukelman, 1993). Baseline and treatment fidelity resulted in a mean percent accuracy of 97% and reinforcement fidelity resulted in a mean percent accuracy of 93%. Reliability measures for the dependent variable will also be reported.

The similar amount of verbalizations produced with digitized speech output and the communication board supports how SGDs immediate acoustic feedback can aide imitation (Blischak et al., 2003). Also, the increase of production of multi-symbol utterances supports modeling on the AAC systems as well as providing verbal models (Binger & Light, 2005).

Future research should address the role of no speech output compared to speech output. Additionally, future research is needed to investigate the role of automaticity of message selection can have on the natural speech production of AAC users. Finally, the current study should be conducted with other populations who use AAC to discover if there are similar findings.

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