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ABSTRACT

This paper explores three different language representation methods used to access vocabulary in augmentative alternative communication (AAC) and identifies which are most effective for core and extended vocabulary. The benefits and drawbacks of using spelling, single meaning pictures, and semantic compaction (Minspeak) are described. The paper finds that for access to core vocabulary, research suggests a ranking of semantic compaction, spelling, and single meaning pictures in order of effectiveness. For access to extended vocabulary, the order would be spelling, single meaning pictures, and semantic compaction. The paper stresses, however, that total communication requires access to both core and extended vocabulary and that monitoring the language activity of highly effective users of AAC has indicated that they use a combination of semantic compaction and spelling, sometimes with word prediction. The paper concludes that for most people who rely on AAC and have a language age of two years or more, the use of multiple language representation methods results in the most effective communication. Those methods include semantic compaction for core vocabulary access and spelling and/or single meaning pictures for extended vocabulary access. (Contains 12 references.) (CR)

Language Representation Method Issues in AAC: All Are Not Equal

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The goal of AAC is effective, spontaneous, timely, interactive, conversational communication. The most significant factor in achieving success with AAC is the language representation method(s) used to access vocabulary. The three commonly used methods are single meaning pictures, spelling, and semantic compaction (Minspeak). This paper explores each method and identifies which are most effective for core and extended vocabulary.

Introduction

Augmentative and alternative communication (AAC) as a field, while perhaps not mature, is well beyond the stage of infancy. Electronic AAC devices have been provided to people with severe communication impairment for over a quarter century. In that time the field has made remarkable progress, spurred in part by technological developments that include the microprocessor, synthetic and digitized speech, and other elements that constitute the components of high tech AAC devices. Today tens of thousands of people world wide who rely on AAC are enjoying the benefits of these developments.

For most people who rely on AAC, personal achievement is a vital function of the ability to communicate. Currently they have the potential for high personal achievement that far exceeds what was possible even a few years ago. Unfortunately, however, this potential is not always realized. Too often people are being limited rather than liberated by their AAC systems. (Romich and Spiegel, 1999) One of the reasons for limited communication performance is that individuals have been provided with language representation method(s) that do not provide for the most effective access to the vocabulary they need to use. This is common when AAC professionals try to apply a single language representation method for the entire vocabulary.

Vocabulary Types: Core and Extended

In providing services to people who rely on AAC, it is important to distinguish between core vocabulary and extended vocabulary. Core vocabulary consists of the few to several hundred words that constitute the vast majority of what is said. Roughly 80% of communication needs can be handled by 250-500 words. (Beukelman and Mirenda, 1992; Beukelman, Jones & Rowan, 1989; Vanderheiden & Kelso, 1987) For effective communication, access to the core vocabulary must be fast and automatic.

Extended vocabulary consists of the thousands of words that are used infrequently.

Both core and extended vocabulary words are necessary for total communication. However, the language representation methods used to access

core and extended vocabulary should not necessarily be the same for best performance.

AAC Language Representation Methods: Spelling, Single Meaning Pictures, and Semantic Compaction (Minspeak)

The three commonly used language representation methods in AAC are spelling, single meaning pictures, and semantic compaction. Each has particular attributes relative to their efficacy for core and extended vocabulary access.

Spelling is the stringing together of individual letters to form words. Spelling is a generally useful skill, particularly for generating printed communication. A positive attribute of spelling is that the character set is relatively small, twenty-six letters for the English alphabet. This is attractive for people with disabilities who may have difficulty in making selections. Further, all words can be spelled.

However, spelling has some serious drawbacks as a method of representing language for conversational communication. Spelling requires spelling skills, which must be taught. The conveying of meaningful information requires the generation of long sequences of characters. For other than touch typists, this can be a slow and laborious task.

Various methods have been devised with the goal of enhancing the speed of communication by spelling. They have either been shown to be ineffective or have their own difficulties.

Many years ago, word prediction held the promise of enhancing the text generation rate of people who could spell. Even though word prediction clearly reduces the number of keystrokes, several studies indicate that there is little, if any, rate enhancement.

In a study designed to explore the effect of the size of the word prediction list on communication rate, Venkatagiri (1994) found that there was not necessarily an increase in rate. Further, this study suggests that searching the word prediction list results in significant cognitive/perceptual demands.

One would expect that word prediction would be at its best when people use a scanning selection technique rather than a keyboard because of the slow selection speed. However, again, research indicates otherwise. Koester and Levine (1994) found that word prediction did not yield a statistically significant improvement in text generation rate. The general lesson here is that an apparent improvement may not be an actual improvement.

In these studies subjects were given a task of transcribing text. Fully 100% of their cognitive energy could be devoted to the process. In actual communication, one might presume that at least some small portion of cognitive energy would be devoted to the content of communication as opposed to the process. Therefore, real communication using word prediction may well be even worse than these studies report.

So why doesn't word prediction increase rate? The general belief is that the cost of the distraction of the changing tasks (selecting a letter, reading a list, processing the information, and then repeating this cycle over and over) and the associated increase in time per keystroke balances the benefit of the reduced number of keystrokes (Treviranus & Norris, 1987)

(Koester and Levine, 1994). Further, such a system, by its very nature, can never become automatic. Automaticity, or motor planning, is the unconscious and transparent use of a method. Touch typing is a good example. Automaticity is key to spontaneous communication. It allows the full cognitive energy to be devoted to the content rather than the process. The fastest people who rely on AAC are using systems that enhance and promote automaticity.

Abbreviation expansion is yet another method of making spelling go faster. With this method, abbreviations are converted to words or phrases by the AAC system. As with word prediction, this can result in significant reduction in keystrokes. Like word prediction, it really requires spelling skills to be meaningful. Unlike word prediction, abbreviation expansion can become automatic. Unfortunately, a generalized approach to this method is essentially impossible. So many core vocabulary words start with the same letters that a significant vocabulary becomes filled with conflicts. Letter coding (abbreviations or otherwise) can have some limited utility for some people who rely on AAC.

Single meaning pictures require a different picture for each vocabulary word. This representation of language is simple to understand. The representation of any word by a picture can be taught. However, single meaning pictures can be a classic example of the dichotomy between simplicity and effectiveness. While simplicity is certainly desirable in isolation, it is certainly not desirable at the cost of effectiveness in communication.

A normally developing three year old has a vocabulary in excess of eleven hundred words. Using a single meaning picture method of representing language, the vocabulary of a three year old would require over eleven hundred pictures. The practical implementation of such a system to result in effective communication is essentially impossible.

Like spelling, single meaning pictures must be taught. Only the meanings of pictures showing object nouns are obvious. All others must be taught. Further, object nouns constitute only a small portion of core vocabulary. Single meaning picture systems are nowhere near as obvious to the people using them as they appear to be to people who can read the associated words. Anyone can test this by removing the words from the picture set and trying to hold a conversation.

Semantic compaction (Minspeak) is the representation of vocabulary items by short sequences from a small set of multi-meaning icons. Like spelling and single meaning pictures, semantic compaction must be taught. Minspeak takes good advantage of the benefits of motor planning, resulting in automatic and rapid communication. Minspeak has been demonstrated to be effective with individuals from language age two and up. Most people who can spell can benefit from the use of a Minspeak system. Training times have been noted to be in the range of ten to twenty hours. However, Minspeak is not very useful for accessing vocabulary words that are used infrequently.

Comparing AAC Language Representation Method Performance

Few studies have been done that compare the performance of the various AAC language representation methods. However, there is some information that would suggest an effectiveness ranking for use with core vocabulary.

Gardner-Bonneau and Schwartz (1989) compared the rate of transcribing sentences using Words Strategy (WS), a particular Minspeak configuration, with that using spelling. The study consisted of six tests and included training in WS. As expected, those who used spelling were faster initially, but their performance quickly plateaued. However, after the third test (approximately fifteen hours of training), subjects using WS were functioning at a rate faster than spelling. By the end of the study, the WS rate was over 32 words per minute (wpm) as compared to 25 wpm for those using spelling. The WS subjects did not reach a performance plateau by the end of the study, but analysis of the learning curve indicated an expectation of 42.4 wpm, 70% higher than those using spelling. Consequently, the results conclusively indicate that WS as an encoding system achieved a significant rate enhancement.

Most of the research summarized above was based on subjects without disabilities. There have been few studies based on actual people who rely on AAC. Language activity monitoring tools, recently under development by Hill and Romich (1999) are making practical the gathering of language data for clinical intervention, outcomes measurement, and research.

In one study based on real users of AAC, however, Burger (1997) compared the performance of people using dynamic display systems with others who used Minspeak and others who spoke naturally. Those using AAC systems were matched as closely as possible for age, gender, employment, and education and all used direct selection although the results were not normalized for variations in these areas. The researcher expresses concern that the quantitative results, strongly favoring Minspeak over dynamic display, could at least in part be the result of variations in these factors.

Qualitative results included the observation that, while those using the Minspeak systems were sequencing icons in a manner consistent with the original intent of the Minspeak method, each subject using a dynamic display system was using it as a spelling board or with word prediction rather than by navigating screens of single meaning pictures. Based on the Gardner-Bonneau and Schwartz study, one would expect Minspeak to be 70% faster, all else being equal.

Questions are raised by this work. Did the subjects using dynamic display systems actively choose to use them in a spelling manner because they had already tried to navigate screens of single meaning pictures and found that method to be less effective than spelling? Are dynamic display systems based on single meaning pictures less effective for the same reason that word prediction does not significantly enhance rate? The dynamic display method using single meaning pictures which can be placed at various locations also cycles through motor, receptive, and processing tasks, precluding the effective use of motor planning.

Using Multiple Language Representation Methods

For access to core vocabulary, the above information would suggest a ranking of semantic compaction, spelling, and single meaning pictures in order of effectiveness. For access to extended vocabulary, the order would be spelling, single meaning pictures, and semantic compaction.

Total communication requires access to both core and extended vocabulary. Monitoring the language activity of highly effective users of AAC has indicated that they use a combination of semantic compaction and

spelling, sometimes with word prediction. Semantic compaction accounts for 85-100% of communication in language samples of significant size. (Hill, 1999). Personal observations of individuals using AAC confirm this hypothesis.

Conclusion

For most people who rely on AAC and have a language age of two years or more, the use of multiple language representation methods results in the most effective communication. Those methods include semantic compaction (Minspeak) for core vocabulary access and spelling and/or single meaning pictures for extended vocabulary access.

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