1994

A comparison of the symbol sets used for augmentative and adaptive communication

Clair J. Judas
University of Northern Iowa

A comparison of the symbol sets used for augmentative and adaptive communication

Abstract

This research paper will review current research concerning the acquisition, transparency, and recall of various types of symbol sets and their use as part of an augmentative and adaptive communication (AAC) system for students with severe mental disabilities. The types of symbols sets include: Object symbol sets (nonidentical objects, miniature objects), Photographic symbol sets (identical colored photographs, nonidentical colored photographs, black-and-white photographs), Graphic symbol sets [Picuture Communication Symbols (PCS), Picsyms, Rebus, Self-Talk, and Blisssymbols], and Orthographic symbol sets (written words). It will look at the rate of acquisition, transparency, & recall of these symbol sets. Recommendations will be made concerning the effectiveness of types of symbol sets as a means of communication for students with severe mental disabilities.

A Comparison of the Symbol Sets Used for Augmentative and Adaptive Communication

A Graduate Research Paper

Submitted to the

Department of Curriculum and Instruction

In Partial Fulfillment

of the Requirements of the Degree

Master of Arts in Education

University of Northern Iowa

By Clair J. Judas

July 1994

This Research Paper by: Clair J. Judas

Entitled:

A Comparison of the Symbol Sets Used for Augmentative and Adaptive Communication

has been approved as meeting the research paper requirement for the Degree of Master of Arts in Education.

July 29, 1994
Date Approved

Sharon E. Smaldino
Director of Research Paper

July 29, 1994
Date Approved

Sharon E. Smaldino
Graduate Faculty Adviser

July 31, 1994
Date Approved

R. Muffoletto
Graduate Faculty Reader

July 31, 1994
Date Approved

Peggy Ishler
Head, Department of Curriculum and Instruction

Abstract

This research paper will review current research concerning the acquisition, transparency, and recall of various types of symbol sets and their use as part of an augmenative and adaptive communication (AAC) system for students with severe mental disabilities. The types of symbols sets include: Object symbol sets (nonidentical objects, miniature objects), Photographic symbol sets (identical colored photographs, nonidentical colored photographs, black-and-white photographs), Graphic symbol sets [Picuture Communication Symbols (PCS), Picsyms, Rebus, Self-Talk, and Blisssymbols], and Orthographic symbol sets (written words). It will look at the rate of acqusition, transparency, & recall of these symbol sets. Recommendations will be made concerning the effectiveness of types of symbol sets as a means of communication for students with severe mental disabilities.

Table of Contents

Chapter 1

Introduction

Students with mental disabilities often have difficulty communicating effectively with their peers, age-mates, and adults. Many of these individuals also have other disabilities that complicate the communication process, resulting in students who are "non-speaking". David Beukelman describes non-speaking students as those "who are unable to use natural speech to meet all of their communicative needs" (Beukelman, 1988, p. 5). While some can produce no sound at all, others can produce sounds that are understandable only by those individuals who are very familiar with them. This inability to speak limits access to educational, vocational, recreational, and interpersonal interactions. Blackstone, Brown, Cavalier, Cress, Mineo, Sweig-Wilson, & VenBiervliet (1989) point out that children who are unable to speak and/or unable to use a pencil to write are without the tools necessary to receive an appropriate education.

Matas, Mathy-Laikko, Beukelman, and Legresley (1985) surveyed public school districts in three urban counties in western Washington State and 15 rural

counties in eastern Washington state. Their study revealed that 0.3% of the students in the urban school districts and 0.6% of the students in the rural school districts were classified as non-speaking.

A variety of physical and cognitive impairments are responsible for this severe communication disorder. Matas et al. (1985) found that of the non-speaking school-age population:

47% are multiply handicapped,
28% are mildly or moderately mentally disabled,
14% are severely or profoundly mentally disabled,
6% are severely language handicapped,
4% are physically handicapped, and
1% are developmentally handicapped.

Augmentative communication (AC) means all communication that enhances or supplements speech (Vanderheiden & Yoder, 1986). The initial goals of augmentative communication were to enhance the daily communication skills of individuals with severe speech impairments. Today, however, AC also is used to facilitate the development or return of natural speech

and/or spoken language comprehension, to access comprehension of language, to develop communication skills, and to provide access to basic human interaction (Blackstone et al., 1989). Standard communication components are the non-speech techniques used by most people (e.g., facial expressions, gestures, head nods, telephones-TTY, typewriters, and computers). Additionally, special augmentative components such as manual signs, communication boards, electronic communication devices, switches, computers with special communication software, hardware and firmware are used.

Statement of the Problem

An area of research that is increasing in activity is related to decision-making models. Researchers are undertaking studies to determine which symbol sets or systems should be taught to non-speaking individuals as part of a communication system. Research has been conducted to establish the most effective vocabulary to include on a communication board display.

Often, the best hope for communication for non-speaking individuals lies in the exciting and fast developing field of augmentative and adaptive communication (AAC). Beukelman (1988) describes

augmentative communication as, "a variety of communication approaches that are used to assist persons who are unable to communicate their messages through natural modes of communication such as speech, gesture, and writing." (p. 6). He goes on to say, "The augmentative approaches include non-aided techniques such as manual sign language and the aided techniques such as communication boards and electronic equipment." (p. 6). For those student who are not able to develop functional use of sign language, the communication board, in one form or another is most likely the communication device of choice.

In order to provide the individual with the most effective and efficient communication board, one of the most important determinations for the educator or therapist to make is the best type of symbol set to use with a particular child (Mirenda & Locke, 1989). Research has found that the vocabulary of AC users is unique, idiosyncratic, and dynamic (Beukelman, Yorkston, Poblete, & Naranjo, 1984). Non-spellers rarely have access to more than 500 symbols. In fact, large vocabularies make selection arrangements, storage and retrieval more complicated and time-consuming.

Symbol research can assist teachers and clinicians to select symbols sets in a more systematic way. Presently, these decisions are often based on the familiarity and availability of symbol sets (largely reflecting pragmatic and marketing issues) rather than concerns related to teaching the comprehension and use of symbols in interactive situations to clinical populations (Blackstone et al., 1989). Educators and therapist who will assist in making those determinations need to have an understanding of the rate of acquisition, transparency, and ease of recall for various types of symbol sets, and be able to match those sets to individual students in order to provide the student with the most effective and efficient means of communication.

Research Question

What types of symbol sets are most effecitve and efficient for use in an augmentative communication system for non-speaking students with severe mental disabilities?

Definition of Terms

acquisition: The function of learning a symbol and its meaning.

iconicity: The degree to which the elements of a sign or symbol are related to the visual aspects of what is denoted (Bellugi & Klima, 1976). It reflects how closely the icon resembles the object, verb, or descriptor it represents .

opaque: A measure of the degree to which a symbol suggests its referent. An arbitrary symbol which has no apparent relationship to its referent is considered to be opaque (Mizuko & Reichle, 1989).

recall: The ability to identify the meaning of a symbol through one or more techniques including verbal match or point to match.

symbol sets: Sets or families of symbols used for communication. These can range from high iconicity (identical objects) to low iconicity (written words).

transparent: A measure of the degree to which a symbol suggests its referent. A symbol which can be readily guessed by naive viewers is considered to be transparent (Mizuko & Reichle, 1989).

translucent: A measure of the degree to which a symbol suggests it referent. A symbol which may not be readily guessable, but the viewer is able to perceive a relationship between the symbol and its meaning is

considered to be translucent (Mizuko & Reichle, 1989).

Chapter 2

Literature Review

This review of the literature on symbol sets, reveals that some are easier to acquire, are more transparent, and are easier to recall than others. The issues of acquisition, transparency, and recall are important in the selection of an appropriate communication system for the student. The reader will also see that even though a symbol set may be the easiest to acquire, most transparent, and easiest to recall, it may not be the best alternative for the communicative needs of a particular student.

Types of Symbol Sets

Object symbol sets. Objects used that are similar to but not identical to the referent are considered symbols. Mirenda and Locke (1989) describe two types of object symbol sets. They are non-identical objects that differ from the referent in at least two dimensions (e.g. color and size, size and shape, etc.) and non-identical miniature objects (about 1 inch in size).

The object symbol for coat would be another coat. While the subject's coat may be a size small, black and white coat, the object symbol may be a size large blue

and red coat. The object symbol would differ from the referent in two dimensions, size and color.

non-identical miniature objects refers to objects that represent the referent but are of substantially smaller size. Following the coat example above, the non-identical miniature object for the subject's coat may be a piece of doll clothing, a miniature coat that would fit a doll, but would not be suitable for normal use.

Photograph symbol sets. Mirenda & Locke (1989) compared the transparency of 11 different types of symbols representing objects with 40 non-speaking subjects. The subjects included individuals with physical impairments or autism in addition to mild, moderate, or severe mental disabilities. In their study, they described three types of photographs as symbol sets: (a) Color photographs identical to the standard objects, (b) Color photographs that are not identical to the referent, and (c) Black-and-white photographs that are identical to the standard objects. They did not use black-and-white photographs that were not identical in their study, but clearly, they could also be used in this category of symbol sets.

Graphic symbol sets. Another style of symbols sets are the graphic symbols. These are symbols sets that use line drawings to represent objects, verbs, and descriptors. In some of these sets, [PIC, Picsyms, Picture Communication Symbols (PCS), Self-Talk, and Rebus symbols] the line drawings are considerably like the object they represent. Blissymbols have some symbols that look like the objects they represent and others that are very abstract and have no representational features. Lexigrams are line drawings that consist of a set of elements (lines & shapes) which are combined to form a symbol. This symbol is arbitrarily assigned to represent an object, verb, or descriptor. Unlike letters in words, which are sequential, the elements are drawn one upon another (as needed) to form a single but more complex symbol.

Orthographic symbol sets. Orthographics are words, standard written or printed text. Orthographic symbols sets normally consist of upper, lower, or a combination of upper and lower case printed letters making up whole words. While this type of symbol set is most useful in the community setting, it is the most difficult for the subject to acquire.

Acquisition, Transfer & Recall With Various Populations

Preschool children with normal intelligence. Clark (1981) examined the ability of normal preschoolers, who were non-readers, to learn printed words, Blissymbols, Rebus symbols and Carrier symbols. Clark reported from her study that in the early stages of learning, Rebus symbols were significantly easier to learn than Blissymbols, and Blissymbols, in turn, were easier to learn than either Carrier symbols or printed words. It is important to note that Clark (1981) used 26 symbols in each of the sets assessed, including nouns, verbs, and prepositions. Many of the Blissymbols were highly stylized and could not be learned without instruction.

Ecklund and Reichle (1987) conducted a study to assess normal preschool children's ability to recall graphic symbols from the Blissymbols and Rebus symbols sets. The authors taught 16 children the Blissymbols and 16 children the Rebus symbols. Eight subjects from each group were required to indicate a pictorial match using a verbal response and eight subjects from each group were required to indicate a pictorial match using a pointing response. Results indicated that the Rebus symbols were recalled with significantly greater

accuracy than Blissymbols. While there was not a significant difference between the verbal and pointing indications of matching, the subjects who pointed made fewer errors than the subjects who used verbal indicators. Ecklund and Reichle (1987, p. 39) note that "one would expect the nonverbal response mode to be easier, since the subject is required only to make a pointing response and need not provide any verbal label for the stimulus...". They also found, in the maintenance probe tasks, the children using the pointing response maintained a higher percentage of symbols regardless of the symbol system they were using. Since graphic symbols are usually taught by having the children point at them, it is encouraging to note that symbols seem to be better maintained when the response is pointing.

Mizuko (1987) in a study designed to investigate transparency and the ease of learning of referents represented by different graphic symbol systems examined whether there are learning and transparency differences across graphic symbol systems (Blissymbols, PCS, and Picsyms) within three different word categories (nouns, verbs, and descriptors). His subjects were normal

children attending preschool programs in Madison, Wisconsin. In the area of learning, both the PCS and Picsyms were significantly easier to learn than the Blissymbols overall. No significant differences between PCS nouns and Picsyms nouns were found. PCS verbs and descriptors were found to be easier to learn than the Picsyms verbs and descriptors on all trials, but significant differences were present in those areas on only 2 of 3 trials. Overall transparency scores were significantly lower with the Blissymbols than with either the PCS or Picsyms. Additionally, while there was no significant difference between the scores for PCS and Picsyms in the noun category, the PCS set scored significantly higher than the Picsyms in the verb and descriptor categories.

In this study, the PCS symbols appear to be the easiest to learn and most transparent in the word categories of verb and descriptor and very comparable to the Picsyms in learnability and transparency in the word category of nouns, with the Blissymbols being the most difficult set to learn and the least transparent across all three word categories. The learnability findings tend to support an earlier study (Hurlbut, Iwata, &

Green, 1982) which suggest that symbols which are more iconic are easier to learn than those that are not iconic.

College undergraduates with normal intelligence. Bloomberg, Karlan & Lloyd (1990) compared the translucency of initial lexicons within the Picsyms, PIC, PCS, Rebus and Blissymbols sets across the same word categories of nouns, verbs and descriptors, using college undergraduates as subjects. Initial lexicons are those symbols that would be used as initial or first symbols to teach a student when beginning to develop an AC system. With this group of subjects, the researchers found the Rebus and PCS symbol sets were equivalent to each other and the most translucent of the five sets, regardless of parts of speech. PIC was the next most translucent for noun and verb referents, followed by Picsyms. The PIC and Picsyms were equivalent in relative translucency when representing descriptors. Blissymbols consistently scored as significantly less translucent than symbols from the other four systems and sets across all word classes. These results are consistent with those of Mirenda and Locke (1989) who found that Blissymbols representing objects (nouns) were

significantly less transparent to individuals with intellectual impairments than either Picsyms or Rebus representing objects.

Although the studies by Clark (1981), Ecklund and Reichle (1987), and Mizuko (1987) used normal preschoolers as subjects, and the study by Bloomberg et al. (1990) used undergraduates, the data may have implications in selecting a symbol system for children and adults with communications disabilities. If one of the goals of communication intervention is to provide an immediate means of communication then ease of learning would be an important factor. Mizuko (1987) referring to the work of Luftig and Bersani (1985) states that one may predict that similar differences found in iconicity (transparency) may be found with acquisition as research has demonstrated that iconicity facilitates acquisition of graphic symbols in adults of normal intelligence. This consideration is particularly important when considering persons with severe cognitive delays, who have difficulty in learning abstract symbols systems, such as traditional orthography (Mizuko, 1987). However, when selecting a system for a person with a physical disability, but with little or no cognitive delay, ease

of acquisition may not be an important factor. In fact, if a system is to be used as a long-term communication system and learnability is not an issue, a more abstract system such as Blissymbols, which allows symbols to be combined and recombined to form words and concepts, may provide a more effective means of communication.

Adolescents with severe mental disabilities. Hurlbut et al. (1982) conducted a study comparing the use of the Blissymbol set and an iconic picture system (drawn from the Rebus symbols). Specifically, they were examining acquisition, maintenance, stimulus generalization, and response generalization. They also collected data on spontaneous usage of either language system throughout the school day. Their subjects were three adolescents with severe mental disabilities. The data revealed that the students required approximately four times as many trials to acquire Blissymbols as iconic pictures. In addition, while the students retained all iconic pictures following initial acquisition they required retraining in almost all Bliss symbols. Stimulus generalization (i.e., the ability to use previously trained symbols or pictures to tact novel objects of the same stimulus class as those used during

training) was evident in both language systems, although students' scores were higher for the iconic pictures (Hurlbut, et al., 1982). Since the students maintained fewer Blissymbols, it is not surprising to find that the stimulus generalization responses in the Blissymbols were also lower. The author notes that the data are important in addressing one criticism of the use of iconic picture training, by demonstrating that such training does not inhibit stimulus generalization (Harris-Vanderheiden, MacKenzie, Reine, & Schiebel, 1975). Some of the more interesting developments are in the area of spontaneous usage. Although all of the students used both systems spontaneously during daily activities, the use of the iconic pictures was more extensive in terms of both frequency and variety. The total number of spontaneous iconic responses ranged from a low of four times the number of Blissymbol responses with one student to a high of twenty one times the number of Blissymbol responses with another. Not only did the students choose to use the iconic symbols more frequently, when they did choose to use the Blissymbols, they only chose to use the ones they had learned during the training sessions. There were several instances

where the students used "crossovers", in that they substituted untrained iconic pictures for previously trained Blissymbols. Hurlbut, et al. (1982) had two possible explanations for the crossovers. First, they felt the responses may have indicated a preference for the iconic symbols. The second possibility (and the one they indicated to be more likely) is that the students' tendency to substitute untrained iconic pictures for previously trained Blissymbols reflected both the lack of maintenance seen with the Blissymbols, as well as the ease with which iconic training generalized to untrained items.

Again, as with the previous studies where the subjects were preschool students with normal intelligence, it appears that the iconic systems have advantages over a more abstract system for initial communication acquisition, for severely handicapped individuals. Hurllbut, et al. (1982) emphasized, that the superiority of the iconic training format may not extend to situations requiring more complex verbal skills.

Adults with severe mental disabilities. Mizuko and Reichle (1989) conducted a study comparing the transparency and recall of symbols from three different graphic symbol sets (Blissymbols, PCS, and Picsyms). The subjects in this study were 21 speaking adults with mental disabilities. Their mental age equivalents scores had a mean of 3.19 years. This study provides an opportunity to compare the transparency and acquisition of Blissymbols, PCS, and Picsyms across the word categories of nouns, verbs and descriptors for preschool children of normal intelligence (Mizuko, 1987) to the transparency and recall of the same symbol sets and same word categories for adults with mental disabilities (but with mental age equivalents close to those of the preschool children) (Mizuko & Reichle, 1989). The authors chose to investigate recall rather than translucency (ease of learning) because (a) the subjects did not have sufficient cognitive skills to participate in a rating scale to gauge translucency and (b) the literature regarding iconicity with children has relied extensively on a proportion of correct responses during a recall task as an indirect measure of iconicity (Mizuko & Reichle, 1989).

The data analysis by Mizuko and Reichle (1989)for the transparency task analysis indicated that there were significant differences among the Picsyms, PCS, and Blissymbols in the noun category, with the Picsyms being the most transparent and the Blissymbols being the least transparent. The differences across the three symbols sets in the verb and descriptor categories were not significant.

The other purpose of the investigation was to determine whether differences existed as a function of system type and word class in symbol recall (Mizuko & Reichle, 1989). In general, more Picsyms symbols representing nouns were recalled over three trials than either than either PCS or Blissymbols. Mizuko and Reichle (1989) compare these findings to those of Mizuko (1987) saying that the lack of a significant difference among the three symbol systems for verbs and descriptors does not support the findings of (the) earlier study which involved normally developing children. They hypothesize that the lack of agreement may be due to the population differences between the two investigations. The preschool children with normal intelligence showed an upward learning curve during the three trials, while

the adults with mental disabilities did not demonstrate the same curve.

The results of the study suggest that transparency may not be equivalent across the different word categories. For nouns, fewer Blissymbols were correctly identified than either PCS or Picsyms, whereas Picsyms was more transparent than PCS. However there were no significant differences across the three symbol systems for verbs and descriptors. This finding has important clinical implications for supporting the use of several symbols systems rather than using one source.

Adolescents and young adults with severe mental disabilities. Romski, Sevcik, and Pate (1988) conducted a study of lexigram use with four institutionalized adolescents and young adults with severe mental disabilities. The lexigrams consisted of 9 elements that were combined to form arbitrary symbols. These symbols are much less transparent than graphic symbols such as PIC, PCS, & Picsyms. The results of the study indicate that initiating instruction at the level of communicative request is a viable beginning for the establishment of symbolic communication in persons with mental disabilities who have severe oral language

impairments. Three of the 4 subjects were able to use the lexigrams to request foods and subsequently objects. Romski, et al. (1988) indicate that with additional experience the emergence of subject-initiated lexigram communication and the facilitation of spoken language comprehension and/or production were also observed. The subjects were taught 4 lexigrams. The greatest number of trials during initial instruction for all subjects was required to learn a conditional discrimination between Lexigram 1 and Lexigram 2. After that skill was achieved, the subjects' trials to criterion decreased considerably. Romski, et al. (1988) note that one factor that may have contributed to the rate of symbol learning for 2 of the subjects who required a large number of trials to learn the first four lexigrams was the abstractness of the lexigrams.

They suggest that individuals with severe mental disabilities who are learning language for the first time may not possess the pictorial referents, experience, and/or speech comprehension vocabulary to which they can attach meaning. Consequently, iconic signs or graphics symbols may be functionally equivalent to abstract signs or graphic symbols for the individual.

Adults who are non-speaking with (mild, moderate, and severe) mental disabilities (and a number with concomitant physical disabilities) or autism. Mirenda and Locke (1989) in their study of the comparative transparency of 11 different symbols representing objects worked with 40 non-speaking subjects. The subjects included a number of individuals with physical impairment in addition to (mild, moderate and severe) mental disabilities. The symbol sets included: non-identical objects, miniature objects, identical colored photographs, non-identical colored photographs, black-and-white photographs, PCS, Picsyms, Rebus, Self-Talk, Blissymbols, and written words. The study was designed to examine the transparency of pictographic symbols used to represent common objects using a large number of subjects across ages and ability ranges, with all subjects being non-speaking and having some degree of mental disability. The subjects were treated as separate groups (mild, moderate, and severe degrees of mental disability; and autism). The subjects with autism were treated as a separate group based on the suggestion that the unique information processing and learning styles of this population might result in idiosyncratic patterns

of symbol recognition and acquisition (Mirenda & Locke, 1989).

Results indicated that similar patterns of symbol recognition existed for all four groups. There were significant differences between objects and the other symbol sets, between Blissymbols and all other symbols sets (including objects) except written words, and between written words and all other symbol sets except Blissymbols. There was also a significant difference between the results for individuals with severe mental disabilities and those for the mild, moderate, and autistic groups. The latter three groups were found to be statistically equivalent.

Mirenda and Locke (1989) note that even though there was not a statistically significant difference among the majority of symbols sets, a consistent hierarchy of transparency was evidenced across the groups. The hierarchy was, in the order of easiest to hardest: objects, color photographs, black-and-white photographs, miniature objects, black-and-white line symbols (including Picsyms, Self-Talk, PCS, and Rebus, in that order), Blissymbols, and written words.

Overall, the results of this investigation confirm

those from previous symbol transparency studies that used both non-handicapped and handicapped subjects (Mirenda & Locke, 1989). It is important to note that this study reflects only the transparency of symbols referring to nouns. It is not possible to assume that the same hierarchy would exist if the referents were verbs and descriptors.

In the discussion of the results of this study, Mirenda and Locke (1989) note the diverse communication needs of non-speaking persons. They continue on to emphasize that this may be especially true for persons with severe intellectual disabilities, as they were found to be significantly more limited in their overall symbol recognition abilities than were subjects in the other groups. They hypothesize that a person may be able to use a particular symbol set to respond to questions but may be unable to use this same set to request desired objects or engage in other communicative acts that require initiation. They suggest that the determination of the appropriate type of symbol to use for a specific communicative or instructional purpose should be made on an individual basis, with care taken to provide multiple symbol sets to users who show

evidence of inconsistent performance in different contexts.

This investigation (Mirenda & Locke, 1989) is the first to examine the relative transparency of a wide range of symbol sets with a large number of subjects who experience communication and other disabilities. It identifies a symbol hierarchy that appears to be uniform across the four disability groups examined (Mirenda & Locke, 1989).

Chapter 3

Summary/Conclusion/Implications

Summary

This research paper examined current literature which evaluated the acquisition, transparency and recall of various symbol sets. These symbol sets included: Object symbol sets (non-identical objects, miniature objects), Photographic symbols sets (identical colored photographs, non-identical colored photographs, and black-and-white photographs), Graphic symbols sets (PCS, Picsyms, Rebus, Self-Talk, Blissymbols, and Lexigrams), and Orthographic symbol sets (written words). It reviewed the research that examined these symbol sets (as available) with subjects that were preschool age and/or undergraduates with normal intelligence. It also reviewed the research that examined these symbol sets (as available) with subjects that were speaking and non-speaking adolescents and/or adults with intellectual disabilities including: (mild, moderate, or severe) mental disabilities (some with concomitant physical disabilities) and autism. A hierarchy of transparency for symbols referring to nouns was discussed, as was a comparison of symbol sets across the word categories of

verbs and descriptors.

Conclusion

In general, it appears that the greater the degree transparency of the symbol set for its referents, the greater the ease of its acquisition for the learner. This condition was very consistent across all learners and symbol sets, with regard to the noun/object referents. The graphic symbol sets: PCS, PIC, Picsyms, Rebus, Self-Talk, and Blissymbols for verbs and descriptors are not as transparent as those for the noun/object referents, but were consistently easier to acquire, more transparent, easier to recall than the graphic symbol set: Lexigrams, or orthographics. In general the graphic symbol sets high in iconicity (i.e. PCS, PIC, Picsyms, Rebus, & Self-Talk) proved to be easier to acquire, more transparent and easier to recall for both learners with normal intelligence and those with handicapping conditions. These high-iconicity graphic symbol sets appear to be preferred choices of sets to introduce to those learners with severe mental disabilities, requiring immediate communication intervention, where the goal is to develop the ability to request objects. There appeared to be some indication

that the more complex graphic symbol systems such as Blissymbols and lexigrams may be more appropriate in those situations where the learner needs to develop a more complete language system and has the intellectual capability to do so. However, the studies reviewed did not examine the functionality of the less transparent graphic symbol sets (i.e., Blissymbols & Lexigrams) within the community. A comparative study of the functionality of these symbols sets in a community setting would be of value.

Implications

There are issues of interest that are related to the acquisition, transparency and recall of symbol sets. The development of new, readily available, and less expensive computerized communication technology has effected how some of these symbol sets may be used, and has caused some of the symbol sets to undergo changes. Communication devices using current technology have the ability to present the learner with the option of easily using multiple types of graphic symbol sets and/or orthographics on the same communication board. The new technology has the ability to dramatically increase the number of these icons that are readily available to the

user. Additionally, electronic communication devices with the capability of spoken output increase the transparency of all the symbol sets to those who are the receivers of the communication. These developments increase the ease with which communication boards can be customized to fit the needs of individual learners as suggested by Mirenda and Locke (1989). Because of the recency of these developments, little research is available to study their impact on users of augmentative and adaptive communication. As these types of devices and altered symbol sets become more common research will need to be undertaken to determine what impact, if any, they have on augmentative and adaptive communication systems for non-speaking individuals with severe mental disabilities.

References

Bellugi, U., & Klima, E. (1976). Two faces of sign: Iconic and abstract. In S. Harmad, H. Steklis, & J. Lancaster (Eds.), The origins and evolution of language and speech, (pp. 514-538). New York: Annals of the New York Academy of Sciences.

Beukelman, D. (1988). Communication options for persons who cannot speak: Planning for service delivery. In C. Coston. (Ed.), Rehabilitation technology service delivery: Proceedings of the national planners conference on assistive device service delivery. Washington, DC: Association for the Advancement of Rehabilitation Technology.

Beukelman, D., Yorkston, K., Poblete, M., & Naranjo, C. (1984). Frequency of word occurrence in communication samples produced by adult communication aid users. Journal of Speech & Hearing Disorders, 49, 360-367.

Blackstone, S., Brown, C., Cavalier, A., Cress, C., Mineo, B., Sweig-Wilson, M., & VenBiervliet, A. (1989). Technology with low incidence populations: Promoting access to education and learning. E. Lahm (Ed.), from a paper based on presentations made at the symposium: Advancing the Use of Technology: The Research/Practice Connection Fy 89 Invitational Technology Symposium. (p. 13). Reston, Virginia: Center for Special Education Technology.

Bloomberg, K., Karlan, G., & Lloyd, L. (1990). The comparative translucency of initial lexical items represented in five graphic symbol systems and sets. American Speech-Language-Hearing Association. 33, 717-725.

Clark, C. (1981). Learning words using traditional orthography and the symbols of Rebus, Bliss, and Carrier. Journal of Speech and Hearing Disorders, 46, 191-196.

Ecklund, S., & Reichle, J. (1987). A comparison of normal children's ability to recall symbols from two logographic systems. Language, Speech, and Hearing Services in Schools. 18(1), 34-40.

Harris-Vanderheiden, D., MacKenzie, W., Reinen, S., & Schiebel, C. (1975). Symbol communication for the mentally handicapped. Mental Retardation, 13, 34-37.

Hurlbut, B., Iwata, B., & Green, J. (1982). Nonvocal language acquisition in adolescents with severe physical disabilities: Blissymbol versus iconic stimulus formats. Journal of Applied Behavior Analysis, 15, 241-259.

Luftig, R. & Bersani, H. (1985). An investigation of two variables influencing Blissymbol learnability with non handicapped adults. Augmentative and Alternative Communication, 1, 32-37.

Matas, J., Mathy-Laikko, P., Beukelman, D., & Legresley, K. (1985). Identifying the non-speaking population: A demographic study. Augmentative and Alternative Communication, 1, 17-31.

Mirenda, P., & Locke, P., (1989). A comparison of symbol transparency in non-speaking persons with intellectual disabilities. Journal of Speech and Hearing Disorders, 54, 131.

Mizuko, M., (1987). Transparency and ease of learning of symbols represented by Blissymbols, PCS, and Picsyms. Augmentative and Alternative Communication. 3,

129-136.

Mizuko, M., Reichle, J., (1989). Transparency and recall of symbols among intellectually handicapped adults. Journal of Speech and Hearing Disorders, 54, 627.

Romski, M., Sevcik, R., & Pate, J. (1988). Establishment of symbolic communication in persons with severe retardation. Journal of Speech and Hearing Disorders, 53, 94-107.

Vanderheiden, G., & Yoder, D. (1986). Overview. In S. Blackstone (Ed.), Augmentative communication: An introduction. Rockville, MD: American Speech-Language-Hearing Association.