Volume 1: Principles, Background, and Application

Simplified Signs

A Manual Sign-Communication System for Special Populations

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8. Development of the Simplified Sign System

Background Information

The original goal of the Simplified Sign project was to develop a system of manual signs that would enhance the communication skills of a number of hearing, but non-speaking, persons. Initially, the focus of the project was to create a sign vocabulary that would meet many of the needs of children with autism or with other disabilities such as cerebral palsy or Down syndrome. We felt that these children would benefit from a new sign-communication system that was easy to learn since their motor and/or memory impairments often made learning and producing signs from existing sign languages very difficult. We also hoped that the system would prove beneficial to older individuals who had experienced a serious loss or impairment of their speech skills because of a stroke.

The focus of the project, however, was expanded while the system was still being developed. This occurred largely as a consequence of the media attention that the project started to receive in 2001. When information about the Simplified Sign System was first disseminated by the various media, we learned that certain individuals were using Simplified Signs with members of population groups that we had never considered. For example, we discovered that the signs were being used in nursing home settings with older individuals who had experienced some degree of hearing loss, but minimal disruption in their speaking abilities. Some of the healthcare professionals who used our signs with members of this population requested that we expand our lexicon to meet the communication needs they witnessed. In light of this feedback, we made a serious effort to do so.

Along with the requests for specific vocabulary additions that we received from individuals who were trying out the system, several published sources helped guide our selection of entries for the Simplified Sign System lexicon. One source was a proposed vocabulary list for non-speaking preschool children based on input from parents and clinicians, language samples from typically developing young children, and word lists prepared by these speaking children's parents (Fried-Oken & More, 1992). If our Simplified Sign System were to prove helpful to many non-speaking or minimally verbal preschool children, then we would need to have vocabulary items for those topics about which the children and their parents wanted to talk. As a result, we made a determined effort to find or to create signs for the large majority of terms on this list. A second published paper also alerted us to certain vocabulary items that we elected to include in the Simplified Sign System. This source was a listing of words used most frequently in conversations by adults between the ages of sixty-five and eighty-five (Stuart, Beukelman, & King, 1997). Because individuals in this age group are more likely to experience hearing loss or strokes that may adversely affect their understanding or production of speech, we felt that we should provide signs for their principal topics of conversation. A third source that helped guide our selection and development of signs for the Simplified Sign System was a manual that contained lists of vocabulary items that would be needed by many adults who used an augmentative and alternative communication system (Collier, 2000). This volume included recommendations for vocabulary items that would facilitate communication across a wide range of settings. If our sign system were to be of assistance to many different persons in diverse settings, then it would need to include signs for many of these recommended words and concepts.

We then elected to include signs in our initial lexicon that might be of assistance in medical settings and for international travel. We felt that the growing numbers of older, hearing-impaired individuals and of non-English-speaking persons in the United States might benefit from iconic manual signs for various medical terms. We also received requests to include signs for medical terms and for human physiology from individuals involved in medical intervention or rescue operations overseas. Such signs might prove especially helpful in instances of medical emergency where speed and accuracy of communication

often are critically important. An important source for many of our signs for medical conditions or terms was the *Random House Webster's American Sign Language Medical Dictionary* (Costello, 2000). Finally, for international travel, we relied on various travel guidebooks and on our own intuitions as to what vocabulary items would likely be of assistance to travelers.

As the lexicon continued to be expanded to address the potential use of the system by persons learning a new or additional spoken language, we also strove to include more signs for concepts within various subject areas such as sports and games, personal care, animals, science, technology, numbers, math, food, law and criminal justice, music, months, countries, holidays, and religion. Moreover, we made a concerted effort to add related vocabulary or synonyms to as many of our existing signs as possible. This resulted in the addition of thousands of terms to the lexicon; many sign entries are supplemented with synonyms so that users can quickly see the range of meanings represented by that sign. Whereas the main entries or sign glosses in the lexicon represent relatively basic vocabulary, the synonyms provide access to a larger and more advanced vocabulary that can be conveyed by the signs. This more advanced vocabulary is less relevant to children, but may prove useful to teenagers, college students, and adults learning a new spoken language, as well as to elderly populations who wish to communicate on a range of topics.

Clarifications

Before describing how we went about developing the Simplified Sign System, we first wish to emphasize several points. The most important is that the system we have developed is not a genuine sign language and is not intended to replace one; it is a system of visual-motor communication that may or may not be used in conjunction with a spoken language. Genuine languages, whether signed or spoken, have much more extensive vocabularies than the Simplified Sign System, as well as underlying phonological systems and rule-based grammars. We have purposefully limited the formational complexity of the signs in our system to accommodate the memory, motor, and cognitive difficulties of many of its intended users. However, a person with a full complement of

memory, motor, and cognitive skills, but who is unable to speak, might wisely consider acquiring a full and genuine sign language.

A second important point is that the Simplified Sign System is not the first serious effort to create or modify signs to make them easier to learn or use. In the last few decades, several different sign systems have been developed to foster communication in non-speaking individuals with autism, an intellectual disability, cerebral palsy, or aphasia (Loncke & Bos, 1997; Skelly, 1979; Windsor & Fristoe, 1991). Other systems that have been developed for persons with disabilities borrow signs from the sign language of a particular country's Deaf community without making any modifications to the signs (Grove 1994; Grove & Walker, 1990). Altogether, these sign-communication systems have proven beneficial to a large number of individuals with serious language and communication problems.

We believe that the success or efficacy of a sign-communication system will be enhanced if it is firmly based on empirical findings of how individuals learn and remember signs, the types of errors they make when forming signs, and their intended users' particular communication needs. Fortunately, much has been learned about how signs are acquired and the problems various individuals with language impairments experience when forming signs (Dennis et al., 1982; Doherty, 1985; Dunn, 1982; Grove, 1990). For many of these persons (and for most typically developing persons overall), signs with clearly transparent meanings (i.e., highly iconic or representative signs) are learned more quickly and recalled more readily than signs that do not resemble their referents. Therefore, our Simplified Sign System contains a large number of signs with clearly transparent meanings. Because many persons with language impairments experience difficulty forming various handshapes and remembering signs with more than one distinct movement, the signs in our system largely avoid these problem areas. The availability of this background information on both sign acquisition and sign formational difficulties was an important factor in our decision to undertake the development of a new sign system. The publication in recent decades of more sign language dictionaries from around the world also helped us. With a larger pool of potential signs from which to choose, our task of finding a sufficient number of useful signs was considerably eased. In more recent years, online resources such as the *Spread the Sign* website (European Sign Language Centre, 2018) have

proven especially helpful when trying to find potential sign formations for specific concepts that we wished to include in an expanded version of our lexicon.[1]

If we have been successful in developing a sign system consisting mostly of signs that are easy to form and that have transparent meanings, then there likely will be additional benefits beyond that of enhancing the sign production and comprehension of the original target populations. One potential benefit is that teachers and staff members might experience less difficulty in interpreting their students' and clients' signs, thus facilitating communicative interaction. Another is that outsiders who do not have a background in sign communication might be able to accurately guess the meanings of some signs and to respond appropriately. If this were indeed the case, then the potential usefulness of such a sign system would be expanded greatly.

Increasing the number of people with whom sign-using children and adults could interact would likely provide further benefits. This interaction should help these individuals to become more socially integrated and to have better opportunities for progress than may currently be available to them. Because many persons with language disorders can feel quite isolated, one should not underestimate the impact of providing them an additional or alternative means of communication, especially if it gives them confidence to interact with other people in public. Even small gains in receptive or expressive vocabulary can have a profoundly positive effect on a person's life, emotional health, and physical well-being. Thus, the Simplified Sign System is not meant to be just a communicative strategy or method, but also a path by which persons with language impairments may attain a higher level of functioning and fulfillment throughout all aspects of their lives.

The final point we wish to mention is that although individuals who are minimally verbal or who have severe spoken language impairments may be the principal beneficiaries of the Simplified Sign System, many persons without any language production difficulties should also

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1   In addition to the sources that we reference here, some sign languages have free online dictionaries (both official and unofficial), computer software for purchase, smartphone apps that can be downloaded, specialized books and supporting materials for teaching, and other resources available to the public. In the future, we hope to procure funding so that we can develop similar materials to support the use of the Simplified Sign System.

consider learning it. Indeed, we would be surprised if many children in preschool programs and students in foreign language classes did not find themselves using Simplified Signs to assist in their spoken language vocabulary acquisition. In the past, it has often been the case that only the teachers and caregivers directly responsible for non-speaking individuals attempted to acquire and use a sign language. Because of the time and effort involved, many individuals shied away from learning to sign. (Kemp, 1998, reported that learning a true sign language is much like learning any other foreign language.) As a result, many relatives of non-speaking individuals and the staff members at educational and medical institutions who cared for them did not learn to sign. The outcome all too often was a signing, non-speaking individual in an environment where most others did not sign — not an optimal situation for sign mastery. This situation also did nothing to overcome the isolation that many non-speaking individuals experienced. One should realize that communication is a process that depends on mutual give and take; in other words, the participation of more than one person. Although our system was developed primarily to address the learning and communicative needs of special populations, it is meant for use by everyone in the non-speaking individual's life. A sign system that is easily learned and remembered by family and staff members (such as the Simplified Sign System) hopefully will result in an environment where signs are used much more extensively; this should in turn enhance the sign-communication skills and social interactions of non-speaking individuals.

Overview

How, then, did we develop the Simplified Sign System? To accomplish this task, we needed to develop a sign lexicon or vocabulary that would be easy to learn, easy to remember, and easy to form. There were several steps to this undertaking. In previous chapters, we reported that signs that were highly iconic or pantomimic were more easily learned and remembered by many non-speaking children and adults than signs that were not as iconic.[2] As a first step, then, we needed to select or create

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2   Iconicity refers to the physical resemblance between a sign and what it stands for, its referent. For more information, see Chapter 1 and Chapter 3.

signs that were highly iconic or representative. If we were unable to find or create highly iconic signs for needed concepts, then we selected or created signs that had clearly discernible ties to their referents once their meanings were explained. The ease with which a person can discern the relationship between a sign and its referent once the sign's meaning has been given is known as the sign's translucency. These highly translucent signs also are more easily acquired and retained than arbitrary signs. The second step in the development of the Simplified Sign System was to modify those signs that were relatively difficult to produce so that they became easier to form. The background information needed for this step came from previous studies of sign production by persons with autism, sign language acquisition in young children, and accuracy of sign recall by college students. The third step in the system's development involved the testing of these potential Simplified Signs with undergraduate students unfamiliar with a sign language. The signs that these students both remembered and formed accurately were kept in the system. Those signs that the students had difficulty remembering and forming were either discarded or modified structurally and then retested.

Once we had tested and approved most of the signs in the initial lexicon, we proceeded to a related step: testing undergraduate students to determine whether our Simplified Sign System (SSS) signs were easier to learn and to remember than American Sign Language (ASL) signs. In this fourth step, student participants were tested on their ability to remember SSS signs and ASL signs immediately after list presentation and after a twenty-four-hour delay. This testing showed that signs in our system were often easier to recall and to form than ASL signs. We have also completed some testing of student participants to see how well they recall Simplified Signs as opposed to Amer-Ind signs. The fifth step involved allowing various investigators to try out the system with different populations. From these investigators, we received valuable feedback with regard to specific signs that we needed to add to our lexicon and information they felt would be helpful in the teaching of our sign system. The final steps in the development of the Simplified Sign System were to provide an explanation of how each sign's formation was related to its underlying meaning and to furnish a short sentence or phrase that illustrated the tie between each Simplified Sign and its referent as a memory aid. The inclusion of this material was done to

make the signs even more memorable. A brief definition of each item in the system also was included to assist non-native speakers of English in their learning of new vocabulary. We will now explore each of these steps in more detail.[3]

Step One: Iconic Sign Selection

A number of studies have reported that iconic signs are more rapidly learned and remembered than signs that are not as iconic or representative (e.g., Baus, Carreiras, & Emmorey, 2013; Coelho & Duffy, 1986; Emmorey & Sevcikova Sehyr, 2018; Griffith & Robinson, 1980; Konstantareas et al., 1978; Lieberth & Gamble, 1991; Ortega, 2017; Perniss et al., 2017; Thompson et al., 2013; Vinson et al., 2008; see also Chapter 3). The usefulness of this finding, however, has been constrained by the relatively low incidence of highly iconic or pantomimic signs in individual sign languages. Selecting signs for the Simplified Sign System from a single sign language therefore would not yield a very large lexicon or vocabulary of highly iconic signs. For this reason, we expanded our search for appropriate signs to the dictionaries of other sign languages and various sign systems. Examination of these dictionaries revealed instances where highly iconic signs for certain concepts existed in some sign languages but not in the others.

For more than eight years, various members of our research group pored over dictionaries of different sign languages and sign systems in search of highly iconic signs. Altogether, we examined a total of forty dictionaries for our initial lexicon of 1000 signs (see Appendix A).[4]

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3   In the pages that follow, we provide a general overview of our methods and procedures for the benefit of family members, caregivers, and service providers. However, it is beyond the scope of this chapter to provide detailed research information on each of the six sign sets that formed the basis of the initial lexicon or the additional seventeen sign sets that formed the basis for the expanded lexicon. Information such as the list of signs tested in each set (and the groupings of signs within those lists), the formational parameters of those signs, the origins of each of the signs, the exact number of signs that passed or failed criterion in each set, errors made by the study participants during testing, specific modifications made to failed signs before retesting them, or detailed statistical analyses related to the testing are not given here. In the future, we hope to publish articles with this data and/or make the data available online for the benefit of sign language researchers.

4   In the years since we completed our initial lexicon of 1000 signs, we continued to examine additional sign language dictionaries (over 60) and to develop new Simplified Signs for our system.

Individual signs often were selected from these dictionaries when we were able to correctly discern the meaning of a sign solely from the picture or drawing of how the sign was formed. From this archival effort, we were able to identify hundreds of signs that we felt were either highly iconic or had readily transparent meanings and that we also felt might be of some use to various non-speaking individuals. When we were unable to find highly iconic or transparent signs for needed concepts from among our host of sign language dictionaries, we often selected translucent signs.[5] Persons with an intellectual disability typically acquire signs with high levels of translucency more easily than signs with more arbitrary ties to their referents (Doherty, 1985; Luftig, 1983).

This selection of signs from various sign languages or systems should make for a degree of international appeal for the Simplified Sign System. Individuals familiar with a sign language from a particular country may well recognize signs from that language in our lexicon. Selecting signs from many different sign language dictionaries also may make our system more usable worldwide because the signs are not based on one specific language or culture, but many. In addition, since we typically perceived the iconic or pantomimic nature of the signs without knowing the particular culture or language involved, it is likely that other individuals from around the world will do so as well.

Unfortunately, although the examination of the different sign languages resulted in a long list of potentially useful signs, there were still many important concepts or words for which we were unable to locate either highly iconic or translucent signs. For such concepts, we needed to create signs that were either highly iconic or translucent and easily formed. In creating these signs, we relied on our own intuitions and those of numerous friends and colleagues (both hearing and deaf). Some of these signs were based on common gestures, others on iconic visual symbols, and a few were related to or derivations of signs that had already passed criterion and were included in the system (for example, using the opposite formation of an action sign to represent that sign's antonym). Regardless of the conceptual origin of a particular sign or our intuitions about whether that sign would be easy to remember

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5   Translucent signs are signs that have clearly discernible ties to their referents once the meanings of the signs have been provided. For more information, see Chapter 1.

and form, we always empirically tested each sign for recall and correct production before including it in the Simplified Sign System. Signs that did not meet the selection criterion were discarded. Thus, every sign in the Simplified Sign System lexicon underwent testing, regardless of whether or not it came directly from a full and genuine sign language or an existing sign system, whether or not its formation needed to be adjusted to make it easier to use by persons with memory and motor disabilities, or whether or not it was created specifically for the lexicon.

Although our efforts to find or to create highly iconic or translucent signs that were relatively easy to form was aimed primarily at facilitating the sign learning of non-speaking individuals, these same characteristics should make the signs relatively easy for other persons to learn as well. The highly iconic nature of many of the Simplified Signs should also enhance teacher and caregiver sign recognition and recall. Similarly, the effort to make Simplified Signs relatively easy to produce for non-speaking individuals with motor impairments should likewise make them easy for teachers and caregivers to form.

Step Two: Sign Formation Modification

After selecting signs for potential inclusion in the Simplified Sign System, the next step was the modification of those signs that we felt would be difficult for children with autism (or for individuals with other motor problems) to form. In addition, when we created new signs for needed concepts, we wished to avoid those formational characteristics of signs that likely would prove difficult for persons with motor and memory deficits. We obtained the background information needed for this task by examining videotape records of the sign production of several different groups.[6] One group consisted of students diagnosed with

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6   The onset of the Simplified Sign System project occurred at the beginning of 1998; therefore, the studies that supported our initial work and that we mention here in this section occurred prior to 1998. In the two decades since we first started developing the system and testing signs for inclusion, many more studies have been published about the signing of children with autism (e.g., see Shield's work in Chapter 5), the acquisition of signs by the children of deaf parents (see Chapter 3), and signing by hearing persons in various situations (see Chapter 7). Much of this research reflects positively on the decisions we made related to the principles of the Simplified Sign System, particularly with regard to iconicity and revision of sign formational parameters.

autism; these students were videotaped while they signed with their teachers (Seal & Bonvillian, 1997). The videotapes were then analyzed to determine which sign formational characteristics (sign phonemes) were produced more frequently and accurately, and which were rarely produced or incorrectly formed.

The second group studied consisted of the ASL-learning children of Deaf parents (Bonvillian & Siedlecki, 1996, 1998, 2000; Siedlecki & Bonvillian, 1993, 1997). The videotapes of these children were analyzed not only to determine which sign phonemes tended to be produced more frequently and accurately, but also to document the order in which children typically acquired them. The third group consisted of undergraduate students who had reported that they were unfamiliar with any sign language (Wright, Bonvillian, & Schulman, in press). These students were videotaped as they tried to recall lists of ASL signs that had been presented to them, and the videotapes were then analyzed to determine which sign phonemes were produced more accurately. In all three sets of videotapes examined, the analysis focused on the sign formational parameters first identified by William C. Stokoe: location, handshape, and movement.[7] The information we gathered on sign phoneme production proved helpful when we needed to create new signs or modify existing signs to make them easier to form.

In all three of the groups studied, the location parameter of the signs was produced with relatively few errors, and considerably more accurately than the handshape and movement parameters. As a result, the location parameter of existing signs was less frequently the focus of revision than were the handshape and movement parameters. Regardless, it should be acknowledged that certain sign locations were acquired earlier in sign language development and produced more frequently and accurately than other locations. More specifically, the signer's trunk (the area of a signer's body from approximately the shoulders to the waist), neutral space (the area in front of the signer's body), chin, cheek, midface (the region near the eyes and nose), forehead, and the stationary hand when it was configured as a spread- or 5-hand (the hand is flat with fingers spread apart and extended) were all areas where signers produced signs frequently, accurately, and early

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7   See Chapter 3 for more information on Stokoe's research into the structure of ASL.

in development. If we needed to modify the location parameter of a sign to make it easier to form correctly, then we typically revised the sign by using one of these locations. Furthermore, because one-handed signs were recalled correctly more often when they involved body contact, we endeavored to include such contact when we either created a new sign or modified a sign's formation.

The configuration of the hand(s) when making signs, the handshape parameter, was the source of numerous errors in the sign formation of all three videotaped groups. Even with this high overall incidence of errors, certain handshapes were produced relatively frequently and accurately. These handshapes were the pointing-hand (the index finger is extended from an otherwise closed hand), the fist (the hand forms a fist), the flat-hand (the hand is flat with fingers together and extended), and the spread- or 5-hand (the hand is flat with fingers spread apart and extended). Two other handshapes, the C-hand (the fingers are together and curved, with the thumb opposite the fingers) and the tapered- or O-hand (the fingers are together and curved, with the finger tips touching the thumb tip), also were produced frequently, but had higher error rates than the first group of handshapes listed. The L-hand (the index finger and thumb are extended from an otherwise closed hand and form a right angle) and baby O-hand (the index finger and thumb are curved and touch at their tips from an otherwise closed hand; also known as a pincer grip) were produced with intermediate accuracy. These easier to articulate handshapes often are known as unmarked or basic handshapes. When modifying existing signs, we typically substituted the above handshapes in place of handshapes that were produced less frequently and accurately.

The movement parameter of signs also was a focus of concern in our selection of signs from sign language dictionaries, in our modification of existing signs, and in our creation of new signs. In the sign languages used by Deaf persons, a substantial proportion of the individual signs require more than one sign movement for correct sign formation. Although such multi-movement signs are not a problem for typical signers, such signs are a source of difficulty for many persons with autism. When videotapes of sign production by students with autism were analyzed, one of the most frequently observed errors was a reduction in length of signs that consisted of more than a single

movement to a single movement (Seal & Bonvillian, 1997; see also Slavoff, 1998). In light of this finding, we tried to create signs for our system that had only a single distinct movement or to modify existing multi-movement signs to a single movement.

An important exception to this procedure was contacting action. Because signs often were formed or recalled correctly when they involved contact with the body, we did not count contacting action as a distinct movement when reducing the number of movements in a sign. Examination of these videotapes also showed that the students typically produced certain types of sign movement (e.g., wrist nodding) less accurately than others. Again, we opted to avoid or modify signs with these more problematic movements.

Step Three: Testing of Simplified Signs with Undergraduate Students

In developing the Simplified Sign System, we felt that we needed to systematically evaluate our impressions as to which signs would be both easily remembered and accurately formed. We elected to assess the learning and recall of our potential Simplified Signs by first testing individuals without any discernible motor, memory, and cognitive impairments and who were unfamiliar with any sign language. In making this determination, we relied primarily on the participation of University of Virginia undergraduate students. We reasoned that if undergraduate students encountered any problems in remembering or forming a particular sign, then that sign would also prove difficult to learn for someone with a cognitive or motor disability. In addition, we felt that the undergraduates' success in learning particular signs would approximate the sign-learning abilities of the teachers, caregivers, and family members who will also need to learn the sign system. Altogether, over one hundred undergraduates participated in the assessment of sign learning and recall for the initial lexicon (and over two hundred fifty students did so for the expanded lexicon). In addition, several dozen other members of the university community provided helpful feedback on possible Simplified Signs.

The procedure adopted to test the undergraduate students' ability to remember and form potential Simplified Signs was a cued-recall

memory task.[8] Each student was told that he or she was participating in a study of memory and recall of manual signs. Participants were tested individually in a laboratory office setting. They sat at a table and faced two experimenters. One experimenter demonstrated the signs and provided their English translations or word equivalents, then later cued each student participant for sign recall by uttering the English word equivalents. The second experimenter focused on scoring the accuracy of the participant's sign production. Each participant was presented six lists of twenty signs, together with their English translations (120 stimuli). Each sign and its translation equivalent were presented at four-second intervals. After each list was presented, the experimenter read aloud each word from that list and asked the student to produce its corresponding sign from memory. The participants were encouraged to provide their best guess for any signs about which they were unsure. This procedure was used in the development of the initial 650 signs in the Simplified Sign System lexicon. In ensuing years, as fewer signs were being tested at one time, the number of lists included in each testing set often was reduced to four lists of twenty signs (80 stimuli).

Each participant's sign recalls were scored for accuracy. A "perfect" recall was defined as a recall identical to the sign demonstrated by the experimenter. In deciding whether a sign was accurately recalled, however, certain sign characteristics typically were not counted. These included such characteristics as the speed at which a sign was produced, unless it was vital to the meaning of the sign (e.g., the sign SLOW must be produced slowly), the hand used to form the sign, or whether the

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8   The fact that potential signs for the lexicon were tested in an artificial setting (rather than in a natural setting or within a larger communicative or semantic context) means that the signs that passed our criterion for inclusion did so without the assistance of additional support (with the exception of the use of facial expressions with emotion signs). In other words, the signs were able to be immediately remembered and properly formed by persons with no experience signing, who had received no explicit training (let alone sustained or repeated training), and who had not been provided environmental cues that may have assisted their recall. This bodes quite well for the signs that passed criterion, as signs that can be remembered in isolation would most surely also be remembered when explicitly taught in both specific sign-training sessions as well as in natural settings, throughout the day's normally occurring activities, and with the aid of environmental contextual information (e.g., teaching food signs at mealtime), of feedback from communication partners, and of the provision of pictures, photos, symbols, and/or real objects that could be used to directly link the sign's formation to its referent. The authors welcome future testing of the signs in these and various other contexts.

sign was made in a clockwise or counterclockwise direction. A sign recall was deemed "essentially correct" if it contained only a small error in its handshape, location, or movement. A sign recall was scored as "identifiable" if, despite being imperfectly formed, it sufficiently resembled the demonstrated sign as to be readily recognized as an attempt to produce that sign. A small number of the recalled signs had such substantial flaws that they could not be identified, and thus were considered unrecognizable. Recalls were marked as "wrong" if they consisted of the production of the incorrect sign for the word cue. A score of "no response" was given if the participant did not attempt to make a sign within ten seconds of the English word cue being presented.

Before testing the undergraduate students on their ability to remember and to form signs, we decided to establish a minimal level of recall accuracy that would need to be attained for a particular sign to be included in our Simplified Sign lexicon. The criterion that we selected was that an individual sign would need to be both recalled and formed perfectly by at least 70% of the undergraduate students tested on that sign before it would be included in the system. That is, for those student research participants tested on a particular sign, slightly more than two-thirds would need both to remember the sign and form it accurately in order for that sign to be added to our lexicon. We selected 70% as our criterion because we wished to include only those signs that most people successfully remembered and formed while at the same time not making the recall task so challenging or the selection criterion so stringent as to drastically limit the number of proposed signs that could be included in the lexicon.

Overall, our impressions as to which signs would be relatively easy to remember and to form were borne out by the undergraduate students' responses on the cued-recall task. These participants, as a group, recalled about 90% of the signs presented to them clearly enough that they could be identified as the signs on the list that they had just seen. The remaining 10% consisted of instances where participants either failed to give a sign response to the English word cue (no response), produced a sign from a previous list (list intrusion), or generated a sign that had such substantial structural flaws that it was unrecognizable. Probably because of the cued-recall format, the location of a sign on a list did not have any effect on whether or not a sign was recalled. Although

the large majority of the participants' signs clearly were attempts at producing the demonstrated sign, a significant proportion of these signs were not formed perfectly. Many of the signs that were not perfectly recalled in their initial list presentation were subsequently modified and then retested with other students in a different list presentation.

Those signs that were not recalled perfectly by at least 70% of the undergraduate students on which they were tested were then examined for the types of formational errors that the participants had made. In a number of instances, the students were relatively consistent in the errors that they made when forming those particular signs. For example, most of the students recalled the initial version of the sign ELEVATOR with the palm of their active signing hand facing down rather than with the palm facing up as had been demonstrated. In instances such as this, the systematic nature of the errors in sign formation provided us with clues as to how to modify the signs to make them easier to form. In the case of the sign ELEVATOR, we changed the orientation of the active signing hand so that its palm faced down, and then retested this new, more easily formed version with another group of students. This revised sign was then recalled perfectly by nearly everyone.

For other signs that were recalled by the undergraduate students with small formational errors, we often revised the signs by changing their problematic handshapes or movements to ones that were more basic. After modifying the signs that initially had failed to meet our selection criterion, we then retested the revised versions with a new group of participants. These revised versions frequently met the selection criterion.

Unfortunately, many of the signs that were not recalled perfectly by 70% or more of the student participants on which they were tested either had major errors in their formation or were not sufficiently memorable to be recalled at all. These signs proved difficult to modify satisfactorily. In these instances, we looked at other sign language dictionaries for alternative signs for a particular concept, or we created our own versions. We then tested these new signs with another group of students.

Altogether, about two-thirds of the signs presented to the students were recalled sufficiently accurately that we included them in our initial lexicon. This proportion, however, somewhat masks what in fact happened. About 300 of the signs presented were recalled perfectly by

all or nearly all of the individuals tested on those signs. The remaining signs tested often had appreciably lower levels of recall accuracy, although they still met or exceeded our selection criterion. What this means in terms of our Simplified Sign lexicon is that some of the signs were recalled perfectly by all of the people tested on them, whereas others were not as easily remembered and formed. Altogether, we tried out about fifteen hundred signs or sign formations before achieving our initial lexicon of 1000 Simplified Signs.

There appear to be several reasons for this variation in recall accuracy. First, many of the signs remembered by all participants were signs for discrete objects or easily demonstrated actions. For such concepts, it was not at all difficult to locate highly iconic signs that were relatively easy to form. The meanings of these signs would likely have been readily apparent to the participants and easily coded in memory.

A second factor that may have influenced sign recall is that the presentation of some signs was intentionally accompanied by an emphatic facial expression when produced by the experimenter. A number of signs recalled perfectly by the participants involved emphatic emotional expression and associated sentiment (e.g., a large grin for HAPPY, a frown for CRY, and a lowered brow for ANGRY). Facial expression was not scored as part of a sign's formational accuracy, but may have been helpful for the participants in recalling the sign. Ties to a sign's referent may have been underscored by accompanying such signs with strong and, sometimes, passionate emotional expressions. The fact that many signs incorporating emotional facial expressions were produced with high rates of accuracy seems to indicate that such emotional content added another dimension by which to place signs in context and associate them with their meanings. These facial expressions also may have enabled signs to be related more effectively to common gestures based on emotion.[9]

A third reason for the variation in recall accuracy is that as time progressed and more people became aware of the project, we received

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9   Although the presence of emotional facial expressions may have facilitated sign recall in the undergraduate students tested, these facial expressions may not affect individuals with autism spectrum disorder (ASD) in the same way. Individuals with autism spectrum disorder often show delayed and atypical processing of emotional facial expressions (Dapretto et al., 2006; Denmark et al., 2014; Herman et al., 2019; Winkielman, McIntosh, & Oberman, 2009).

feedback from teachers, caregivers, and medical professionals with regard to concepts they felt should be added to the lexicon. For these requested additions, it frequently proved difficult to locate highly iconic signs with a single sign movement from our collection of dictionaries. As a result, we often had to create the signs ourselves. Fourth, as more and more signs were added to the Simplified Sign lexicon, it became increasingly difficult to find or create signs that did not substantially overlap or resemble signs already in the lexicon. Finally, in the latter stages of testing, we often had to try out multiple variants of a sign before we found one that met (or exceeded) the 70% perfect recall selection criterion. This occurred for words or concepts that we felt were essential to include in the initial Simplified Sign System lexicon. Indeed, we tried out a half dozen signs for SISTER before we found one that was sufficiently memorable to meet the selection criterion. All of these factors appeared to influence the relative ease (or difficulty) with which a particular sign was recalled and accurately formed.

Step Four: Comparison Testing of Simplified Signs

An important issue that we needed to examine was whether signs from the Simplified Sign System were easier to learn and to remember than signs from another sign language. If Simplified Signs were found to be more difficult to learn, then there would be little justification for the dissemination of yet another collection of signs to already over-burdened parents, teachers, and language professionals. One exception to this statement should be noted. If the Simplified Sign System contained a number of signs for concepts needed by particular populations that were not included in another sign language or system, then it would be worthwhile to disseminate it to members of those groups. With these concerns about evaluating our sign system in mind, we embarked on a program of systematic comparison.

Simplified Sign System Signs and ASL Signs

The focus of our study was a comparison of Simplified Sign System (SSS) signs and American Sign Language (ASL) signs. As the principal language of members of the Deaf community in the U.S., ASL has a

number of important advantages over the Simplified Sign System. As a full and genuine sign language, ASL has a vocabulary of thousands of signs, many more than the SSS. ASL dictionaries and teaching materials are already available, and there are established ASL classes in much of the U.S. With these advantages, it would be important for us to show that Simplified Sign System (SSS) signs were more easily learned and recalled than ASL signs.[10]

In assessing the ease of learning ASL signs and SSS signs, we elected to examine the ability of individuals to recall signs immediately after lists of signs were presented to them and to recognize those signs after a twenty-four-hour delay (Emmons, 2004). In both these immediate- and delayed-recall studies, the participants were undergraduate students at the University of Virginia who were unfamiliar with any sign language. Although in the future we would like to compare the ease with which various non-speaking populations learn signs from different sign languages and sign systems, the abilities of the undergraduate students probably resemble those of the caregivers, teachers, and speech-language professionals who will also need to learn Simplified Signs.

In both the immediate- and delayed-recall studies, our first step was to develop lists of SSS signs and ASL signs that could be systematically compared. We randomly selected a number of SSS signs and then obtained the ASL signs for the same words or concepts. If the signs were identical or nearly identical in both ASL and the SSS, we excluded those signs from testing. One concern we had was that lists composed solely of ASL signs would contain a higher proportion of signs with more than

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10   Although the ASL-SSS comparison study was the only one we were able to complete before John Bonvillian's retirement in 2015 and passing in 2018, this does not mean that it would not be fruitful to carry out further comparison studies with other deaf sign languages. Since our system takes inspiration from as many sign language dictionaries and sign systems as we were able to consult, it is important to note that such comparison studies would probably have to be performed on a one-by-one basis. As some of our sign language dictionary searches were more fruitful than others, certain sign languages have more representation in our system than others. In order to properly conduct comparisons in the future, it is necessary to follow the same steps that we did when designing the lists of SSS signs to be compared with ASL signs, including the elimination of signs that formationally resemble each other and taking into consideration the number of movements involved. With these factors taken into account, it is unlikely that a future study would use the exact same Simplified Signs found in the ASL-SSS comparison study; instead, each study would need to tailor its vocabulary lists to the particular sign language chosen for comparison.

one movement. Such lists would probably take longer to present and thus add another factor (time of presentation) to the study. In addition, because most ASL signs are not pantomimic or highly iconic, a list composed solely of ASL signs might be perceived by the participants as noticeably more difficult. Our solution to these concerns was to compose lists that had equal numbers of ASL signs and SSS signs. With this in mind, we prepared eight lists of thirty signs each (fifteen ASL signs and fifteen SSS signs). Each thirty-sign list was assigned to one of two groups. Half the participants in the immediate-recall study were shown one set of four thirty-sign lists (120 stimuli), and the other half were shown the second set (120 stimuli).

During each list presentation, an experimenter demonstrated how each sign was formed and provided its English word or translation equivalent twice. Participants were instructed not to physically imitate the signs as the experimenter presented them. After presenting each list, the experimenter cued the participant for recall of each sign by uttering its corresponding English word or translation equivalent. The participants were encouraged to provide their best guess for any signs about which they were unsure. Each participant's sign recalls were scored for accuracy in sign formation, as well as for whether the correct sign was recalled for the English word provided. Sign recall accuracy was analyzed with criteria similar to those used with the original testing of Simplified Signs. Those signs that were recalled and formed correctly were deemed "perfect" recalls, whereas those signs that were remembered but included a small formational error were deemed "essentially correct" recalls.

The sixty University of Virginia student participants in the immediate-recall study remembered significantly more SSS signs than ASL signs (Emmons, 2004). The participants' mean (average) percentage of perfect ASL sign recalls was 42.8%; the participants' mean percentage of perfect SSS sign recalls was much higher at 66.9%. Thus, the clear majority of the SSS signs were recalled perfectly, whereas fewer than half of the ASL signs were. We also analyzed the combination of the participants' perfect recalls and essentially correct recalls, a classification we called "recognizable" sign recalls. The undergraduate students' mean percentage of recognizable ASL sign recalls was 64.1% whereas their mean percentage of recognizable SSS sign recalls was 82.5%. Thus,

even when analyzing formational accuracy of sign recall less strictly, many more SSS signs were recalled than ASL signs. Our analysis of the participants' sign recall productions showed that the handshape parameter of ASL signs proved to be an area of particular formational difficulty.

In our examination of the students' recall of ASL signs and SSS signs, we observed quite wide individual differences in recall scores. Some of the participants remembered the large majority of the signs presented to them, whereas other participants accurately recalled many fewer. This wide range in recall scores surprised us because all of the participants were undergraduate students at a highly selective university, not one of them had a clearly discernible motor disability, and none had reported ever having taken a sign language course (if a participant had taken or was taking a sign language course, then such a background likely would have assisted that particular individual on the sign recall task). Such variability in sign recall led us to ask whether there were any distinct patterns of responses among the participants. Two different patterns emerged. One consisted of students who accurately recalled many of the signs and who recalled only slightly more SSS signs than ASL signs. The other consisted of students who recalled relatively few ASL signs while remembering many more SSS signs. That is, those student participants who had the greatest difficulty remembering ASL signs remembered many more Simplified Signs. Although generalizing from undergraduate student research participants to clinical populations is fraught with difficulties, we thought that it was a good indicator for subsequent intervention programs that those individuals who encountered the most difficulty remembering ASL signs showed much better performance recalling Simplified Signs.

In the delayed-recall study, we showed a different group of students three lists of thirty signs each (90 stimuli) on one day and then tested them on their ability to recognize those signs the next day. As in the immediate-recall study, each list of thirty signs consisted of fifteen ASL signs and fifteen SSS signs. The experimenter demonstrated how each sign was formed and uttered its English word equivalent twice during the initial presentation of each list. Unlike the immediate-recall study, however, the experimenter cued the participants on the second day by producing each sign and then asking the participants to write down

the sign's English translation. Even after a twenty-four-hour delay, the participants recognized significantly more SSS signs than ASL signs (Emmons, 2004). This pattern occurred for both scoring criteria: when only the precise English word equivalent was scored as correct (49.0% for SSS signs, 35.2% for ASL signs) and when synonyms of the English word equivalent also were scored as correct (52.9% for SSS signs, 36.2% for ASL signs). Therefore, both the immediate- and delayed-recall studies' findings consistently indicated that Simplified Sign System signs were noticeably easier to remember than ASL signs by typically functioning individuals.

Simplified Sign System Signs and Amer-Ind Signs

In addition to the ASL comparison study, we also conducted a preliminary comparison of undergraduate students' immediate- and delayed-recall of Amer-Ind signs (Skelly, 1979) and Simplified Sign System signs. Selecting the stimuli for this comparison study, however, proved more difficult than it did for the ASL-SSS comparison discussed above. There were several reasons for this. At 236 distinct signs, Amer-Ind's lexicon is rather limited in size and therefore does not offer as many choices for cross-system comparison. Furthermore, there are signs in Amer-Ind for various concepts (such as *bribe* or *buffalo*) that we felt were not sufficiently useful to include in our initial lexicon of 1000 signs, thus further reducing the number of concepts available for testing. Finally, because both systems relied on some of the same historical source materials about the signs of Native Americans, a number of the signs in Amer-Ind and the SSS are highly similar or identical. For these reasons, the number of contrasting sign pairs present in both systems was smaller than those available for the ASL-SSS study.

As in the comparison study involving ASL signs and SSS signs, undergraduate research participants were shown lists of signs and then cued for recall either immediately after list presentation or after a delay. Although this testing is far from completed, an initial examination of the participants' scores failed to show significant differences in recall scores as a function of sign system. The student participants remembered almost as many Amer-Ind signs as Simplified Sign System signs.

In reflecting on this absence of statistically significant differences in the immediate- and delayed-recall scores between SSS signs and Amer-Ind signs, it is important to consider the two systems' similarities. Both the Simplified Sign System and Amer-Ind primarily selected signs from existing dictionaries of sign languages or sign systems (in some cases, the same ones). The signs in both sets, moreover, were chosen because they were perceived as highly iconic or pantomimic and relatively easy to form. Another factor that may have contributed to the similar recall score levels is that in a few instances the same formational gesture or sign appeared in both sign systems, although with different glosses or English translations. For example, a flexed upper arm is identified as the sign for MAN in the Amer-Ind system whereas the same gesture is identified as the sign for STRONG (powerful, strength) in the Simplified Sign System. It should be noted that these signs were tested in different sign sets, and the same participant did not see both similarly formed signs. In light of these various similarities across the two systems, it should not be surprising that the student participants' recall scores did not differ noticeably. Indeed, the principal difference between the two systems appears to be the much larger size and probably greater usefulness and applicability of the Simplified Sign System.

Step Five: Feedback from Users

When we began working on the Simplified Sign System in 1998, our goal was to develop a communication system that would benefit non-speaking individuals and their teachers and caregivers. Although that goal has remained our primary one, we decided to expand our focus after receiving an email from a language therapist who was trying out our system with various groups of older individuals. In this email, she informed us that our Simplified Sign System was a very helpful addition to programs in nursing homes. Because we had not contemplated patients or clients in nursing homes as potential beneficiaries of the Simplified Sign System, we were intrigued by this information.

A substantial proportion of residents or clients in nursing homes or assisted living facilities has difficulty hearing, is in the process of losing their hearing, or has already become deaf. Because of their impaired hearing, these individuals may not be able to understand either the

speech of the staff members at their nursing home or the speech of their fellow residents. Furthermore, staff members often find it rather cumbersome and time-consuming to write down information that needs to be conveyed.

To overcome some of the communication difficulties that she observed, the language therapist elected to teach Simplified Signs to interested staff members at the nursing homes where she was a consultant. She found that the staff members learned the SSS signs very quickly. These staff members then used the signs to augment their spoken language interactions with their clients. A limitation to the version of the Simplified Sign System that she used, however, was that it had not been designed for older individuals in a healthcare setting. In light of her feedback about the potential usefulness of our sign system with a population we had not previously considered, we began to create or find signs that likely would be needed in a nursing home or assisted living environment.

Additional impetus to generate new signs for a healthcare setting came from a nursing supervisor who commented that patients' impaired hearing was not the only communication problem that she or her staff members encountered. She explained that many of the patients in the facilities she supervised spoke languages other than English. She remarked that having an easily learned sign-communication system for everyday interactions would be quite helpful, and potentially life-saving in certain circumstances.

Worthwhile feedback about our system also came from an enthusiastic group of students, parents, and teachers from northeastern North Carolina who volunteered to carry out a pilot study of how well our Simplified Signs could be learned by youngsters with severe communication difficulties. The student volunteers first learned some Simplified Signs and then taught those signs to ten participants, ranging in age from nine to fifteen years, from the special education program of the Elizabeth City, N.C. public school system. These ten youngsters previously had been identified as having either a severe communication limitation or an intellectual disability.

During the first weekly individual thirty-minute session, the student volunteers put most of their effort into the teaching of three or four new signs to the participants with whom they were working. In subsequent

weeks, not only were new signs introduced, but the participants were also tested on their sign retention and on the accuracy of their sign production. Although the number of signs acquired varied widely across individual participants (from eight to forty), as a whole these youngsters were able to learn most of the signs to which they had been introduced. One week after being shown several new signs for the first time, the participants were able to remember over 80% of those signs. Of the signs that these participants remembered, more than 95% were formed relatively accurately. These numbers compare quite favorably to the lower levels of mastery reported in many previous studies of non-speaking populations who were taught signs from existing sign languages.

In addition to providing useful information as to the potential efficacy of the Simplified Sign System, the volunteers in this pilot study unintentionally helped change our thinking about the format of our system. Soon after these student and teacher volunteers began using our sign system, many of them decided that having pictures of the referents (e.g., the objects, actions, or properties for which the signs stood) would probably enhance the learning of the signs. These volunteers sifted through magazines to locate appropriate pictures to go with the signs they wished to teach. They then cut out the pictures they needed and mounted them on cards to be used during their teaching sessions. The student volunteers would often pair the sign with the appropriate picture or drawing when first teaching it and later use the picture alone when prompting for sign production. In light of these volunteers' desire to have a picture accompany their sign-teaching efforts, we decided that we would eventually need to provide a picture of the concept underlying each sign in our Simplified Sign System as an instructional aid. In the future, we hope to develop flashcards, workbooks, software apps, and other materials that make effective use of pictures and the drawings of how Simplified Signs are formed.

Step Six: Memory Aids

The last step that we included in our effort to facilitate the learning and retention of signs was to provide the learner with information that might more effectively tie each Simplified Sign to its referent. We discovered from teaching our Simplified Signs to a small group of students from

overseas that some potential learners for whom English was not their first language would not know the meanings of some of the English words in the lexicon. On those instances when the students failed to grasp the meaning of the English words, they also experienced difficulty understanding how our Simplified Signs related to these words. For this reason, we included a brief definition of each of the words in our lexicon.

We also provided information on how each sign in our system was tied to its meaning in two ways. One was a short sentence or phrase that concisely tied each sign to its referent. The other approach was to provide a more detailed explanation of the relationship between each sign's formation (its location, handshape, movement, and/or facial expression) and its conceptual basis or meaning. In crafting these two memory aids, we felt that the more detailed or explicit explanations of sign-referent relationships would prove especially helpful to individuals as they were first learning our Simplified Signs, and that this would be the case particularly for those persons largely unfamiliar with American culture. Then, once the learner had come to understand the link between a sign's formation and its meaning, we hoped that the shorter memory aids would be sufficient to jog the learner's memory in the future. Moreover, we felt that this additional information would be particularly important for those signs that were not as clearly iconic or pantomimic as others. An explanation of the tie between a sign and its referent often is provided in stories about a sign's origin in Deaf sign languages. For example, the sign for BOY in ASL is made with the hand at the top of the signer's forehead. The sign's action is indicative of a boy tipping his cap. Although our memory aids do not necessarily reflect the origin of a sign's formation in any particular Deaf sign language, they do provide useful information that concretely links the sign's formation to its underlying conceptual basis. One reason we wished to include these explanations is that we, the authors, often relied on such information when trying to remember signs. Secondly, there is a sound empirical basis for doing so.

The effect of providing information about the tie between a sign and its referent or an explanation of the sign has been examined in two studies. In one study (Maynard, Slavoff, & Bonvillian, 1994), undergraduate students unfamiliar with any sign language or sign system were presented lists of signs together with their English word or translation

equivalents (word-sign pairs). The students were randomly assigned to one of three experimental conditions or groups. The students in the first experimental condition were given a brief explanation (a short sentence or phrase that helped tie that sign to its English word equivalent) for each sign they were to learn. These explanations consisted of either brief accounts of the origins of the signs or of how these signs were related to their referents. The students in the other two experimental conditions were urged to use alternative recall strategies (e.g., overt rehearsal of the signs). All of the students were tested for their ability to remember the signs after being cued by their English translation equivalents both immediately after each list was presented and again after a one-week delay. When tested for immediate recall, there were only slight differences among the three groups of participants in the number of signs that they recalled. After a delay of one week, however, those students who had received information about the origins of the signs or explanations of the ties between the signs and their referents remembered many more signs than did the students in the other two groups or conditions. Thus, it appears that giving a brief description of the tie between a sign and its referent serves as an important memory aid for longer-term sign recall.[11]

The results of a second study (Stedt, 1984) also showed that providing explanations of signs often enhanced individuals' recall of those signs. In this study, students in the second, fifth, and eleventh grades were shown ASL signs in sentences and subsequently asked to verbally identify the signed sentences in a recall task. Those signs that had received mnemonic (memory assisting) explanations were recalled much more often by the students than those signs without such explanations.

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11 The results of this immediate- and delayed-recall study mirror the results of a different recall study involving the recognition of arbitrary signs versus iconic signs (Lieberth & Gamble, 1991). In that study, investigators found that participants remembered about the same number of arbitrary signs as iconic signs shortly after the signs were presented. In contrast, many more iconic signs were recognized after a longer delay (see also Ortega, 2017). Thus, iconic signs are easier to remember over longer periods of time (as in Lieberth & Gamble, 1991) and having an explanation of the tie between a sign and its referent also increases recall over the long term (as in Maynard et al., 1994). A combination of strategies from these two studies (i.e., using iconic signs plus giving memory aids) should result in even better long-term recall.

The findings from these two studies that showed that providing student learners with explanations of the ties between observed signs and their underlying meanings aided them in remembering the signs also are consistent with views about how the human mind or brain operates. Experimental psychologists showed some years ago that having research participants focus on the meaning of words (semantic encoding) was a particularly effective way for them to remember the words (Craik & Tulving, 1975). More recently, a view has emerged that the brain strives to find meaning in or to make sense of our environmental experience (Carey, 2015; Proulx & Inzlicht, 2012). By providing the student learners in the two studies discussed above with brief accounts of the signs' origins or how the signs were related to their referents, the signs likely became considerably more meaningful and memorable for the learners.

Although receiving explanations about the sign-referent connections aided undergraduate and school-age students in their ability to remember signs, such information probably would affect various sign-learning groups quite differently. The staff at facilities where non-speaking persons are taught to sign, the parents or caregivers of such youngsters, elderly persons with hearing impairments, certain individuals with expressive speech aphasias (i.e., those who have suffered a loss of productive language ability but who can still understand spoken language), students using signs to facilitate their acquisition of foreign language vocabulary, and children in preschool programs might benefit from having the tie between a sign and its referent provided to them. In contrast, non-speaking children with autism spectrum disorder or children with a severe or profound intellectual disability may not reap similar benefits from such explanations.

Concluding Remarks

We believe that the Simplified Sign System we have developed will prove beneficial to many individuals who encounter or experience serious communication difficulties. We say this because the signs included in our system were the product of research efforts to determine which signs should be included and what formational parameters of signs should be avoided. We are not aware of other sign languages or

sign systems developed in a similar systematic manner. The finding that undergraduate students found Simplified Signs easier to remember and form than signs from a genuine sign language also bodes well for future use of the Simplified Sign System. Perhaps caregivers and staff members at programs for non-speaking individuals will be more inclined to learn and use signs if they perceive them as more readily acquired.

Careful examination of the next chapter, which focuses on how to teach and use signs from the Simplified Sign System, reveals many helpful methods for enhancing the communicative efforts and successful social interaction of minimally verbal or non-speaking individuals. In addition, we answer many questions that teachers, staff members, caregivers, and family members may have, including a response to those who have reservations about using signs in general or Simplified Signs in particular. We hope that the teaching guidelines we provide, as well as our overview of how to develop a communication plan for an individual, will result in a comprehensive strategy in which to encourage and accurately measure a person's progress with Simplified Signs.

Although the present sign system represents years of effort, we are under no illusion that it cannot be improved. We welcome recommendations for new signs to include in our vocabulary as well as suggestions for modifying existing signs to make them easier to form and to remember. We should note that we expanded the size of the Simplified Sign System lexicon (to about 1840 signs) and began work on the development of a one-handed version of our system. We anticipate that a larger vocabulary of Simplified Signs will make the system a more useful vehicle for the teaching and learning of foreign language vocabulary items. We also hope that a one-handed version of our system will help meet the communication needs of those individuals with severe motor impairments to one of their hands or arms. Finally, we would readily accept advice on any helpful teaching strategies, research, exercises, or other information that should be included in future editions of this book or in supporting materials such as workbooks or multimedia resources. Only when we obtain input from many different minds will the Simplified Sign System reach its full potential as a communication system.