

Current research findings to support the use of sign language with adults and children who have intellectual and communication handicaps

Nicola Grove, M.Sc., L.C.S.T.

Research Information Officer, Makaton Vocabulary Development Project

Over the past 10 years, research has gone some way towards answering two questions which are fundamental to the use of non-vocal communication:

1. Why may signing succeed where oral training has failed?
2. What is the relationship between the development of sign and speech?

1. What makes signing a successful approach for non-verbal people?

Non-verbal people can and do learn signs when they have failed to acquire speech (see for example, Kiernan, Reid & Jones 1982), and it appears that signs are easier to learn than spoken words (Reid 1984). Why should this be so?

Reasons to do with the nature of the handicap

- When there is a physical problem affecting speech processing and production, as in deafness, orofacial palsies and speech apraxia, other channels of expression and reception may be intact, or less affected.
- Mentally handicapped people, especially those with low verbal IC, may prefer visuo-spatial to auditory vocal coding, and they may perform better on tasks involving visual and kinaesthetic skills especially when there are no demands on memory (O'Connor & Hermelin, 1978; Anwar 1983).
- Non-verbal autistic people seem to prefer to code information through visuo-spatial and tactile channels (Kiernan 1983, Bonvillian & Nelson 1982).

Hence by teaching signing, you may be capitalising on relative strengths, rather than attempting to build on an area of weakness.

Reasons to do with the mode of transmission

The auditory trace of a spoken word is momentary; difficult to process, recall and imitate. It is dynamic, cannot be held, is hard to shape, and provides no constant source of feedback.

- Although a sign is also a temporal dynamic signal, it can be held static as a model to imitate. Hands can be moulded and shaped into signs far more easily than sounds can be shaped into words. Non-verbal people will probably use their hands instrumentally in a more differentiated way than their voices - to reach, grasp, point and push away. Teaching signing builds on this ability.

- Visual and kinaesthetic feedback is available; the signer can see and feel himself making the signs in most cases. We know that this is important, as it appears that signs which are visible to the signer, and signs which involve some kind of contact, are easier to learn than signs made outside the signer's field of vision, or signs which do not involve touch (Konstanteras & Leibovitz 1982; Lloyd & Doherty 1983; Kohl 1981; Dunn 1982).
- The visual and tactile-kinaesthetic consequences of signing are also important for memory. Saltz & Donnenwerth-Nolan (1981) found that enacting the meaning of a sentence, and mentally visualising it, helped recall of the sentence. They suggest that motor enactment leads to the formation of a perceptual-motor trace in memory. Lloyd & Doherty (1983) use this notion to explain why "touch" signs are easier to learn than "non-touch" signs; they hypothesise that bringing the hand into contact helps to form this trace and marks the 'endpoint' of a sign. Action as a trigger for memory is a familiar process to all of us - it can be difficult to recall exactly what is involved in riding a bicycle or driving a car until you are actually involved in the sequence itself. Bruner calls this kind of memory "enactive memory" and suggests that it is the earliest form of representation for young children, for whom action and perception are intimately linked. People who have no "inner language" through which to symbolise experience for themselves, are likely to be more dependent on enactive memory; thus the consistent motor activity involved in signing can provide a basis from which to develop stable associations between events and consequences.

Reasons to do with the iconicity of signs

The term iconicity refers to the strength of the association between the form of a sign and what it represents. BSL signs HOUSE, DRINK, BOOK, are highly iconic; BISCUIT, SISTER, are more abstract. The basis of iconic associations varies. They may be action based - (DRINK; SWIM; BANANA) visually based (HOUSE; MOON; COW), or conceptually based (NURSE; KING; SOLDIER). Perception of iconicity depends on the ability to form the appropriate associations - e.g. connecting the fact that houses are conventionally depicted with peaked roofs with the form of the sign.

There are two recognised dimensions of iconicity:

- how guessable is the sign by a naive viewer (called transparency)
- how closely related are the sign and its meaning judged to be? (called translucency)

Signs which are easily guessed are usually also thought to be closely related to meaning. However, the reverse is not always the case. A sign like TREE is not very "guessable", but is commonly judged to be very "translucent".

This rather abstract distinction is important because "translucency" is much more critical to learning than "transparency". There is now a considerable amount of evidence that associations between sign forms and meaning are perceived by moderately mentally handicapped and deaf-blind people in a similar way to non-handicapped adults (Griffith et al 1983; Doherty & Lloyd 1983; Luffig 1983), and that signs which can be easily linked with their meanings are more easily learnt and retained.

However, this probably only applies above a certain level of ability. Young children acquiring sign as a first language do not seem to make much use of iconicity (Orlansky &

Bonvillian 1984) and this may also be true for the severely handicapped (Bornstein & Jordan 1984). For those people at a very early stage of development, it has been suggested that action based signs, which recreate all or part of a motor sequence, are likely to be most salient (Griffith et al 1983; Reichle et al 1981). This is because the earliest concepts are thought to derive from actions with objects, and interactions with people - and the suggestion ties in well with the theory that signing draws on the earliest form of memory, which is motoric and enactive. A difficulty with this line of argument is that signs usually depict action in a rather stylised way, and there is no guarantee that the action itself will be recreated in the learner's representation of the sign. A boy aged 13m, for example, produced DRINK (usually considered to be highly enactive) by extending his arm at shoulder level and opening and closing his fist.

Iconicity does seem to function as an extra cue to the learning of signs as labels for actions and events - a cue that is not available to the same extent in spoken language. However, it interacts with many other features of sign language, including the following:

- Level of conceptual abstraction. Signs can represent concepts which are concrete (BISCUIT; RUN; SLEEP; HOT; TOILET) or abstract (YESTERDAY; HOLIDAY; HOW MUCH; WHEN). In general, the more abstract a concept is, the more difficult it is for handicapped people to learn. If there is a clear association between form and meaning, this mitigates the difficulty of learning more abstract signs (as there may be for example in HOW MUCH; HUNGRY; and NIGHT).
- Motor complexity. The simplest signs involve handshapes and movement patterns which emerge early in development - such as flat hand, fist and extension of index finger, and symmetrical up and down movement. The more complex a sign is, the more difficult it is to learn (Kiernan 1984; Kohl 1981).
- Perceptual complexity. Signs which look alike are more difficult to learn, particularly in groups (Luffig 1983; Griffith & Robinson 1980). Again studies such as those of Doherty & Lloyd 1983 strongly suggest that the effects of these features are interactive; that translucency can help in the discrimination and recall of a complex sign, but that it is not a sufficient condition for sign learning to occur.
- Finally, the functionality of the sign in daily life; the extent to which its use is motivating, and it is reinforced in the environment, is of obvious significance; though this has not been systematically investigated.

Translucency, then, can act as a potent clue to meaning. It is a contributing, but not a determining factor in the learning of signs.

Reasons to do with developmental patterns in the acquisition of gesture and spoken language

As babies develop communication, their gestures and body movements are generally more advanced in signalling power than the speech sounds which typically accompany them.

For example, a 10 month old infant uses babble as oral play, (mamama) as a distress signal, and smacks her lips when food is presented; and this is the extent of her vocal "talk". However, she is also waving goodbye, extending her arms to be picked up, flapping her arms in excitement, handing objects to adults, reaching for objects, and arching her back and averting her face to indicate refusal.

Typically, the first communications are like these, involving hand use, and eye contact in giving, showing, and greeting behaviours, which act as the contexts for the emergence of words (Grove & Walker 1984). Speech and gesture then develop in parallel during the first and second year. Probably because neurological control of the hands matures earlier than that of the speech musculature, gestures appear to be a more primal avenue of communication than the spoken word (Bates et al 1979; Volterra & Caselli 1985).

Indeed, some researchers maintain that both deaf and hearing children who are acquiring signs as a first language from their signing parents, develop vocabularies earlier than babies who are learning to speak. Bonvillian (1983) in a study of 11 such children, found that the average age for the first sign was 8.5 months; average age of use of 10 signs was c13 months. This is significantly in advance of oral language norms. Other research suggests that when the gestural vocabularies of children who sign and children who speak are compared, there is no such difference because all babies of this age use their hands to signal meanings. In a spoken language environment, these gestures are not seen as particularly significant, whereas in a signing environment they are credited with the status of first words (Caselli 1984).

Be that as it may, the evidence from developmental studies indicates that signing and gesture may be accessible to people who lack the ability to develop speech. Furthermore, the strongly physical nature of gestural communication means that it is naturally an interactive process. By teaching signing, according to Schaeffer (1978), you teach the principle "goal-directed action" - namely purposeful, intentional communication.

Summary

Signs have been shown to be easier to learn than spoken words for handicapped people. Several reasons are suggested:

1. The nature of the handicap in many types of communication difficulty means that there is a natural reliance on a visual and kinaesthetic modality.
2. Signs are easier to prompt than words; they provide consistent sources of feedback, and they tap the enactive, motor memory which underlies more symbolic forms of processing.
3. Signs often provide clear associations between form and meaning which can be used in learning by those with the experience to perceive them.
4. Gesture appears to be a more primal means of communication in normal development.

2. The relationship between signing and speech development

A commonly expressed fear of families and caregivers when alternatives to speech are proposed, is that the student will give up attempting to talk.

The overwhelming evidence is that this is most unlikely. On the contrary, it appears that signing may facilitate the development of speech.

A survey by the Thomas Coram Research Unit of schools in 1978 found that around 36% of children in ESN(S) schools, and 33% of children in schools for the physically handicapped,

were said to have increased their use of speech after learning to sign. 22% of the ESN(S) children were said to have improved articulation (Kiernan et al 1982). In a Makaton survey, of 1004 individuals, 39% showed improved vocalisation, and 25% improved expressive speech. This is reported data only, but there are also direct observations of spontaneous speech development consequent on sign training (Daniloff & Shafer 1981; Wells 1981; Kahn 1981; von Tetzchner 1984).

Why should signing facilitate speech development?

1. Signs can mediate the learning of spoken words

Several studies suggest that pairing signs with words leads to a transfer of learning, and the acquisition of spoken words (Bricker 1972; van Biervliet 1977; Penner & Williams 1982). A study by Reid (1984) found that not only were signs learned more quickly than words, but that children who learned signs first, subsequently found it easier to learn words. They seemed to have developed an understanding of the principle of labelling in sign, which then transferred to the spoken word. This effect has been demonstrated mainly in conditions of structured teaching, and it is not known whether the same kind of generalisation would occur without highly systematic teaching of associations. Most researchers suggest (e.g. Kiernan 1983) that it is not enough to rely on the spontaneous transfer of signing to speech. However, there is some evidence of the spontaneous emergence of speech. For example, in a single case study by von Tetzchner 1984, a language disordered child improved his speech skills dramatically over a period of time without specific training. He acquired many spoken words after learning to sign, and there was a clear relationship between the signed and the spoken vocabularies. It is suggested that the signs helped to differentiate speech sounds for the child, whose articulation improved considerably.

Two other studies suggest that signing can directly facilitate articulatory skills, and that this effect may be due to the controlled movements of signing providing a "motor plan" for accompanying speech (Ferrarese et al 1982, Wells 1981). One of Wells' students was observed to break up the syllables of a spoken word to correspond with the rhythm of the sign. That this may be more than an isolated phenomenon is suggested by observations of body language in non-handicapped adults and children, which provide evidence of a close link between manual activity and speaking

2. Links between signing and speaking

The structures in the brain which control the hands, face and lips, are adjacent to one another as represented in the precentral and post-central gyri (Gibson 1974), and it has been suggested that language may have a gestural origin (Kendon 1975; Hewes 1977).

The intimate relationship between body movement and speech is demonstrated by newborn infants, who are observed to move in synchrony with the voices of those around them (Trevarthen 1977). This is perhaps not surprising given that hearing is the first sense to develop in utero, where the growing baby is exposed to the sound and rhythm of its mother's voice, and can be seen to respond to environmental sound as well.

Young children continue to show patterns of synchrony in their own speech and movement (Lin & Duchan 1980). In adults, verbal activity is accompanied by bodily movement, co-ordinated with the segmented sound utterance, and intonation (Condon 1977). Hand movements are particularly closely associated with speech. This synchrony seems to be distorted in the body movements of autistic and other dysfunctioning children who show abnormal responses to sound (Condon 1977).

Hence it may be that teaching one co-ordinated motor activity - signing - somehow entrains another - speaking, as has been suggested by Konstanteras & Leibovitz (1981). This theory is still very speculative, and awaits some hard evidence from experimental research.

Summary

There is evidence that signing can facilitate the development of speech. Signs may mediate the learning of spoken words when they are consistently paired in teaching. In addition, the neurologically based links between manual activity and speech suggest that there is a natural affinity between the two modes of communication.

What is not yet clear is the extent to which speech ability must be present for signing to have this beneficial effect. Studies on autistic children suggest that only those with some potential for speech imitation progress to spoken language (Kiernan 1983 - see also Makaton RIS, II, forthcoming Nonspeech Communication and Autism).

Conclusion

The idea of teaching people with communication handicaps to sign can seem strange. In our society we place such an emphasis on verbal and written channels of information, that it is easy to overlook how much is conveyed through gesture and body language. Signing draws on skills of communication that are naturally available, and which are the first to develop in a growing child.

Not all people with spoken language difficulties will be able to sign, of course. Physical handicap may prevent the use of gesture. Recent research also indicates that individuals will show modality preferences - for speech, signs, or graphic symbols (Reid 1984). For example, one study found that mentally handicapped people found Blissymbols more difficult to learn than signs or rebus symbols, which are more pictorial. People without memory problems could learn signs and rebuses with equal ease; but rebuses were easier to learn than signs for those with memory problems (Goossens 1984). In effective 'total communication' all possible channels of communication will be made available to the individual - speech, sign and symbols. The recent inclusion of symbols into Makaton programmes reflects this unified approach.

References

Anwar, F. (1983). In J. Hogg & P.J. Mittler (Eds) *Advances in Mental Handicap Research* Vol.11, John Wiley & Sons Ltd., pp.203-231 (1983)

Armstrong, D.S. (1983). Iconicity, Arbitrariness and Duality of Patterning in Signed and Spoken Language: Perspectives on language evolution. *Sign Language Studies*, 38, 51-69 (1983)

Bates, E. et al (1979). *The Emergence of Symbols: Cognition and Communication in Infants*. New York Academic Press (1979)

Bonvillian, J.D. (1983). Early sign language acquisition and its relation to cognitive and motor development In J. Kyle & B. Woll (Eds) *Language in Sign : An International Perspective on Sign Language* Croom Helm pp116-125 (1983)

- Bonvillian, J.D. & Nelson, K.E. (1982). Exceptional cases of language acquisition. In *Child Language*. Vol.3, Edited by K.E. Nelson, Gardner Press (1982)
- Bornstein & Jordan (1984). Functional signs an approach from simple to complex. UPP Baltimore (1984)
- Bricker, D.D. (1972). Imitative sign training as a facilitator of word-object association with low-functioning children. *Am. J. Ment. Defic.* 76, 509-516 (1972)
- Bruner, J.S. et al (1966). *Studies in cognitive growth*, John Wiley, New York (1966)
- Caselli, M.C. (1984). Communication to language; deaf children and hearing children's development compared. *Sign Language Studies*, 39, 113-144, Summer 1983
- Cicone, M. et al (1979). The relationship between gesture and language in aphasic communication. *Brain and Language*, 8, 324-349 (1979)
- Condon, W.S. (1977). A primary phrase in the origin of infant responding behaviour. In *H.R. Schaeffer (Ed) Studies in mother-infant interaction*, New York Academic Press (1977)
- Daniloff, J.K. & Schaeffer, A. (1981). A gestural communication program for severely and profoundly handicapped children. *LSHSIS*, 12, 4, 258-268 (1981)
- Doherty, J.E. & Lloyd, L.L. (1983). Effects of production mode, translucency and manuality on sign acquisition and recall by retarded adults. Paper presented by *107th Annual Meeting of American Association for Mental Deficiency*, Dallas, Texas, USA, 31st May, 1983
- Dunn, M.L. (1982). Presign language motor skills. *Communication Skill Builders*, Tucson, Arizona (1982)
- Ferrarese, R., Norton, P. & Whitmont, 5. (1982). Can signing improve the quality of autistic speech? *Except. Child*, 29, 2, 117-125 (1982)
- Gibson, J. (1974). *A guide to the nervous system*. Faber (1974)
- Goossens, C. (1984). The relative iconicity and learnability of verb referents differentially represented by manual signs, Blissymbols and Rebus Symbols: an investigation with moderately retarded individuals. Paper presented at the *3rd International Conference of Augmentative and Alternative Communication* 18-20th October, 1984, Cambridge Mass.
- Griffith, P.L. & Robinson, G.H. (1980). Influence of iconicity and phonological similarity on sign learning by mentally retarded children. *Am. J. Ment. Defic.* 85, 291-298 (1980)
- Griffith, P.L., Robinson, J.H. & Panagos, J.M. (1983). Tactile iconicity: signs rated for use with deaf-blind children. *J.A.S.H.* 8(2), 26-38 (1983)
- Grove, N. & Walker, M. (1984). Communication before language. *RIS*, II, 2-4, MVDP (1984).
- Hewes, D. (1977). A model for language evolution. *Sign Language Studies*, 15, 97-168 (1977)

- Kahn, J.V. (1981). A comparison of sign and verbal language training with nonverbal retarded children. *JSHR*, 46, 113-119 (1981)
- Kendon, A. (1975). Gesticulation, speech, and the gesture theory of language origins. *Sign Language Studies*, 9, 349-373 (1975)
- Kendon, A. (1979). Some emerging features of face to face interaction studies. *Sign Language Studies*, 22, 7-22 (1979)
- Kiernan, C.C. (1983). The use of nonvocal communication techniques with autistic individuals. *JCPP*, 24, 3, 339-375 (1983)
- Kiernan, C.C. (1983). The exploration of sign and symbol effects
- In J. Hogg & P. Mittler (Eds) *Advances in Mental Handicap Research*. Vol.2, pp.27-68, Chichester Wiley (1983)
- Kiernan, C.C. (1984). The imitation and learning of hand postures. In Berg, J.M. (Ed) *Perspectives and Progress in Mental Retardation Vol.1 - Social, Psychological and Educational Aspects Baltimore*, University Park Press (1984).
- Kiernan, C.C., Reid, B. & Jones, L. (1982). Signs and Symbols Use of nonvocal communication systems. *Studies in Education II*, Heinemann Educational (1982)
- Kohl, F. (1981). Effects of motoric requirements on the acquisition of manual sign responses by severely handicapped students. *Am. J. Ment. Defic*, 85, 396-403 (1981)
- Konstanteras, M.M., Uxman, J. & Webster, U.D. (1978). Iconicity: effect on the acquisition of sign language by autistic and other severely dysfunctional individuals. In Siple, P. (Ed) *Understanding Language through Sign Language Research*. Academic Press (1978)
- Konstanteras, M.M. & Leibovitz, S.F. (1981). Early communication by autistic children signing and mouthing versus signing and speaking. *Sign Language Studies*, 31, 135-154, Summer 1981
- Lin, B.W. & Duchan, J. (1980). Using movement to differentiate patterns of interaction and situational understanding in the verbal production of a 2½ year old child. *Sign Language Studies*, 27, 113-122 (1980)
- Lloyd, L.L. & Doherty, J.E. (1983). The influence of production mode on the recall of signs in normal adult subjects. *JSHD*, 26, 595-600 (1983)
- Luffig, R.L. (1983). Translucency of sign and concreteness of gloss in the manual sign learning of moderately/severely mentally retarded students. *Am. J. Ment. Defic.*, 88, 3, 279-286 (1983)
- O'Connor, N. & Hermelin, B. (1978). *Seeing and Hearing in Space and Time*. Academic Press (1978)
- Orlansky, M. & Bonvillian, J.D. (1984). The role of iconicity in early sign language acquisition. *JSHD*, 49, 287-292 (1984)

Penner, K.A. & Williams, W.N. (1982). Comparison of sign versus verbal symbol training in retarded adults. *Perceptual & Motor Skills*, 55, 395-401 (1982)

Reichle, J., Williams, W. & Ryan, S. (1981). Selecting signs for the formulation of an augmentative communicative modality. *JASH*, 6, 48-56 (1981)

Reid, B. (1981). An investigation of the relationship between manual sign training and speech development for mentally handicapped children. Final Report to the SSRC

Reid, B. (1984). Acquisition and recall of signs and words by mentally handicapped children. In J.M. Berg (Ed) *Perspectives and Progress in Mental Retardation. Vol.1 - Social, Psychological and Educational Aspects*. UPP Baltimore, pp.239-250 (1984).

Saltz, E. & Donnenwerth-Nolan, S. (1981). Does motoric imagery facilitate memory for sentences? A selective interference test. *J. Vbl. Learn & Vbl. Behav.* 20, 322-332 (1981).

Schaeffer, B. (1978). Teaching spontaneous sign language to nonverbal children theory and method. *Sign Language Studies*, 21, 317-352 (1978)

Trevarthen, C. (1977). Descriptive analyses of infant communicative behaviour. In Schaeffer, H.R. op cit. ch.10 p.227 (1977)

Van Biervliet, A. (1977). Establishing words and objects as functionally equivalent in sign language training. *Am. J. Ment. Defic.* 82, 178-186 (1977)

Volterra, V. & Caselli, M.C. (1985). From gestures and vocalisations to signs and words. In W. Stokoe & V. Volterra (Eds) *SLR 83 - Proceedings of the 3rd International Conference on Sign Language Research*, Rome 1983. Silver Spring (Md): Linstok Press; Rome: Istituto di Psicologia CNR (1985)

Von Tetzchner, S. (1984). Facilitation of early speech development in a dysphatic child by use of Signed Norwegian. *Scand. J. Psychol.* 25, 265-275 (1984)

Wells, M.E. (1981). The effects of total communication training vs. traditional speech training on word articulation in severely mentally retarded individuals. *Applied Res. in Ment. Retard*, 2, 323-333 (1981)