Current research findings to support the use of signs with adults and children who have intellectual and communication difficulties

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This paper is an update of that written by Grove in the early eighties and reports on recent research findings, and other literature published mainly in the 1990s, relating to the use of manual sign in the promotion of communication abilities in individuals with learning difficulties. The use of sign as an augmentative and alternative communication (AAC) system to speech has become an accepted form of intervention with this client group across the world since pioneering work in the 1970s (Grove and Walker, 1990; Konstantareas, 1985 for a review; Konstantareas, Oxman, and Webster, 1977; Walker, 1973, 1978).

The original paper addressed two main questions:

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

Whilst these have continued to be addressed by clinicians and researchers additional questions have arisen around the long term effects of early sign intervention (Launonen, 1996, 1998; LeProvost, 1993), and the processing mechanisms involved for individuals dealing with complex asymmetrical modes of input and output (Bjorck-Akesson and Lindsay, 1997; Grove, Clibbens, Barnett and Lonke 1997; Grove and Smith, 1997; Smith, 1997; Sutton, 1997; von Tetzchner, 1997). For those other than the hearing impaired, for whom a relatively symmetrical pattern of input and output exists (Smith, 1997), the typical modality pattern is that of speech as the primary input/receptive mode and manual signs or graphic symbols as the primary output/expressive mode (Grove and Smith, 1997). The focus of this particular review is manual sign but reference is also made to research encompassing graphic symbol systems where relevant. For a review of current theoretical perspectives on the acquisition of language through AAC in Europe see von Tetzchner and Jensen (1996).

Changes in terminology

During the seventies and eighties the term 'total communication' (Barrera and Sulzer-Azaroff, 1983; Lombardino, Willems and MacDonald, 1981; Sisson and Barrett; 1984; Wells, 1981) was used to describe:

"... the simultaneous use of manual signs and spoken words..." (Lombardino, Willems and MacDonald, 1981: 455).

During the nineties the terminology describing the combination of speech plus AAC systems: manual/gestural signs, visual/graphic symbols, photographs, pictures, tangible symbols, representational objects and real objects has evolved to include the terms bimodal and multimodal reflecting the relationships across and between modalities for those who are not using speech as their primary means of accessing or producing language (Smith and Grove, in press). Lonke, van der Beken and Lloyd (1998 cited in Smith and Grove, in press) further extend this to distinguish between "parallel multimodality" which refers to speech plus gesture or sign (as in Makaton manual signing), and "recoded multimodality" which refers to the re-
What makes signing a successful approach for non-verbal and minimally verbal individuals?

It is apparent from earlier (Kiernan, Reid and Jones, 1982) and more recent research findings (Grove, 1995; Launonen, 1996, 1998; Romski and Sevcik, 1997 for a review) that both children and adults are able to develop meaningful communication through the medium of manual signs in the absence of intelligible speech. Some additional evidence for why this should be so is outlined below.

Nature of the underlying aetiology

- Where the underlying aetiology is primarily physical, for example profound hearing impairment or severe articulatory dyspraxia, manual signing may be one of the only potentially exploitable means of expression particularly in early childhood before the development of literacy skills (Owens, 1993). For children with neurogenically based articulation disorders manual communication systems are seen as a positive contribution to developing meaningful communication and interaction whether as a temporary or long term measure (Hall, 1995).

- For the majority of children with cognitive/intellectual impairments who may either: never develop speech, develop a few words which are relatively unintelligible or, who are echolalic, AAC provides a means by which to develop receptive and expressive language skills (Romski and Sevcik, 1997). This is based upon the premise that such individuals find it relatively easier to process information through the visuo-motor channel rather than the auditory-vocal channel particularly where profound short-term auditory memory and processing problems are evident as in Down syndrome (Broadley, MacDonald and Buckley, 1995). The proposition being that visual information is more 'concrete' and accessible whereas the auditory trace of a spoken word is a transient, arbitrary sensory stimulus which requires processing and rehearsal to become a cognitive representation (Gathercole and Baddeley, 1993; Morgan Barrie, 1995). In terms of discriminating information received through a predominantly visual mode children appear able to consistently distinguish communicative gestures from those which are non-communicative at an early age and in multi-layered linguistic organisation (Pettito, 1993). This differentiation for semantic qualities has also been supported for visual graphic symbols, shown in differences in recordings of Auditory Evoked Responses (AER) in the left hemisphere frontal and temporal lobes, when six children with learning difficulties were shown meaningful and nonmeaningful graphic symbols (Molfese, Morris and Romski, 1990).

- Children with Down syndrome are known to present with delayed speech and language development (Dykens, Hodapp, and Evans, 1994; Franco and Wishart, 1996) and whilst this is known to be associated with neurological anomalies (Schmidt-Sidor, Winsiewski, Shepard, and Sersen, 1990) no single cause has yet been identified (Chapman, 1997; see Rondal, Perera, Nadel, and Comblain, 1996 for a review). However, this group has been found to learn manual signs more quickly than words at the early stages of development (Abrahamsen, Lamb, Brown-Williams and McCarthy, 1991; Launonen, 1996; Layton and Savino, 1990; LeProvost, 1993; Miller, 1991, ). Miller et al (1992) reported that the initial vocabularies (sign and sign plus speech) of children with Down syndrome were not significantly different from their
typically developing mental age-matched peers and in some cases were greater before 17 months although the advantage tailed off after this time. Interestingly, the vocabularies they developed were initially different i.e., sign only, sign plus speech and eventually speech only which may indicate a separation of the modality lexicons.

The use of manual signs is believed to be advantageous with this clinical group by ‘tapping’ into their areas of strength i.e., visuo-spatial rather than areas of deficit, auditory-vocal given the processing difficulties they experience and the high incidence of hearing loss (Buckley, 1993; Remington and Clarke, 1996).

- Research with adults with Down syndrome suggests atypical cerebral organisation of function for speech perception (Elliott and Weeks, 1993; Elliott, Pollock, Chua and Weeks, 1995) evidenced by their being less successful than controls with learning difficulties on tasks requiring a series of movements to be performed in response to verbal instruction, but being able to outperform controls when provided with a visual demonstration. This is attributed to the right hemisphere atypically subserving receptive speech and visual-spatial processing within which co-existence speech processing is disadvantaged. It may be that the comparative strength for visual over auditory information is a result of this. At an early stage this may support the use of manual signs to aid comprehension given the evidence that children with Down syndrome present with delayed language development as early as the second year but are able to acquire vocabulary successfully if provided with signed input (see Lynch and Eilers, 1991; Miller, 1988 for reviews; Miller, 1992; Miller et al, 1995).

- For individuals presenting with disorders of communication in the more profound range of the autistic continuum a preference has been shown for information presented via the visuo-spatial (Peterson, Bondy, Vincent et al., 1995) and tactile channels rather than the auditory-vocal channel with suggestions that the more concrete nature of the mode facilitates not only comprehension but also retrieval of linguistic information for expression (Schweigert and Rowland, 1998a, 1998b).

- Where individuals are using ‘challenging’ behaviours (self-injury and aggression) as a means of functionally communicating a need for attention the introduction of AAC has led to a reduction of behaviours which interfere with effective language acquisition and promotion of more meaningful interaction (Duker and Remington, 1991; Durand and Crimmins, 1991).

The relationship of gesture and spoken language development

Successful language acquisition is believed to develop from early non-verbal communicative behaviours, in particular the use of gestures and pointing (Franco and Butterworth, 1996; Franco and Wishart, 1996). These two components play an important role in the development of imperatives and declaratives and co-exist with eye contact as a means of securing joint attention, an essential foundation for language development in all children (Harris, 1992; Harris, Kasari, & Sigman, 1996; Tomaseillo and Farrar, 1986) and a skill which is frequently absent in children with autism (Sarria, Gomez, and Tamarit, 1996; Tager-Flusberg, 1994).

Developing infants are known to integrate a number of modalities: gesture, body movements, facial expression and vocalisations as means of communication prior to the development of speech as the primary linguistic mode (Capiri, Iverson, Pizzuto, and Volterra,
1996; Grove, 1997; Smith, 1997; Roy and Panayi, 1997). Over time the strength and relevance of the different modes to the communication context changes as children become more proficient within each mode (intra-modal development cf. Smith, 1997) and learn to manipulate them in relation to one another (intermodal development cf. Smith, 1997). Thus, at the pre-linguistic stage infants are making sense of, and producing, functional communication in a number of modalities.

Marcos (1991), and Marcos and Kornhaber-le Chanu (1992) report on the relationship of gestures, vocalisations and words in typically developing infants aged around eighteen months. The infants in their studies all reverted to gesture and exaggerated body movements when words failed to produce the desired results of requesting an object. This may indicate a reversion to a more reliable mode of communication and is evidence of intermodal manipulation.

At this point a distinction will be drawn between the two categories of gesture to which reference is made in current research (Capirci, Iverson, Pizzuto, and Volterra, 1996). 'Deictic gestures' emerge during the pre-linguistic period and are used to request, declare, and draw attention, be it joint or otherwise, to an object or location. They do not convey any representational meaning, this can only been gleaned by the communication partner from the given context, or by looking at the proffered object. 'Representation gestures', as their name suggests, represent a given object or action and may be considered symbolic with the meaning frequently transferable across contexts for example, a cupped hand moved toward the mouth to represent 'drink'. This type of gesture emerges slightly later than deictic gestures but the two are frequently combined.

McNeill (1992) highlights certain characteristics of gestures which are produced with speech: they are produced in synchrony with speech; they do not show duality of patterning; they are rarely combined and therefore convey single idea units; they cannot be segmented and there are no conventions governing standards of form (Grove, 1997).

Studies into the relationship of gesture with late speech development are interesting. Thal and Tobias (1992) found late talkers (between 18 months and 33 months) produced communicative gestures more frequently than age- and language- matched controls, as did Franco and Wishart (1996) in their study with children with Down Syndrome, possibly as a compensatory strategy. However, in a subsequent study Thal and Tobias (1994) found late talkers to be more like age/comprehension matched controls than language (expressive) matched controls producing a reduced diversity of non-symbolic (deictic) gestures such as showing and pointing. It was not considered that the late talkers lacked the ability to represent objects and events symbolically but rather experienced difficulty in using this spontaneously and flexibly in contexts requiring more abstract applications.

Capirci, Iverson, Pizzuto and Volterra, (1996) investigating the relationship of gesture and spoken words found all twelve typically developing children in their study (recorded at 16 months and 20 months) produced gestures and words as two element 'utterances' before producing two-word spoken utterances. This supports earlier findings by Goldin-Meadow and Morford (1990) and they and conclude that this pattern is part of the typical developmental sequence in the transition to two-word utterances. It was suggested earlier by Acredolo and Goodwyn (1990 cited in Capirci, et al 1996) that this combination of speech and gesture is used by young children as the gestural modality is more accessible when complex articulatory mechanisms are still underdeveloped compared to cognitive skills. It is interesting to note that none of the children combined two 'representation gestures' and only a few produced 'referential gesture and referential word' combinations which would have resulted
a more complex semantic utterance, they preferred instead to do this only in the vocal mode. Capirci, et al suggest this may:

"...reflect a deeper constraint on the gestural modality in hearing children receiving a spoken language input"
(1996: 670)

This may have implications for children and adults who are using sign given the asymmetry of the input/output as mentioned earlier.

Summary

Current evidence indicates that switching between gestural and vocal modalities is a natural developmental occurrence in establishing and facilitating early communication and supports the argument to use manual gestures when the vocal modality is underdeveloped or absent.

Links between gesture and sign

It was thought initially that manual signs might be part of a natural developmental progression from gesture and pointing for individuals who were unable to develop intelligible speech and for whom gesture was already serving an important communicative and representational function. Manual signs, as used in a sign language, differ markedly from gesture in a number of ways: they show a disassociation with speech; demonstrate utterance like timing; occur in combination conveying more than one unit of meaning; are segmentable, and the forms they take are convention based (Grove, 1997).

Evidence from typically developing adults indicates that whilst linguistic properties may emerge in a manual form from gesture recruitment to such status occurs only when the vocal mode is removed and may not represent an evolutionary continuum of manual communication (Singleton, Goldin-Meadow and McNeill, 1995). However, this was based upon individuals whose primary mode was spoken language and there is evidence to suggest that children with learning difficulties, whose primary mode is visuo-spatial, do modify signs and gestures creatively to indicate contrastive meaning and as such may perform linguistic, non-linguistic and metalinguistic functions (Grove, Dockrell and Woll, 1996; Grove, 1997).

Smith (1997) states that if a hierarchical relationship exists between communicative gestures and linguistic development in sign it should be particularly evident in children acquiring sign as a first language. Interestingly, findings indicate that the use of gesture and later linguistic development appears to be similar for those acquiring either speech or sign language with gesture performing an augmentative rather than a linguistic function (Pettito, 1993; Smith, 1997; Woll, Grove and Kenchington, 1997). McNeill (1992), based upon Kendon (1988), proposes a continuum in the acquisition of sign language, which suggests that in the transition from gesture to sign language:

" i) the obligatory presence of speech declines,
ii) the presence of language properties increase (and)
iii) idiosyncratic gestures are replaced by socially regulated signs" (p37).

It must be remembered that this relates to sign language rather than manual signs used to augment speech and for which the linguistic learning environments, procedures and
fundamental purpose are markedly different (Clibbens, Powell and Rimmer, 1992; Harris, Clibbens, Chasin and Tibbitts, 1989).

The importance of iconicity in AAC

The level of iconicity or translucency of a manual sign or graphic symbol has long been considered an important factor in the selection of initial vocabulary for individuals with learning difficulties, the belief being that the degree of representativeness would positively effect the learning process (Fuller and Lloyd, 1990; Romski and Sevcik, 1997). However, it is now considered that this may not be the most important factor in sign or symbol acquisition whilst acknowledging that initial vocabularies function primarily as requests for concrete referents (Schlosser, Lloyd and McNaughton, 1996).

"Although translucency of a sign has been shown to influence the rate at which it is acquired, it may not be the single most important factor. The reinforcing value of an item might have a greater effect on the rate at which the corresponding gesture is acquired. That is, a candy bar represented by an opaque gesture might be more easily acquired than a highly guessable gesture for water." (Reichle, 1991: 54)

An additional factor positively affecting sign or symbol acquisition is whether it is introduced to represent a word which is already within an individual's receptive vocabulary, in such instances iconicity has been shown to be of benefit (Hurlbut, Iwata and Green, 1982 cited in Schlosser, Lloyd and McNaughton, 1996). Therefore in situations where receptive vocabulary is being taught this may not be so relevant. Iconicity has been shown to have a positive effect upon listeners' perception of speech intelligibility of adults with learning difficulties using manual signs. Naive listeners (with no prior knowledge of manual sign) consistently rated single words accompanied by iconic signs, but without contextual clues (edited from connected speech), as being more intelligible than those which were not accompanied by signs or when the signs were abstract in nature. This suggests that signing may assist effective communication even for listeners without sign knowledge as many functional signs are highly iconic (Powell and Clibbens, 1994; Clibbens, Powell and Grove, 1997).

Summary

It appears that whilst gestures do perform communicative (representational/ symbolic) functions they are supplementary to and disassociated from spoken and manual sign language in a similar way. In the absence of speech gesture can be assigned linguistic status but this does not necessarily form part of a natural continuum in the expression of complex linguistic information through a manual mode.

The relationship of manual sign and speech

A number of studies have reported the positive effect of manual signing upon early speech development and intelligibility (Kouri, 1989; LeProvost, 1993; Remington and Clark, 1996; von Tetzchner, 1984, Wells, 1981) and later speech development (Clark, Remington and Light, 1988; Layton and Savino, 1990). Longer term positive effects of early sign intervention have also been reported for spoken vocabulary and social interaction skills including turn taking and active conversation roles (Launonen, 1996, 1998; Miller, et al., 1995). Miller et al., reported that early signing increased communicative success for children in the use of early words and in vocabulary growth although as intelligibility improved and the number of communication partners and vocabulary size increased sign use declined.
A small scale within-subject study with adults with learning difficulties suggests there may be continued advantage in sign use after the development of speech (Powell, 1993; Powell and Clibbens, 1994). The relative intelligibility of speech produced with "high" signing and without manual signs ("low" signing: cf Grove and McDougall, 1991) revealed consistently positive effects upon perceived speech intelligibility whether the speaker could be seen or not. This positive effect held for speakers who had previously been rated as "poor" - virtually unintelligible, and "good" - reasonably intelligible to strangers, which questions the earlier trend of only introducing sign to those with no, or mainly unintelligible, verbal output. These findings support the argument that manual sign not only facilitates the development of communication and speech but can also contribute positively to speech intelligibility.

**Summary**

The use of manual signs can facilitate early communication and vocabulary growth and also enhance speech intelligibility for older individuals who may otherwise use speech as their main mode of communication.

**The relationship of manual sign and expressive language development**

A longitudinal study by Launonen (1998), evaluating the effect of early signing intervention between six months and three years of age demonstrated facilitation of a typical balance in mother-child patterns of interaction allowing active rather than passive conversation roles for the children, and long term gains in expressive language and cognitive skills (Launonen, 1996; 1998).

In an unusual study involving twin girls with Down Syndrome born to deaf parents who used BSL, Woll, Grove and Kenchington (1997) found the children to have difficulties in mastering the linguistic systems of both sign and speech. Whilst this raises questions around the use of sign, given that they were exposed to a natural language environment which would be expected to provide a better learning opportunity than those exposed only to keyword signs, they were also exposed to a bi-lingual environment and were therefore required to master two different linguistic systems. Given the profile of delayed acquisition of syntax known to exist in Down Syndrome (Chapman, 1995; Fowler, 1990) this may have added to their difficulties although they might have been expected to show an advantage in the visuo-spatial mode, which was not the case.

Despite the undoubted success of manual signing (and graphic symbols) in facilitating communication in verbally disadvantaged groups a number of studies suggest that AAC users with learning difficulties experience difficulty in developing expressive language in either mode beyond a basic level (Grove, Dockereill and Woll, 1996; Heim and Baker-Mills, 1996; Smith, 1996a, 1996b; Udwin and Yule, 1990). Grove (1995) and colleagues (1996), for example, found that output for children whose primary expressive mode was manual sign rarely produced utterances beyond Brown's (1973) Stage I (MLU 1.0-2.0) and II (2.0-2.5) despite comparatively higher comprehension levels for speech and sign utterances. This finding was supported by Launonen (1996; 1998) who found the children with Down Syndrome in her study rarely progressed beyond one unit of meaning in sign when using sign and speech despite developing longer MLUs using speech alone.

Questions are being asked as to why there should be such a ceiling in the expressive use of manual signs: whether it is due to properties inherent in the way AAC systems are
represented mentally (Hjelmquist, 1997); whether the constraints exist within the systems
themselves (Smith, 1996a; Smith and Grove in press) and the way in which they are
presented (Grove and McDougall, 1991); and whether different AAC intervention strategies
should be pursued at different points in the language development process (MÆ ller and
von Tetzchner, 1996) after the acquisition of an initial functional vocabulary (von Tetzchner,
Dille, Jorgenesen, Ormhaug, Oxholm and Warme, 1998).

Factors which may constrain expressive language
development for AAC users

Influence of communication partners

The quality, quantity and consistency of AAC input to individuals cannot be ruled out as a
contributory factor to restricted output however, how best to optimise this is still uncertain
(Smith, 1997). In the study by Grove and associates (1996) the number of manual signs per
spoken utterance produced by teachers was rarely above 2.0 which if a socio-cognitive
approach relying upon modelling is adopted, could in part explain the children's restricted
performance. In addition, individuals relying upon manual signs and graphic symbols are
frequently only exposed to their use in planned routines and limited situations indicating that
input may be both impoverished (Bryen and McGinley, 1991; Grove and McDougall, 1991;
Kiernan, Reid and Jones, 1982) and context specific, which may explain the paucity of
spontaneous use (Udwin and Yule, 1991).

Studies with both children (Grove and McDougall, 1991) and adults who use manual signing
have shown a trend of increased sign use with staff who sign against those who do not
despite poor levels of intelligibility and communication breakdown (Calculator and Delaney,
1986; Powell, 1993; Powell, 1998).

The importance of bimodal input (sign or symbol plus speech) by communication partners as
a means of modelling and promoting a shared communication mode cannot be dismissed
(Calculator, 1988; Grove and McDougall, 1991; Romski and Sevcik, 1996). However, whilst
multi-modal or bimodal input is reported to be an advantage (Iacono, Mirenda and
Beukelman, 1993) reservations have been expressed at more complex linguistic levels (Woll,
Grove and Kenchington, 1997). Remington and Clark (1993a, b) for example, claim multi-
modal input may facilitate or inhibit as attention may be given to only one mode. This view is
supported by McNeill (1992) and Singleton, Goldwin-Meadow and McNeill (1995) who
suggest a language-like organisation of the manual-gestural code occurs only at the
expense of speech being suppressed and the visuo-spatial mode coming to the fore.
However, this may already be a typical occurrence for individuals with Down Syndrome as
noted earlier (Elliott, Pollock, Chua and Weeks, 1995).

The way in which communication partners interact with children using bimodal or multi-
modal systems differs when the primary mode is different for the two parties. For example in
‘parentese’ (speech-speech) and responsive interaction approaches to intervention, a
number of adjustments are made when speaking to young children, amongst them
modelling, recasting and expansion (McTear, 1985). These strategies are believed to
facilitate the acquisition of higher level morphology and syntax particularly in children whose
mean length of utterance (MLU) is above 2.5 (Yoder Kaiser, Goldstein et al. 1995).
Interestingly, this is the point beyond which very few AAC users progress (Grove et al. 1996;
Grove and Smith in press) and for whom such strategies in bimodal or multi-modal form are
unlikely to be part of the typical communicative exchange when feedback, clarification
and expansion is more likely to be the vocal mode (Alm and Newell, 1996; Powell, 1998).
Capirci, Iverson, Pizzuto and Volterra (1996) also point out that the ability to use representational combinations beyond a one element level in a modality may depend upon exposure to that as an input. Current research findings suggest this rarely occurs for AAC users.

**Influence of the systems themselves**

It is possible that one of the reasons for restricted output may lie within the systems themselves (Smith, 1996a; Supalla, 1991). Smith and Grove (in press) suggest that the modes of communication offered to individuals with communication disorders differ from spoken language and sign languages in the potential for segmentation and re-combination (Light, 1997; Smith and Grove, 1996), an important feature of natural languages. The absence of these features may constrain the production of novel utterances with multiple units of meaning. This in turn denies children using AAC the opportunity to experiment and produce 'output as input' and to 'play' with language (Elbers, 1995) the experience of which is believed to facilitate aspects of the analytical process underlying typical spoken language acquisition. If this is the case AAC users who are non-speakers are placed at a distinct disadvantage when the process of acquiring this skill is reliant upon comprehension alone (Blockberger, 1998).

**Influence of the perception of the system by communication partners**

Whilst Grove and colleagues (1996) found the number of signs within utterances produced by children restricted, detailed transcription and analysis revealed features which could not be attributed to the teachers' input and which appeared to convey additional meaning. These features included:

- **sign order** as in ABA sequences:
  - DUCK EAT DUCK 'The duck is eating'
  - BUS RED BUS 'The bus is red'
  - CHAIR MUMMY CHAIR 'Mummy is on the chair.'

- **sign modifications**, examples included: repetition of signs to pluralise; change of location of a sign to a different signing space from normal when retelling a past event (narrative); elaboration of a sign and change in orientation as in using two hands for the sign LOOK, and reversal of the sign towards self to convey a directive - "All of you look at me!" (p109). Specifically, changes to hand shape indicated properties of objects which were referents of the sign; changes in location indicated how or where and action was located, and changes in movement about the manner or how an action was performed. Grove et al, suggest this is evidence of creativity at the morphological and cognitive level, being related to gestural and iconic properties, rather than the development of syntax. However, in order appreciate this fully clinicians and others need to develop more understanding of the structure of sign and be able to adequately identify contrasts and consistencies indicative of linguistic development in order to comment and expand in a manner more equivalent to that of typical spoken interactions.

**Critical periods**

A number of critical periods have been proposed in language acquisition which may be particularly important in terms of intervention for those experiencing difficulties in acquiring language normally (Rondal and Edwards, 1997). Rondal and Edwards cite a number of
studies (Curtiss, 1977, 1988; Mayberry, Fisher and Hatfield, 1983; Newport, 1992; Ploog, 1984; Quigley, Smith and Wilbur, 1974) which indicate that whilst vocabulary and pragmatic skills may be acquired well beyond adolescence this is not the case for syntax in either spoken or sign languages which is optimally acquired before the age of eight. Interestingly, MRI studies indicate that second language learners store phonological elements of both languages in the same place if learned during the language acquisition period (before the age of ten) and separately if acquired after this period (Montgomery, 1998) whereas semantic features are stored together. Lenneberg (1975 cited in Rondal and Edwards, 1997) also proposes a decline in the plasticity for phonological learning after the age of seven which has implications for the timeliness of programmes of intervention addressing this aspect of development.

If the critical period argument is taken as true there are important implications for how and when intervention based upon AAC is provided particularly in the case of syntax. Results from studies with children with Down Syndrome (Buckley, Bird, and Byrne, 1996) indicate that early intervention using manual sign can facilitate all aspects of language including syntax and reading.

**Metalinguistic and pragmatic use of manual sign**

To perform as a competent communicator it is necessary to enter into a collaborative process (Clark, 1996) which involves the speaker in not simply sending a message but also in ensuring it is adequately understood by their communication partner (Abbeduto and Hesketh, 1997). This involves both questioning behaviour and modifications, or repairs, to the initial utterance if so required. There is evidence to suggest that individuals using bimodal communication use sign quantitatively differently depending upon the nature of the communication context, including the cognitive demands and the communication partner (Grove and McDougall, 1991; Powell, 1998; Smith and Grove, in press). It may therefore not be a static personality trait within an individual's communication repertoire but may be a reflection of communicative competence (Hymes, 1971; Garvey, 1977; Powell, 1998). Smith and Grove conclude that bimodal signing increases in contexts such as story recall (facilitated by pictures) for two reasons: firstly such a task specifically targets visuo-spatial contrasts which may predispose an individual to produce more signs and gestures (McNeill, 1992) and secondly, the cognitive demands involved in the recall of sequential material may require the recruitment of an alternative mode if spoken language is unequal to providing sufficient detail (Rime and Schiatura, 1991). Hence, in order to communicate information which is visual and complex the load of linguistic organisation is transferred to a shared vocal-manual base (Smith and Grove, in press) enabling the speaker to communicate the required information more competently.

Powell (1998) found that whilst the adults in her study used manual signs as a means of repairing spontaneous conversations this was only used as a second repair attempt with modifications if the staff member also used sign. In instances where the staff member did not use sign the conversations were shorter in length and were more likely to be abandoned. This again indicates the influence of conversation partners in not only optimising the communication abilities of AAC users but in facilitating opportunities in which they can operate competently.

**Conclusion**

The use of manual sign continues, without doubt, to support early communication skills and lexical development for children and adults unable to express themselves verbally.
Launonen, 1998; Miller, 1995). Semantically children have been shown to produce modality-specific (manual) strategies to add to the meaning however, syntactic abilities tend to remain restricted with the majority reaching a plateau at an early stage of development (Grove, Dockerell and Woll, 1996).

Who signs, when and where affects the socio-cultural aspects of manual sign which is still perceived as a lower status means of communication than speech (von Tetzchner, Grove, Lonke, Barnett, Woll and Clibbens, 1996). The influence this may have upon an individual’s willingness to use sign, and how much of a hindrance it poses to individuals developing towards their language potential is still unknown.

How best to structure intervention for children and adults learning language through manual signs is still a matter for further research and evaluation although certain factors seem clear and support earlier recommendations:

1. Intervention needs to occur as early as possible in order to capitalise on critical periods in speech and language development. This is particularly crucial for optimising early child-carer communicative interactions and enhancing later language skills and syntactic development.

2. The use of bimodal and multi-modal communication by communication partners is required in order to redress the asymmetry of input and output. Whilst this requires further research it is known to positively influence sign use by children and adults with learning difficulties in a number of contexts and can alleviate communication breakdown.

3. Clinicians and others need to develop more understanding of the structure of sign and be able to adequately identify contrasts and consistencies which are indicative of linguistic development in order to comment and expand in a manner more equivalent to that of typical spoken interactions and so promote development.

Whilst this review presents some points which may appear potentially negative for the use of manual signs in terms of complex linguistic development, it must be remembered that it continues to offer one of the most effective and meaningful communication modes for individuals with learning difficulties. How to optimise intervention and allow individuals to realise their communication potential continues to be a challenge for clinicians and researchers alike.

References


