Actions speak louder than words:

Signing and speech intelligibility in adults with Down's syndrome

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Previous studies into the use of key-word signing with people with a learning disability have concentrated on its contribution to the development of speech and language. The few studies focusing on its relationship to actual speech production and intelligibility were based on taught target words or phrases. This study, which was of quasi-experimental design, looked at whether reported improvements in intelligibility were supported in spontaneous speech production. Communication samples were collected by video recording 'good' and 'poor' speakers under 'high' and 'low' signing conditions. 'Skilled' and 'naive' raters assigned intelligibility ratings under 'seen' and 'unseen' conditions. It was predicted that speech from the 'high' signing condition would be rated more highly than that from the 'low' signing condition. This was supported. The iconicity of signs was shown to have a positive effect for 'naive' raters when rating the 'poor' speakers, which may counter previous arguments that the general public would be unable to understand communication attempts by people using key-word signing.

Introduction

The research reported here arose from discussions within a team of speech and language therapists working with people with learning disabilities, during the process of clinical audit and peer review. Observations were made regarding the apparent improvement in the intelligibility of speech when adults involved in 'Total Communication' groups used key-word signing. Concern was expressed however, as to whether the speech was actually more intelligible or whether it was the knowledge of sign that was assisting therapists in interpreting otherwise (partly) unclear utterances.

In recent years there has been greater recognition of the need to use augmentative and alternative communication systems with people with learning disabilities. The Total Communication approach advocates that all modes of communication be made available to the person with communication difficulties as appropriate. This can involve the complementary use of speech, manual signs, photographs and pictorial symbols alongside all the usual elements of non-verbal and paralinguistic communication. Key-word signing is the simultaneous use of speech and manual signs from the Makaton Vocabulary and British Sign Language for the Deaf to support key words in an utterance.

A literature search revealed a lack of empirical research material to support the therapists' observations in *spontaneous* utterances. Previous studies had focused on subjects producing pre-prepared word lists and taught target words, and where the subjects were predominantly children (Creedon, 1981; Sisson and Barrett, 1984). Grove and McDougall's (1991) study revealed differences in the amount of sign use by school children between environments where sign was used frequently and those where it was limited. Where sign was used frequently (high signing environment) the children appeared to understand that the 'communication code' included sign use and adapted their communicative style accordingly. Informal observations by the speech and language team appeared to support this in relation to adults with a learning disability.

Previous research strongly suggests that the use of signing encourages speech and language development (Creedon,1981; Grove and Walker, 1990). When the use of signing as an augmentative system is initially proposed parents and carers are frequently wary that signing will replace speech, or cause a reduction in any present verbal skills, despite many studies showing evidence to the contrary (Creedon, 1981; Sisson and Barrett, 1984). These fears have led to continued pressure on speech and language therapists to provide 'speech only' treatment programmes, particularly for those who already have some recognisable speech. However, many people with learning disabilities do not possess the pre-requisite skills required to modify speech production, due to, for example, hearing impairment, dyspraxia or poor self-monitoring skills.

Another frequently voiced opinion is that the general public will be unable to understand communication attempts using key-word signing as they do not have a knowledge of sign (Kiernan, 1983). However, in a functional setting this has yet to be proven. This study aimed to test the hypothesis that the use of key-word signing may improve the intelligibility of spontaneous speech without working directly upon articulation or the phonological system.

Method

To discover whether key-word signing, within the context of a total communication approach, increased the intelligibility of spontaneous speech in adults with a learning disability, the 'high' versus 'low' signing environment concept was used as the basis of a within-subject comparative study.

There were four male subjects, all presenting with Down's syndrome and with a mean age of 34.4 years (range 24-37). All attended community resource centres and had received total communication therapy from the speech and language team, but without any direct input for a period of twelve months. They were filmed in both 'high' and 'low' signing situations. This was defined by the amount of sign used by the familiar person with whom they were conversing, i.e. one always used key-word signing whilst the other did not. The subjects were classified following a non standardised phonological assessment, as being either 'good' or' poor' speakers, there being two of each.

The video tapes were then edited to include examples of elicited and spontaneous single words, and spontaneous phrases, presented at ten second intervals. For both the 'high' and 'low' conditions the utterances were matched within, but not between, subjects. The video tapes were then rated for intelligibility by three different types of rater in an attempt to see how different groups may react to differing levels of speech intelligibility and key-word signing.

The raters were i) a 'skilled' listener who knew sign (a speech and language therapist who did not know the subjects), ii) a 'skilled' listener with no knowledge of sign (a speech and language therapist who worked in a different speciality), and iii) two 'naive' listeners who had no sign knowledge or prior contact with the client group or speech and language therapy; representing the general public. In order to see whether sign had an effect upon intelligibility, over and above the normal non-verbal cues, it was decided that all segments should be rated by listening only ('unseen' condition), as well as by normal viewing ('seen' condition).

Randomised video segments were presented of each subject in the following conditions: i) 'low' unseen (i.e. heard only), ii) 'high' unseen, iii) 'low' seen (i.e. seen and heard) and iv) 'high' seen. The interval between sessions was two days, except over weekends when it was three. After a trial rating, raters were asked to score the level of intelligibility on a five point ordinal scale (where 1 was speech rated 'unintelligible' and 5 was 'totally clear'). Raters wrote the word they thought had been said and then assigned an intelligibility rating on the ordinal scale alongside for the elicited and spontaneous single word presentations. When rating phrases only an overall intelligibility rating was assigned.

As the focus of the study was spontaneous speech, the elicited responses were excluded from the segment raw data for analysis. Where a single word response differed from the target word the score was reduced to the minimum 1. Raw scores were summed and converted to a percentage. Iconicity was noted for single word production in the 'high seen' condition. Intra-rater reliability was measured and found to be acceptable. Due to the small sample size and variability within subjects it was felt that any significance shown using inferential statistics would be questionable. Therefore the results are purely descriptive.

Results

All subjects were always assigned a higher intelligibility rating in the 'high' condition (i.e. when key-word signing was used) than in the 'low', even when the segment was rated by listening only ('unseen'). The overall mean difference was 12% in favour of the key-word signing condition for all subjects. This may imply that key-word signing had a positive influence on the level of speech intelligibility. Many non-verbal cues naturally accompany normal spontaneous speech, so the results for the 'unseen' condition were examined. In the 'low' condition (no sign) whether raters did or did not see the segment had virtually no effect (0.8%). However in the 'high' condition (key-word signing) there was an increase of 14% in intelligibility when the segment was heard only. A comparison between the 'high seen' and 'low seen' conditions showed an increase in the intelligibility rating of 18.4% in favour of key-word signing. Therefore it appeared that the use of key-word signing had a positive effect upon intelligibility over and above the normal non-verbal cues.

The results also showed that under all conditions the 'good' speakers were rated higher (35% on average) than the poor speakers, supporting the classification system that had been used. Interestingly the 'poor' speakers showed a lower increase in intelligibility when using key-word signing than the 'good' speakers, but, when sign was not used ('low seen' condition) the majority of their utterances were rated as unintelligible. The improvement displayed by the 'good' speakers may reduce fears that verbal skills will be reduced by the use of key-word signing.

Whilst key word signing is described as the simultaneous use of speech and sign not all key words are necessarily signed. The number of signs used simultaneously was explored but, with the exception of one subject, there appeared to be little or no relationship between the intelligibility scores and the percentage of words signed.

It was anticipated that the 'skilled' raters would assign higher intelligibility scores by virtue of their higher-than-average exposure to people with intelligibility difficulties. However, this was only borne out 50% of the time. In the remaining 50% equal or higher intelligibility scores were assigned by the 'naive' raters. They also consistently assigned higher intelligibility scores to the two 'poor' speakers than the 'skilled' raters. This may have been because the 'skilled' raters were focusing upon the phonological profile rather than the overall 'guessability' of the message. There was virtually no difference between the two 'naive' raters' scores.

As mentioned previously it was predicted that the knowledge of sign would positively influence the intelligibility rating in the 'high seen' condition by the 'skilled' rater with sign knowledge. This was not the case for the 'good' speakers. However the two 'poor' speakers were consistently assigned higher scores by the 'skilled' rater with sign knowledge than by the other three raters. These findings in part support the supposition that the speech and language therapists' observations were being influenced by their knowledge of sign.

The effect of the iconicity of signs upon the intelligibility rating was explored in detail. Interestingly for the two 'good' speakers there was no difference across all raters between signs which were classed as iconic or not. However, for the two 'poor' speakers a different picture emerged. Only words paired with signs that were considered to be iconic were

assigned a rating by both the 'naive' raters and the 'skilled' rater without sign knowledge, the rest were considered to be "not understood." For the 'skilled' rater with sign knowledge the level of iconicity had no influence for any of the subjects. This positively supports the speech and language therapists' impressions that they were being influenced by their sign knowledge. However, it may also refute the argument outlined by Kiernan (1983) that the general public would be unable to understand communication attempts by sign users. If signs are iconic in nature, and many of the functional signs are, then they can assist the 'naive' listener in interpreting the spoken message.

Conclusions

In the past sign use has been advocated mainly for people who have little or no speech. This study has shown that those with relatively 'good' speech can achieve increased intelligibility. This may cast doubt upon the advisability of phasing out the use of sign as speech develops. This study supports, in spontaneous speech production, the findings of Sisson and Barrett (1984) that "sign training appeared to facilitate appropriate oral speech" (p.564). Furthermore it is in agreement with results indicating that Total Communication may have facilitated improved articulation, and, of greater importance, that it was significantly more effective than speech exercises or word imitation (Wells, 1981).

The authors would like to stress the significant role that keyword signing can play, as a therapeutic tool, in improving speech intelligibility as part of the Total Communication approach. In order that the majority of people with a learning and communication disability may *optimise their communication potential,* parents and carers should be involved in implementing this approach.

It is recognised that there is a need to repeat this study with amendments and a larger sample, to be able to draw more conclusive results. Further investigation is also required to examine why there is a positive effect on speech intelligibility when using sign, but the findings here do suggest that this relationship exists.

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