The impact of high-tech augmentative and alternative communication (AAC) on the language and communication of students with autism

Rebecca Checkley, UK

Editorial comment
Rebecca Checkley is a paediatric speech and language therapist with a background in teaching and a long-standing interest in learning difficulties and the use of information technology to support language learning and communication. She currently works at a specialist school for children with ASD. In this paper, Rebecca presents the current evidence in support of the use of high-tech aids to develop communication and language. It is clear that there is relatively little written on the topic and opinions are divided over the wisdom and efficacy of the use of such aids with children with ASD. So her study is an important one as it adds to the literature and her data appears to show benefits to the two children concerned. Rebecca's paper is a prompt for further research on the use of these relatively new technologies.

Address for correspondence
Sutherland House school
Sutherland Road
Carlton
Nottingham NG3 7AP
E-mail:
Rebecca@scarthin.wanadoo.co.uk

Acknowledgements
I would like to acknowledge the dedication and creativity of teaching staff, Salena Eaton, Helen Hamilton and Caroline Morrison, who worked with me on this study. My thanks also to the boys' parents and the staff at Sutherland House School for their support, and to Owen and David who showed us what could be achieved.

Introduction

It is estimated that between a third and a half of all people diagnosed with autism do not use speech functionally (National Research Council, 2001). Although augmentative and alternative communication (AAC) aids have been reported to offer valuable potential in supporting the communication of people with ASD (Mirenda, 2003) the use of high-tech communication aids for people with autism remains controversial. For example, in Goldman's (2002) AAC assessment protocol for non-verbal children with ASD, she specifically excludes high-tech communication aids, unless a child has additional physical or neurological needs:

> *'high-technology AACs are not generally considered for this client group... learning about communication and why and how we interact with others would not be greatly aided by the use of high-technology AACs. The 'cause and effect features' of such aids may also serve as communication distracters, and could therefore hinder rather than promote communication.'*
>
> (Goldman, 2002, p2)

Discussion with specialist colleagues indicates that this perspective is widespread and has informed decisions about the allocation of resources to buy high-tech AAC for children with autism. In this context of controversy, it became a priority to systematically evaluate our use of high-tech aids with children with ASD, since our experience was that, in practice, a range of positive benefits were observed. The project reported here was a preliminary, empirical study to clarify the issues at stake, and to begin to identify an agenda for further research into the impact of high-tech AAC on children with autism.

The research project

The research project developed from a speech and language therapy (SLT) intervention with two primary-aged boys with ASD and severe language disorder. One boy had little spoken language and the other had none. Both boys attend a specialist school for children with ASD where there was no existing use of communication technology. In the initial intervention, the boys were provided with voice output communication aids (VOCAs), by running talking software (Clicker 4) on laptops. In each case,

significant changes in a range of their communicative and independence behaviours were reported, including increases in spoken language, attention and book-sharing. In addition, an external specialist AAC team made a highly positive assessment of the intervention after watching video recordings.

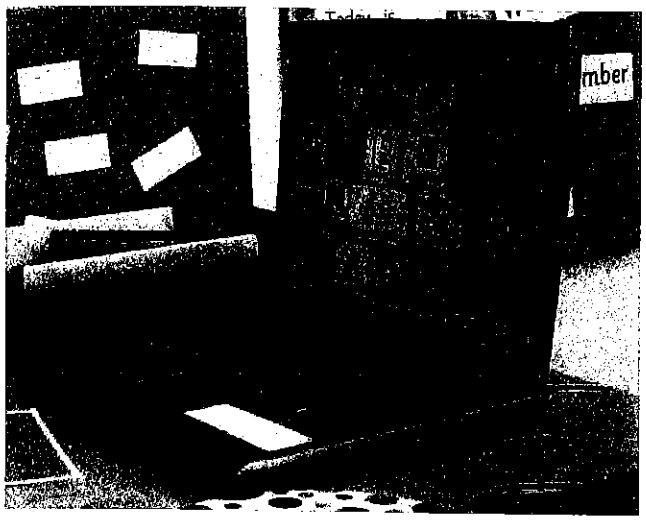
Evidence-based practice

The project was based on principles of evidence-based practice (EBP) and was guided by Ralph Schlosser's work in this field (Schlosser, 2003). Through EBP, health practitioners question the value of a therapeutic intervention by combining workplace research, academic research findings, clinical expertise and the views of the child, parents and others involved. Central to EBP is 'stakeholder evaluation', where the views of those affected by the intervention, shape conclusions about its value. In addition, it is expected that an intervention should be 'ecologically valid', that is, directly relevant to the child's real communication challenges.

Definitions and terminology

Within the field of AAC, aids are categorised as *low tech,* paper-based aids (eg as in the Picture Exchange Communication System (PECS) (Bondy and Frost, 1994), medium tech, battery-operated, recorded speech aids (eg Big Mac) and *high tech* with multiple messages, synthesised speech and dynamic display (eg DynaVox). Communication software is increasingly available to run on ordinary computers to create high-tech aids.[1]

Figure 1: Laptop running Clicker 4, set up as VOCA



[1] AAC information available at www.ace-north.org.uk
[2] Clicker information available at www.cricksoft.com

We had no access to dedicated high-tech aids or specialist software so we used educational software (Clicker 4) on a laptop to create this facility.[2] With Clicker 4 we were able to build multiple linked word screens with voice output and thus provide our students with high-tech VOCAs (see Figure 1).

Review of the literature

Research throughout the field of AAC is frequently described as inadequate (Mirenda, 2003; Schlosser, 2003), specific areas of AAC remain largely unaddressed (Von Tetzchner and Grove, 2003) and many studies are undermined by methodological weaknesses (Schlosser, 2003). This lack of research evidence challenges practitioners' ability to justify the use of expensive high-tech communication aids (Schlosser, Blishak and Rajinder, 2003) and is a critical weakness in practice (Von Tetzchner and Grove, 2003).

The research base for VOCA use in autism

In a unique paper, Mirenda (2003) seeks to present what is known about the use of VOCAs by students with autism. She identifies nine relevant studies, all located in schools. The complexity and type of aid varies and only two studies, Light et al (1998) and Mirenda et al (2000, cited Mirenda, 2003) include computer-based, high-tech aids. Light et al (1998) present a single case study description which aims to develop an assessment procedure and Mirenda et al (2000) carried out a retrospective examination of 58 people with autism who had loaned VOCAs from a state loan bank. Mirenda et al (2000) conclude that both computers with communication software and dedicated VOCAs can be used successfully in school to support the communication of students with autism.

More recently, Gallimore et al (2005) describe the introduction of high-tech dedicated VOCAs to two students with autism aged 16 and 18. They report a range of positive outcomes including students' use of a wider vocabulary, improved intelligibility and spontaneous novel self-expression. They conclude:

> *'These facilities may reveal a previously unknown language skill.'*
>
> (Gallimore et al, 2005, p.12)

In Schlosser, Blishak and Rajinder's (2003) comprehensive review of general VOCA research, they include investigations into the impact of VOCAs on partners' attitudes towards AAC users. We have found no similar research in relation to VOCAs and autism.

The impact of VOCAs on spoken language

Mirenda (2003) refers to the 'growing body of research' which indicates that AAC facilitates the growth of spoken language in people with autism. She describes two studies incorporating VOCAs which record speech progress in people with ASD (Mirenda et al, 2000; Romski and Sevcik, 1996, cited Mirenda, 2003). Romski and Sevcik (1996) suggest that progress may occur because the consistency of the synthetic speech output supports language learning.

The development of language and communication in children using AAC

Von Tezchner and Grove (2003) seek to explore the language development of children who use AAC. They make references to children with autism and their conclusions have relevance to all children using AAC. They demonstrate that AAC users have a very different language learning experience to that of normally developing verbal children. Their language growth is invariably scaffolded by professionals, not the child's family, and AAC users have much less possibility of leading and active learning. Unlike normally developing children who grow within a community of spoken language users, language development opportunities for children who use AAC are crucially dependent on planning; children depend on the means and opportunities provided by professionals. The attitudes and expectations of people in the child's environment are therefore critical.

Computer-assisted learning and ASD

Williams et al (2002) reviewed the research into computer-assisted learning (CAL) in autism and describe positive outcomes in learning and behaviour which they link to its visual mode of presentation. Murray (1997) has also suggested that the features of computers make them a unique context for shared experience and thus for building communication with students with autism.

In summary, there is very little research in this field, but the literature does suggest that people with ASD can benefit from VOCA access and that VOCAs may facilitate progress in spoken language. The communicative environment is considered critical to progress and computers may offer a particularly effective medium for learning. Set within this context, our project aimed to explore the language and communication achievements of students with computer-based VOCAs, in a functional context with their usual communication partners.

Project design and procedure

The project was designed to answer the following question:

> *In what ways does access to a VOCA change the language and communication of primary aged children with autism and severe expressive language disorder in class curricular activities?*

Participants

Two children, Owen (aged 10) and David (aged 11), from different classes were included (the names have been changed to protect their identity). Owen uses unintelligible, single, open-syllable utterances supported with single Makaton signs and PECS. His comprehension is at a two to three word level. He was introduced to Clicker 4 in January 2004 and we secured funding to buy a Dynavox which arrived during the project period. David's primary mode of expression is speech. His expression is at one to two word level, with jargon. His comprehension is at a three word level. He was introduced to Clicker 4 in June 2004.

Research design

This project aimed to combine qualitative and quantitative data both to meet the requirements of EBP and to provide a broader database for answering our project question. Quantitative data was collected through video analysis, qualitative data through questionnaire and diary records completed by the staff and parents. The project used an A–B design and attempted to address the limitations of A–B design (Schlosser, 2003) by using multiple baselines and recording outcomes in a treated and non-treated context. Two communication behaviour baselines were recorded in two subject sessions for each child and the VOCA intervention was applied to one subject area only. Samples of video were reanalysed by three independent therapists to produce a measure of inter-observer reliability and support a consistent analysis of the video data.

Project timescale

The project ran over a 12-week term. The children were initially videoed in a science and maths lesson with no VOCA access, to collect baseline data. The intervention had two strands. The children's VOCA skills were developed in individual sessions with their key worker and the SLT throughout the project period. In addition, after approximately six weeks, the VOCA was introduced into one class subject with no direct SLT support. At the end of the project period, each

child was again videoed in science and maths to investigate changes in their communicative behaviours. Parents and teachers completed a questionnaire at the start and end of the project to provide qualitative evidence for this review. A record of each child's attitudes to the VOCA was attempted by including a photo of the laptop within the child's PECS choice symbols. Each key worker was provided with a diary to record the children's laptop requests and any other observations.

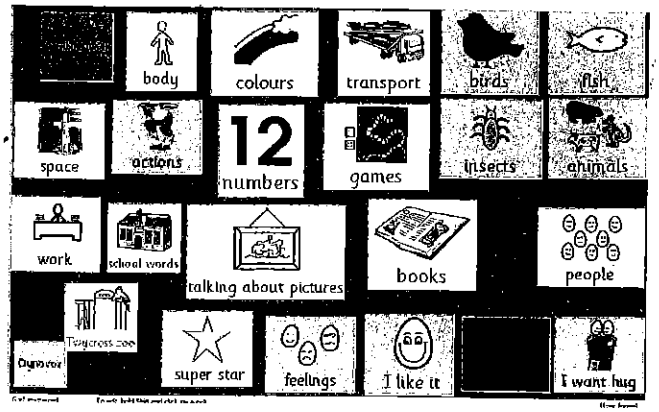
Intervention

The VOCA intervention was based on a list of principles for effective intervention in AAC. To devise this list, we drew on the literature review and on training resources from SCOPE (Hazell and Larcher, 2005) and ACE Oxford (Moore and Gresswell, 2004). We identified three aspects of successful intervention: the child, the communication partner and the communication environment. Each child's key worker took the role of communication partner, working alongside the therapist to develop the child's VOCA use. The AAC principles were regularly discussed with the child's key worker and class teacher. We aimed to raise staff awareness and provide opportunities for discussion, but the project did not work directly on partner skills and communicative environment. The main focus of this intervention was to expand the child's VOCA skills.

The key features of the child intervention were as follows:

- **Building the child's independence in accessing vocabulary.** Children were introduced to a master screen which linked to all their word screens (see Figure 2). Children practised navigation to locate vocabulary.
- **Expanding language.** New vocabulary was regularly introduced and children worked on sentence building. Children's interest materials were used to encourage creative and extended language.
- **Expanding functional use. Self-expression cells** (eg 'I need a hug', 'finish') were included, linked to an emotions screen. This was used in informal interaction and in structured activities. Games were introduced which encouraged children to use the VOCA in pragmatic ways, for example directing, questioning, requesting and guessing.
- **Opportunities for unplanned learning.** Time was made to follow the child's lead; building screens with the child that reflected the language of their interest.

Figure 2: Master screen



Through these activities the children became familiar with two types of word screen: categorical linked vocabulary screens and task specific screens which had all the vocabulary necessary for a particular task (see Figures 3 and 4).

Figure 3: Categorical vocabulary screen about space

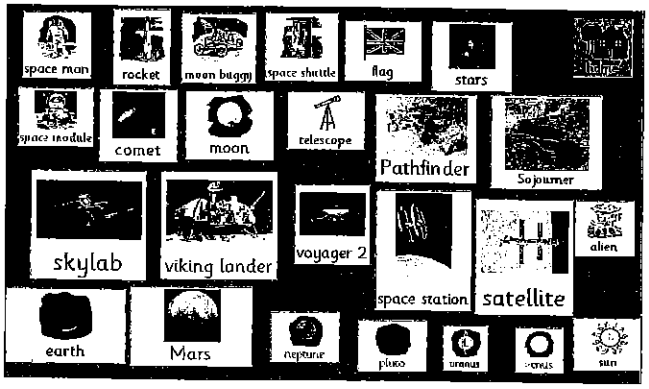
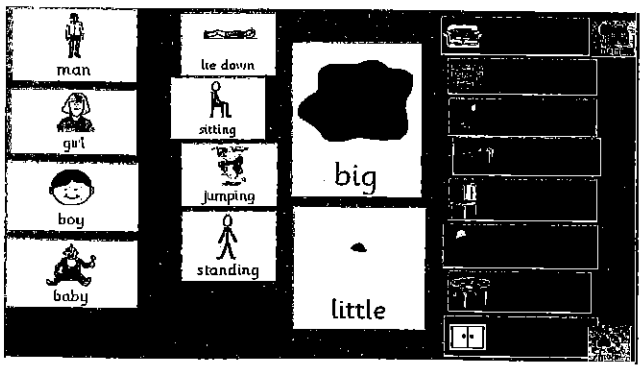


Figure 4: Task specific screen: 'sentence building with adjectives'



Data collection and analysis

Quantitative evidence was collected through the analysis of 20-minute clips of video from each lesson. Changes in language were measured by recording the total amount of vocabulary children used, expressed through sign, symbol, speech or VOCA. Changes in communication were measured by recording children's range and frequency of verbal and non-verbal communicative acts. Behaviours were categorised using criteria drawn from *The Pragmatics Profile of Everyday Communication Skills in School-Age Children* (Dewart and Summers, 1995). Behaviours were additionally categorised as directed to self or other and prompted or spontaneous.

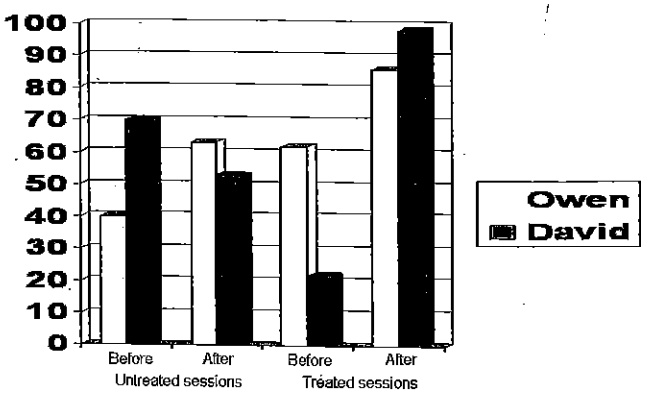
Qualitative evidence was collected through the analysis of questionnaires completed by parents and staff. The questionnaires explored feelings about communication aids, their priorities for the child and their observations of the child's communication. The key worker diaries were used to find evidence for the child's evaluation of the VOCA.

Results

Quantitative data

Both children used most vocabulary when they had access to a VOCA and included vocabulary in a greater proportion of their communicative acts (see Figure 5). David used the VOCA and speech with similar frequencies, often using the VOCA to answer and then repeating with speech. Owen's VOCA use dominated his communication. He used this alone in 68 per cent of his communications. David used the VOCA mainly for curricular vocabulary, but occasionally switched to other favourite screens to say space words. Most of the vocabulary Owen used was also curricular, but he had brief periods of repetitive cell pressing where he explored the lesson screens and listened to words.

Figure 5: Proportion of children's communicative acts that included vocabulary



The video analysis showed that prior to the intervention the boys had individualised patterns of communication. David's communication took two main forms – self-expressive behaviours and responses – with occasional instances of two other behaviours. Similarly, self-expressive behaviours and responses dominated Owen's communication, but he 'gave information' relatively frequently and showed instances of all categories of behaviour. He had a more balanced communicative profile.

After the intervention, the boys showed broadly similar frequencies of communication behaviours in the second, untreated session (see Figures 6 and 7). However, when the VOCA was introduced into class, both students showed a marked fall in self-expressive behaviours, while another behaviour increased. For David, self-expressive behaviours fell from 75 per cent to 11 per cent of his communications, while 'responses' increased from 10 per cent to 81 per cent. Owen's self-expressive behaviours fell from 31 per cent to 8.5 per cent of his communications, but 'giving information' increased from 5 per cent to 23 per cent. The data notes record that in many of these instances Owen was shouting out relevant vocabulary to the teacher leading the session. Self-expressive behaviours were defined as those which expressed emotion or asserted independence. Behaviours recorded in this category included Owen's hand biting and paper shaking, and David's behaviours included musical vocalisations, face tapping and putting fingers to his ears.

The data also recorded the direction of the children's communications (to self or to others) and whether they were spontaneous or prompted. David showed no clear patterns. Owen, however, had a very stable pattern of communication. With and without the VOCA around 70 per cent of his communications were directed to others and at least 45 per cent of his communications were spontaneous.

Qualitative data

Analysis of the qualitative data revealed generalised changes in the children's communication. Carers reported increases in the quantity and range of children's vocabulary and communicative behaviours:

> *'We were doing a goodbye card today and he was doing the wording; he said (using VOCA) "Thank you" and "love you"... It wouldn't have occurred to me to offer that, because they're outside of basic needs and wants.'* (Owen's teacher)

Figure 6: Number and proportion of communicative behaviours recorded for David in each session

Function	Science 1		Sciece 2		Maths 1		Maths 2	
	No.	%	No.	%	No.	%	No.	%
Attention directing	1	3	0	0	0	0	0	0
Request	0	0	0	0	0	0	0	0
Questions	0	0	0	0	0	0	0	0
Giving information	1	3	0	0	3	4	1	2
Responses	20	54	10	59	8	11	43	81
Self-expression	13	35	7	41	57	75	6	11
Humour	0	0	0	0	0	0	0	0
Unclear	2	5	0	0	8	11	3	6
Total	37		17		76		53	

Figure 7: Number and proportion of communicative behaviours recorded for Owen in each session

Function	Science 1		Sciece 2 VOCA		Maths 1		Maths 2	
	No.	%	No.	%	No.	%	No.	%
Attention directing	0	0	1	1	1	2	1	1
Request	1	2	1	1	2	4	0	0
Questions	1	2	0	0	0	0	8	12
Giving information	3	5	16	23	9	17	3	4
Responses	30	55	37	53	15	27	27	40
Self-expression	17	31	6	9	20	36	16	24
Humour	0	0	0	0	1	2	0	0
Unclear	3	5	9	13	7	13	13	19
Total	55		70		55		68	

'David's verbalising with other people. He asked Sue to put his shoes on – and it was loud! Before he started using it I think he would have just sat there with his shoes... He's less passive.'
(David's teacher)

'He's calmer and more confident... You can see him having a joke. A lot more interaction is initiated by him.' (Owen's key worker)

Both teachers observed changes in the boys' speech:

'He is starting to self-correct when he talks – he'll say a word, then press it on the computer, then he'll say what he hears.' (David's teacher)

'He tries to vocalise and his vocalising's getting clearer.' (Owen's teacher)

In order to make a 'stakeholder evaluation', parents and staff were asked about their attitudes towards the use of AAC for their child, before and after the intervention. Owen's parents and staff were always enthusiastic and this enthusiasm increased when he received his own aids. David's family and staff were initially apprehensive, unsure about its value for a verbal child. They were concerned about its potential impact on his speech:

'He might become dependent... It needs to be 'as well as' not 'instead of' speech.'
(David's parents)

By the end of the project these anxieties were allayed:

'I initially thought it may replace language but now I see that it doesn't do that at all.' (David's parents)

'Initially I would have said, well he can talk, he doesn't need one but I do feel... it is beneficial for him. For him it's more helping his memory and it's helping him sort out what he wants to say...' (David's teacher)

Parents and staff were asked about their aspirations for their child. Parents were unanimous in their priority:

'to be able to communicate his feelings and needs so that both he and the people around him can be happy and relaxed.' (David's parents)

Both boys' parents felt that the VOCAs had helped to achieve this:

'He seems much more able to communicate his feelings/needs.' (David's parents)

'it's relieved his frustration... he's more relaxed... mood is so much brighter.' (Owen's parents)

Teachers put considerable value on the formal language achievements of children and hoped for generalised language gains from the VOCA. Both teachers reported a range of achievements and evidence of generalisation:

'David uses a lot of the language that we've been putting in the computer. He's used that knowledge that he's picked up from that particular screen and used that.' (David's teacher)

All the key carers involved evaluated the intervention and their experience of high-tech AAC very positively. However, they identified a number of difficulties with managing the aids which included technical breakdown and the challenge of finding time to set up new vocabulary screens. Recurrent themes in the contributions were a belief in the child's potential and a description of the child as having exceeded expectations:

'Owen surprised us, we thought he'll never know all these words or use so much of it... he's making us adapt it to his needs.' (Owen's key worker)

'David's communication has improved dramatically... he's exceeding expectations, with lots of hope for the future.' (David's parents)

No conclusions could be drawn about the children's views from the data we collected. Staff were unable to use the diaries and laptop symbol frequently enough to collect evidence for the boy's evaluation of the VOCAs.

Discussion

The quantitative analysis recorded changes in both the non-verbal and verbal children's language and communication when they had access to VOCAs. Their use of vocabulary increased and their 'self-expressive behaviours' reduced. Owen gave information more often and David's responses rose. There are a series of challenges to the validity of this data. A number of variables changed in the lessons and class teachers approached their use of the VOCA in different ways. The video data record is incomplete and the computer-based intervention was affected by the arrival of Owen's dedicated aid. In addition, we established an inter-observer reliability measure of just 90 per cent. However, triangulating the data with the qualitative evidence, it is clear that this project records changes in the children's language and communicative behaviours which were evaluated positively by those involved and that these were achieved when the students had access to high-tech AAC. The qualitative data records generalised increases in the quantity and range of children's vocabulary and communicative behaviours.

As a piece of evidence-based practice, this study sought to prioritise 'stakeholder' attitudes when drawing conclusions about the value of the intervention. Although parents and teaching staff had somewhat different aspirations for the children's communication, all considered the children had shown beneficial changes at school and home. Their evaluations were unanimously positive. Our attempt to record the children's attitudes to the VOCAs failed. We can report, however, that, 15 months after the project, both children continue to use them to support expression and language learning.

The qualitative data describes spoken language progress during the VOCA intervention. Romski and Sevcik (1996) linked such progress to the consistent auditory models provided by VOCAs. Our observations of both children's persistent VOCA imitation patterns would corroborate this. However, we were also impressed by the speed with which children memorised

dynamic screens and word location. Their proficiency suggested that the VOCA's visual organisation helped students to memorise, organise and access vocabulary and would agree with Williams et al (2002) who suggest that computers' visual presentation promotes learning in students with ASD.

The quantitative data pointed to very specific communication changes for each child when the VOCA was present. David responded more and Owen gave more information. Both of these behaviours could be explained through environmental changes, rather than as changes in the child's motivations. David may have responded more because he was asked more questions and Owen's expression may have been categorised more accurately because it was now understood. In Owen's case, the stability recorded in his communication patterns supports the interpretation that it was not Owen who changed, but rather the listener. When Owen used the VOCA he appears to have been better understood. The qualitative data records carers' changed perceptions of the child's abilities and potential. Staff reported that students communicated with them more successfully and that their communications were easier to hear and understand. A primary impact of the VOCA may thus have been on staff, promoting changes in their understanding and expectations of the child.

The VOCAs' impact on intelligibility revealed unexpected patterns in the data. It became clear that Owen was echoing language with the VOCA when he did not understand. This is a common characteristic in autism and was recorded by Gallimore et al (2005) in a student's VOCA use, but had not been previously recognised in Owen's disordered speech.

Informal review of the videos suggested that the aids became a communication mediator. They provided a commonly understood vocabulary and structure around which child and adult negotiated meaning. This was most clearly shown when Owen tried to label 'hippo' with his VOCA but had no word cell for it. As his teacher watched, he searched through his screens in vain and finally offered 'rhino'. 'Yes, you know it isn't a rhino', she replied, 'but it is similar isn't it?' Similarly, asked to name a complex shape, David recalled the wrong answer. He then used his VOCA to show his understanding and self-corrected his speech. Watching this process, his teacher affirmed, 'Yes, that's right'. These positive exchanges illustrate how skilled communication partners were able to work with the child and aid to establish the child's meaning.

As ASD practitioners, we take the development and support of visual communication to be central to our practice. However, high-tech AAC, which is similar to PECS but offers a voice and much higher memory capacity, is not assumed to be a tool that we explore with children with autism. In the context of controversy about the value of high-tech AAC for with people with autism, we concur with Mirenda (2003) who expresses considerable concern about the ways in which decisions are made, given the lack of comparative research and the lack of protocols for using AAC for people with autism.

Concluding comments

This project concludes that high-tech AAC can bring a range of benefits to verbal and non-verbal children with autism and severe language disorder. These include:

- increases in the child's language and communication
- changes in the attitudes of communication partners, leading to greater awareness of a child's abilities and raised expectations of their potential
- providing a mutually understood means by which child and carer may negotiate meaning

This EBP project has many challenges to its validity and these can only be initial conclusions. However, they point to the urgent need for thorough research and detailed case analysis to inform and develop our practice in this area. As a result of this pilot work, a partnership project has been initiated with Dr Nick Hodge and Sue Chantler of the Autism Centre at Sheffield Hallam University and with Alli Gaskin of Lancasterian School, Didsbury. Funding is being sought to extend this research further.

References

Bondy, A and Frost, L (1994) The Picture Exchange Communication System, in S. Handleman and S Harris (Eds) *Preschool programs for children with autism,* Texas: ProEd.

Dewart, H and Summers, S (1995) *The Pragmatics Profile of Everyday Communication Skills in Children* Windsor, NFER Nelson.

Gallimore, A, McCaulay, M and Steiner, N (2005) Children with autism spectrum disorder using VOCAs? *Communication Matters,* 19, 2, 10–12.

Goldman, H (2002) ACAP: *Augmentative Communication Assessment Profile,* Oxon: Speechmark.

Hazell, G and Larcher, J (2005) *Supporting communication through AAC.* Web training module materials http://www.scope.org.uk/education/aac.shtml, London: SCOPE.

Light, JC, Roberts, B, Dimarco, R and Greiner, N (1998) Augmentative and alternative communication to support receptive and expressive communication for people with autism, *Journal Communication Disorders,* 31, 153–180.

Mirenda, P, Wilk, D and Carson, P (2000) A retrospective analysis of technology use patterns in students with autism over a five-year period, *Journal of Special Education Technology,* 15, 5–16.

Mirenda, P (2003) Toward functional augmentative and alternative communication for students with autism: Manual signs, graphic symbols, and voice output communication aids, *Language, Speech, & Hearing Services in Schools,* 34, 3, 203–216.

Moore, R and Gresswell, A (2004) *Looking beyond the individual: the role of the environment and communication partners,* Unpublished training materials, Oxford: ACE Centre Advisory Trust.

Murray, D (1997) Autism and information technology: therapy with computers. in S Powell and R Jordan (Eds) *Autism and learning: a guide to good practice,* London: David Fulton.

National Research Council (2001) *Educating children with autism,* Washington DC: National Academy Press.

Romski, MA and Sevcik, R (1996) *Breaking the speech barrier: language development through augmented means,* Baltimore: Paul H. Brookes.

Schlosser, RW (Ed) (2003) *The efficacy of augmentative and alternative communication,* London: Academic Press.

Schlosser, RW, Blishak, DM and Rajinder, KK (2003) Roles of speech output in AAC: an integrative review, in RW Schlosser (Ed) *The efficacy of augmentative and alternative communication,* London: Academic Press.

Von Tetzchner, S and Grove, N (2003) *Augmentative and alternative communication developmental issues,* London: Whurr.

Williams, C, Wright, B, Callaghan, G and Coughlan, B (2002) Do children with autism learn to read more readily by computer assisted instruction or traditional book methods? *Autism,* 6, 1, 71–91.