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Implementing AAC with children with profound and multiple learning disabilities: A
study in rationale underpinning intervention.

**Title:**
**Implementing AAC with children with profound and multiple learning**
**disabilities: A study in rationale underpinning intervention.**

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Implementing AAC with children with profound and multiple learning disabilities: A study in rationale underpinning intervention.

**Abstract:**

There is a developing research base to support the rationale underpinning augmentative and alternative communication (AAC) for people with learning disabilities. However, there is a paucity of research examining the process involved in implementing AAC support for people who have profound disabilities. This paper seeks to explore the processes involved in planning and implementing AAC systems to support the communication of two six year olds with profound and multiple learning disabilities. Following assessment, a plan of intervention involving specific implementation of objects of reference, gestures and signs was implemented to enhance communication opportunities for both children. Both children improved their communication skills through use of specific AAC supports. Results suggest that important aspects to include when planning intervention are understanding the level of each child's cognition in relation to their receptive abilities, and a consistent, collaborative approach where strategies are agreed between team members. Specific challenges are discussed.

150 words.

**Key words:** profound and multiple learning disabilities; functional communication; augmentative supports; communication opportunities.

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## 1.Introduction.

This paper seeks to explore the processes involved in planning the development of augmentative and alternative (AAC) systems for two children who are described as having profound and multiple disabilities (PMLD). Aside from the processes involved, it will consider the evidence base underpinning the selection of AAC materials, and it will attempt to consider a the strategies that are necessary when developing appropriate supports for these children.

AAC is described as an area of clinical practice that attempts to compensate (temporarily or permanently) for the impairment and disability patterns of individuals with severe disorders of communication. (Beukelman & Mirenda, 1992). It is acknowledged that AAC users typically use a range of modes to support their communication, e.g. facial expression, gesture, objects, symbols, speech approximations, signs, communication passports and electronic devices, (Binger & Light, 2006; Light, Collier & Parnes, 1985). However, the evidence and methodology underpinning the process of implementing AAC support for people with profound and multiple disabilities is unclear.

The term "profound and multiple disabilities" or PMLD is used to describe individuals who have a profound cognitive impairment alongside multiple disabilities including physical, sensory and /or health related difficulties, (WHO, 1992; Cartwright & Wind-Cowie, 2005). Consequently, those with PMLD are likely to be pre-verbal communicators and may require carers and significant others to interpret their non-verbal communication signals as well as using touch, natural gesture and objects with them to support their language and communication opportunities within the environment, (Guess et al., 1993; Green et al., 1996; Bloom, 1993; Brooks, 2005; Franco, 1997; Locke, 1997).

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Difficulties with communication place children who have PMLD at risk of becoming excluded and may often lead to "social and educational isolation as well as significant frustration," (Romski & Sevcik, 2005, p 176). In this study, we present the methods and approaches for implementing a programme to develop AAC support to two children with PMLD in an attempt to reduce isolation and promote choice.

Traditionally, children who are thought of as having PMLD are provided with access to multi-modal forms of AAC support, and this is considered to be good practice, (RCSLT ;2006). Such supports may also include training others to interpret non-verbal communication including whole body movement, using tactile supports, promoting access to materials for those with complex physical needs or using specific systems such as objects of reference, (Park, 1997: Thompson, McKerchar & Dancho, 2004; Trief, 2007). Some children may have access to switches where specific sounds or target vocabulary are included. However, it is hypothesised that there are many challenges in implementing and using AAC with children who have such complex communication and physical needs as they are likely to find initiating and maintaining an interaction difficult.

Research has sought to explore some issues within this population; how does the system support communication; is it used consistently; does the child have the skills to use it effectively and can the system compensate for additional sensory deficits? (Rowland et al, 2000; Millar, Light & Schlosser, 2006; Trief, 2007). Light, Collier & Parnes, (1985) studied eight non-speaking children who used a variety of communication boards. Video recordings were made of their free play with their main carers over a 20 minute period of time. Interestingly, 81.8% of children's communication initiations were conveyed by vocalization, gesture, or eye gaze used individually or in combination and responded to, whereas only 18.2% of their turns

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involved using their communication boards with the communication partner. It is possible that the communication partners did not understand the benefits of using the communication boards with the children, hence the reason why it was used less often. This suggests that training for those who interact with AAC users to ensure specific supports are used and that the rationale for their use is understood is an essential part of the intervention process, (Hetzroni, 2003 ; Light & Drager, 2007). Generalisation of communication skills may be impaired if communication partners are not trained adequately in that opportunities to use AAC to support receptive and / or expressive skills may not be facilitated as much as with other, more able communicators, (Kent-Walsh et al, 2005). Adequate training involves understanding the types of communication attempts being initiated, the reasons why a particular approach has been selected and how to extend communication opportunities within functional contexts using the selected AAC medium, (Kent-Walsh et al, 2005; Binger & Light, 2006).

Many pre-school children who have PMLD use low tech systems, i.e. gestures, signs, communication boards/visual supports, simple voice output communication aids,(VOCAs),  objects of reference, (Park, 1997; Binger & Light, 2006). A demographic study carried out in the USA , revealed that within a pre-school population who had been referred for speech and language therapy intervention, 24% required sessions to develop aided and / or unaided AAC out of a total of 4,192. Only 15% of this group used VOCAs, (Binger et al, 2006).Binger et al, (2006)  , also found that opportunities to expand such systems are few as they do not have sufficient capacity to allow for development, particularly at a metalinguistic level, i.e. relevant vocabulary may not be programmed into the system to enable more complex utterances to be used, or there may not be vocabulary to enable the AAC user to

engage with a full range of communication acts. This issue was also highlighted by Light & Drager, (2007), where they found that AAC systems used with children did not allow for adequate expansion of skills as the vocabulary in the system was not reviewed and updated in terms of the user's needs.

A range of studies have reported the benefits of AAC that enhance communication. Seventeen adults with learning disabilities were asked about what they found helpful when accessing information. They reported that they found symbols and photographs of particular benefit as the permanence of the information supported their comprehension, (Owens; 2006). Frost and Bondy (1994) developed the concept of PECS, (Picture Exchange Communication System), as a means of developing opportunities of spontaneous exchange and requesting for children with social and communication difficulties. The rationale for this approach is rooted partly in the fact that symbols are static within the communication environment, and this visual permanence reduces memory load and supports receptive language. Researchers have also found that the visual nature of many AAC materials can support the user's comprehension of the situation and therefore increase communication episodes and attempts, (Yoder and Stone 2006). Such support can reduce the incidence challenging behaviours, (Charlop-Christy et al, 2002), or can add meaning and understanding to settings for those with sensory impairments, (Park; 1997). Multi-modal AAC approaches that include visual and auditory stimuli such as symbols, switches, objects of reference and use of non-verbal skills have been described as having the potential to provide additional communication support and increase expressive language attempts, (Goussens, 1989; Park, 1997; Cress et al, 2003).

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Although many of the studies mentioned highlight the many benefits of AAC for people who have PMLD, few explore the process involved in deciding which approach will suit a user and why. No current studies have evaluated whether matching an AAC strategy to a user's cognition and receptive function is more likely to promote better, more functional outcomes if the user has PMLD. It is important to reflect on the necessary stages towards implementing AAC and stimulate discussion in this area to ensure that the systems in place have a functional application for children who have significant communication needs both receptively and expressively.

## 2. Case Presentation.

Two individual cases were involved in this study; both children were aged six and had a diagnosis of profound and multiple learning disabilities, (PMLD). Both participants attended a school for children with severe learning disabilities and were in the same class. The class comprised of six children in total with one teacher and two learning support assistants.

K was aged 6 years and 2 months at the time of recruitment to the study. His vision was reported as functional, and his hearing was within normal limits. K was described as being severely physically disabled and required wheelchair access. He had some upper limb function, but needed an adult to support him to hold and manipulate items. He was also described as having episodes of "challenging behaviour", usually at specific times such as mealtimes where he demonstrated food refusal and shouting. K was able to vocalise to gain attention, respond to others and attempt to use basic gestures.

B was aged 6 years and 4 months at the time of recruitment to the study. Hearing was within normal limits, but he had visual difficulties; B was able to identify familiar people or objects if within his direct line of vision. B was described as being severely physically disabled and required wheelchair access. Some attempt to imitate basic gestures was evident along with use of simple gestures such as waving "bye". B also used tuneful babble and had a range of vocalisations used with meaning.

### 3. Method.

The researchers spent two weeks gathering information, using a range of informal assessment methods to build a profile of each of the children's skills prior to treatment. Each child's strengths and needs were discussed with the teacher, learning support assistants, (LSAs) and parents. In both cases, The Pre-Verbal Communication Schedule (PVCS; Kiernan & Reid, 1987) was used to gain a baseline measure of each child's communication abilities. Observation was carried out within the classroom and across a range of curricular activities so that the full range of each child's communication ability and opportunity was observed informally. Due to the limited time span of this project, eight weeks, it was not possible to visit the home. (Three weeks was the initial assessment period, followed by five weeks intervention).

Following on from informal assessment and the observations made, a checklist was devised with staff based on The Pragmatics Profile of Everyday Communication Skills, (Dewart and Summers, 1995). It included the following four sections:

1. Expression: ability to request; ability to reject; ability to gain attention; intent; other means of initiation.

2. Comprehension: response to [name]; response to verbal commands in context; response to gesture and Makaton signs.

3. Social Interaction: ability to joint reference with significant other; turns taken after a model and/or prompt; number of times significant other needed to prompt.

4. Behaviour: ability to express pleasure; ability to express distress.

Based on the information gained from observation and assessment, specific materials were selected for each of the children. Vocabulary was selected for both children that could be used within free-play, lunch time and music lessons, and that was motivating for each child.

### 4. Case conceptualisation.

Each child was thought to be showing signs of needing further augmentative and alternative resources to enhance their development due to the following reasons:

1. They were showing a desire to communicate by non-verbal means across a range of situations, and had shown some appropriate responses when whole class strategies were used, e.g. Makaton signs, (Walker, 1977).

2. Neither child had any consistent individualised additional AAC supports in place other than the whole school total communication approach.

3. Both had instances of challenging behaviour when staff felt that the children's communication attempts had been mis-understood.

Strategies for implementing the AAC chosen for each child were discussed with staff and agreed upon. AAC materials were based on each child's strengths. For K it was identified that his comprehension and expression were supported by visual cues such as objects, photographs and gestures, and therefore his programme would incorporate these strengths. For B his comprehension and expression were supported by use of touch and simplified language as well as objects and gesture.

Intervention for both children took place within the classroom during music, (30 minutes per day), free play (30 minutes per day) and lunch times daily (30 minutes per day) with their LSA in close collaboration with the teacher and SLT. In addition, the researchers worked with each child twice a week for 30 minutes (-a total on 1 hour direct one to one) focusing on strategies, but within the classroom ~~context) in one of the settings described.~~context. In summary, this meant that each child had a total of 12.5 hours specific focus on developing their communication skills within a collaborative and integrated setting. A learning support assistant was present during each researcher session so that consistency in carryover was optimised in the other settings with the LSA. The intervention lasted for 5 weeks. Having the intervention take place within a familiar learning environment was felt to be beneficial for the children in that specific AAC goals would be beneficial if linked to a familiar context. This supports the recommended approach suggested by Beukelman & Mirenda, (2005) who reported that the most effective AAC intervention is carried out within a natural environment for the child where context can add meaning to the AAC strategy being taught.

### 5. Course of treatment and Assessment of Progress.

Pre-treatment and post assessment, AAC materials were selected based on each child's strengths and needs. The plan of therapy was agreed with all relevant staff and family members.

A specific number of photographs were selected for K including the following items: [cup/spoon/plate/more/bye/ball/car/book/teddy/dolly/bubbles/train].

Vocabulary was selected by staff and family with regard to; i) motivation and ii) responsiveness to the target vocabulary during assessment. In addition, staff were

using natural gesture, specific Makaton signs, (Walker, 1997; Grove, 1980), and hand over hand /physical prompting to help K focus.

Implementation involved requesting, with the adult lifting K's hand to touch each photograph at the beginning of the intervention. Time for processing was allowed, and K was rewarded with praise if he responded by pointing himself or signing.

The rationale was discussed with staff and family members. Photographs were selected to build on K's existing abilities with using objects communicatively. K had also demonstrated some emerging abilities with gesture and Makaton signs, (Walker, 1977; Grove, 1980 ; Grove, Porter et al, 1999). However, it should be noted that K did not reliably access his signs compared to photographs, for example, he was observed signing [sad] when he was [happy] on more than one occasion. There were also examples of imitated signs used randomly.

For B, a range of items related to the targeted activities were selected: [bubbles/balloon/paper/cup/spoon/plate/ drum/ tambourine/whistle/ shaker/bells]. In addition, B would have his hands moulded into the sign/gesture shapes and receive physical prompting for [more/hello/bye].

Implementation involved use of verbal prompts and helping B to feel two items/objects pre- specifying a choice. Time to respond was part of the strategy. If B appeared unsure, he would be supported by an adult to feel the item again.

The rationale for B's AAC supports was as follows; objects were chosen to be presented within B's field of vision and near enough for him to touch them. Although objects of reference have significant benefits in supporting comprehension, their principle use with B was to promote expressive opportunities, (Park, 1997 ;Grove, Porter et al, 1999). In addition, to compensate for B's visual impairment and to

supplement his ability to respond to auditory input, use of simplified speech with time to process information was employed.

A range of objects to facilitate choice and express needs to support B's development were selected on the basis of needs and motivation. The objects were to be used mainly through the medium of touch due to his visual impairment. Highly motivating items such as bubbles, a balloon, musical instruments and noisy paper were used to implement the strategies for B during individual teaching time. The objects of reference chosen to represent these activities were a bubble stem, a deflated balloon, bells and a square piece of the noisy paper.

The choice to use more than one AAC strategy for each child is rooted in the work of Cress & Marvin, (2003) who reported on the effectiveness of using multiple forms of AAC to support communication. A multi-modal approach is judged to provide opportunities for increased initiation of language, (Cress & Marvin; 2003)

**Intervention Procedure**

**Intervention for K:** K was seated in his supportive chair for all sessions so that he had maximised upper limb function. The sessions for K focused on developing his choice making skills through use of photographs and matched symbols, as well as consolidating use of the Makaton sign [more]. For choice making, the photographs were presented on K's seating tray, one on the right hand side, and one on the left hand side. The photographs were named and pointed at to capture K's attention when being introduced. Prompts included a verbal prompt, a gesture prompt, (pointing), and a hand over hand prompt. K was also allowed time to process information. Use of neutral photographs, (e.g. everyday items such as a brush), in the initial choice options to teach the concept of using photographs functionally was implemented.

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For signing, K would be presented with two visual models, with a verbal prompt. He was allowed time to process the information. If he did not imitate, then his hands would be lifted with use of a physical prompt. Once familiar with the visual items, then physical prompting would be reduced to enable more independent use.

**Intervention for B:** B was seated in his supportive chair for all sessions so that he had maximised upper limb function. Use of neutral objects, (such as everyday items, e.g. a shoe), were used in the initial choice options to teach the concept of using the objects functionally. B would be shown objects within his field of vision, then observe them as they were placed either side of his seat tray. An adult would physically prompt him to touch each object with naming, followed by opportunities for him to reach and make a choice.  B had use of simplified language to allow him opportunities to process information, and all his verbal attempts were responded to by communication partners. As part of the intervention plan, it was predicted that B would require fewer physical prompts as he became more familiar with the materials presented.

**Evaluation of progress and outcomes.**

Observation sheets were filled in after each session, and video recordings were made of the sessions. Both children were video recorded for 5 minutes in three settings before and after their interventions. The settings were; lunchtime, playtime and music. The teacher, learning support assistants, researchers and parents of the children involved were asked to rate the video clips. In addition, four raters who had not participated in the intervention were used to observe and rate each clip. These raters were final year speech and language therapy students who had had no previous contact with either child. All raters viewed random presentations of each child, and they were required to fill in the observation sheet used in the intervention based on

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The Pragmatics Profile of Everyday Communication Skills, (Dewart & Summers, 1995). A matrix was provided with each of the sections to be observed:

1. Expression.

2. Comprehension.

3. Social Interaction.

4. Behaviour.

Analysis included before and after measures of the children's communication competence using their AAC strategies in lunchtime, playtime and music lessons. Mean scores from the raters were used for analysis. The Wilcoxon test was used to interpret the data. Graphs were used to indicate prompts used during sessions with each child.

**Results.**

At the beginning of the intervention, K relied heavily on the researcher to physically prompt him to make a choice. As shown in figure 1, physical prompting was necessary throughout the first four sessions in order to direct K to make a choice. Over time, the number of physical prompts K required decreased and he began to independently make choices. K made a total of three independent choices during the fifth session, requiring seven physical prompts, and made four independent choices by the sixth session. During the seventh session, the number of choices independently made by K dropped to three. However, during the eighth and ninth sessions this increased to four and K made a total of five independent choices during the final session.

K made some unreliable choices during a few of the sessions. K began making choices independently during the fifth session although at this stage, he had 60%

correct choice reliability. However, in general, the number of incorrect choices made decreased as treatment progressed and by the seventh session, only one out of seven of his choices were unreliable.

Consideration was given to the use of partial physical prompting and a strategy was agreed pre-the intervention. This was given when K used joint referencing and attempted to eye point at a required item. When this was done, an adult would gently touch his hand as a prompt as well as using a verbal prompt and thus enable him to reach himself. This strategy was used for both children throughout the intervention.

Figure 1 to go about here

B required both verbal and physical prompts to make a choice using the AAC system selected for him. In B's case, the term physical prompt refers to occasions when he was helped by the researcher using hand over hand prompts to explore the tangible objects used as a support. Verbal prompting was used when B was verbally assisted to make a choice. Figure 2 shows an overall decline in the number of prompts B required during his therapy sessions. Over the ten sessions, the number of physical prompts required declined, so by session five, only two physical prompts were needed, and by session seven, only a partial physical prompt was required. Active physical prompting decreased when B became more familiar with the objects and only one or no physical prompt was needed.

Figure 2 to go about here

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K was encouraged to develop use of the sign [more]. At the beginning of therapy, he required continuous modelling, physical prompting and repetition from the researcher. Repetition involved using the target vocabulary, use of the sign where K could watch and the researcher lifting K's hands to complete the appropriate hand shape for the sign.  Hand over hand physical prompting was required to enable K to request [more] throughout the first two sessions. During the fourth session, K signed [more] three times with a partial prompt. As K received more intervention, the number of direct physical prompts he required decreased. He only required one physical prompt by the final session and was able to sign [more] independently six times. The number of partial prompts also decreased as time passed. Spontaneous initiation of the sign without an adult visually modelling but in response to the word only was also noticed in the last session.

Figure 3 to go about here.

Table 1 to go about here.

The greatest difference in communication development with K post introduction of the AAC system was his attempts to initiate contact with others, particularly during mealtimes. Figures 1 and 2 show changes in K's communication attempts using the AAC supports. All raters observing the video clips felt that K used more signs and photographs/symbols post therapy across all three situations, although the difference only reached statistical significance at mealtimes, (Table 1). It was noted that the number of vocalisations and gestures increased along side the use of AAC strategies throughout all contexts.

**Expressive language.**

For K spontaneous communication included a range of skills such as spontaneous reaching; spontaneous use of waving to indicate [hello/bye] when people greeted him; spontaneous use of [hug] gesture to indicate contentment; spontaneous use of the [more] sign on hearing the word in classroom tasks; spontaneous ability to select one out of two photographs/symbols from:

[cup/spoon/plate/more/bye/ball/car/book/teddy/dolly/bubbles/train].

The playtime session showed the greatest difference in B's expressive communication, although significant changes were noted in all contexts observed, (Table 1). The greatest change was in his ability to request and to reject. Observations from the raters revealed that he used more gestures with intent, and was able to show rejection clearly by shaking his head and vocalising, or by pushing items away. An increase in word attempts was also observed, with B saying the names of items he wanted as well as using words such as [more] [no] and [off]. A change was noted in his ability to gain attention; he would call staff members names more and verbalised [hiya] to gain attention post therapy.

For B, spontaneous communication included skills such as spontaneous use of reaching and pushing away with meaning; spontaneous vocabulary use for the following: [more / no / yes / hiya / bye / off / bubbles / researcher's name / no more / balloon / music / paper]; spontaneous ability to select the following objects to indicate choice: [bubbles/balloon/paper/cup/spoon/plate/ drum/ tambourine/ whistle/ shaker/bells].

**Receptive language.**

With comprehension, K was able to respond more frequently to his [name], mainly by sustaining eye contact, and joint referencing with others. This would be frequently accompanied by vocalisation. K was also recorded as responding more

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frequently to verbal output from others in the classroom, usually by pointing to a photograph or by signing [more]. This was usually in response to prompts such as "What would you like?" "Do you want x or y?" etc. No significant changes were noted compared to the beginning of the intervention but informal, qualitative observation suggests that K's receptive language skills were more consistent.

No significant changes were noted in B's comprehension skills compared to before the intervention. No significant changes were noted compared to the beginning of the intervention but informal, qualitative observation suggests that B's receptive language skills were more consistent.

**Social development.**

There was an indication that K showed increased use of eye contact to engage others within a communicative context. K's LSA felt that this was a significant change allowing K to engage in more positive communication interactions. K was also noted on the video waiting his turn, and participating more in the turn taking process, particularly in playtimes.

Fewer social interactions occurred pre-introduction of the AAC system. Opportunities for B to participate with his communication partner were smaller in these settings. An increase in social skills post therapy was clear in all settings: verbalising, gesturing and using vocalisations socially were clearly observed by all raters.

**Behaviour.**

K appeared to show less signs of stress such as crying and shouting during mealtimes after the intervention. He also demonstrated fewer food refusals. This potentially indicates more productive communication attempts with the implementation of the

AAC strategies selected. There was also an increased attempt by K to engage communicatively through use of frequent eye contact with his LSA.

Within lessons, B presented as being more attentive and focused, with an increase in attempts to engage with others and participate. Prior to the intervention there had been no concerns with B's behaviour.


## 6.Discussion.

This small study has highlighted some success within the area of developing a communication system for two children with PMLD. An explanation as to the success of this programme appears to be attributable to the selection of approaches related to the child's level of receptive language and communication ability as well as their level of cognition. More focused and targeted use of AAC by staff may also have been an influencing factor, although it should be noted that staff were not spending any additional time with the children. In addition, the expertise of the school staff, and the relevance of the items/vocabulary chosen in relation to the curriculum had positive benefits for both children, for B more than for K.

However, both systems rely on an adult supporting the child to access and use the system, and this could be construed as a disadvantage and a long term complication,(Grove et al, 1999). A more longitudinal study would provide opportunities to explore how to promote increased opportunities for independent initiation and usage. Further studies could also explore in greater depth the hierarchy of prompts used, how effective they were, and if they generalised to more class based contexts outside of the teaching and implementation sessions.

Follow up occurred a term post the intervention programme. Although K made no significant changes in his communication skills during playtime and music time,

he did develop a functional use of the sign [more], particularly at meal times which was significant. This relates to the research by Layton & Savino (1990) that comments on the immediate effectiveness of signing within a functional context. K did learn to spontaneously choose using the photographs and achieved the ability to select up to five choices during mealtimes.  This would suggest that the visual aids accompanied by signing supported K's communication opportunities, (Goussens 1989; Grove , Porter et al, 1999;  Light & Drager 2007). However, he did have a high reliance on an adult actually having the photographs present for him to access therefore reducing independent opportunities.

B had previously demonstrated few consistent skills. He learnt to make four choices using objects of reference and targeted vocabulary, and was able to generalise this to playtime and music time settings. A significant improvement was noted across the three settings measured; general opinion suggests that B developed skills in expressive abilities, social skills and receptive skills. It may be that with the added focus on AAC as a strategy, this may have provided additional prompting for B's receptive skills, and therefore this could suggest that there was in fact no change in receptive function, only a clearer interpretation of non-verbal signals.

K made most progress in the area of choice during mealtimes. This could have been due to the tangible nature of the setting, as well as the organisation in having his photographs and supports present at this time. In addition, it may be that the learning support assistant who supported him during meals used a more consistent approach to presenting the materials in an accessible way. Some comments were made that the photographs were not always present, and this suggests that within daily routines outside of the taught sessions, that use of photographs was not consistent. Inconsistency with use of AAC particularly where prompts are needed is mentioned in

the literature, (Rowland et al, 2000), and it is assumed that this could influence consolidation of skills. In this case, it could have had an impact on K's performance during music and free play sessions.

B improved in the area of using objects to specify a choice. His reliability in making a choice increased as he became used to the objects being presented. He had additional strategies in place such as adults using simplified language, and an adult using graded hand over hand prompting to assist B to access his objects and make choices. This fits into the developing research that supports the use of tangible relevant objects as AAC strategies, (Turnell et al, 1994; Rowland et al, 2000; Trief, 2007).

Video recordings made indicate that K developed more turn-taking abilities through use of gaze, joint referencing and shared attention. It could be that the use of additional visual supports provided more opportunities to interact, and the support staff with K may have received a greater understanding of the rationale underpinning the AAC used as the intervention progressed. Evidence suggests that the visual nature of AAC does increase turn-taking and interactive opportunities, (Light et al, 2007). Attention to tasks generally appeared to be improved, with reduced challenging behaviour episodes, supporting the suggestion that challenging behaviour can be reduced if visual supports are in place to facilitate communication opportunities, (Hetzroni, 2003).

B appeared to develop an increase in the ability to initiate vocalisations and words, e.g."hiya" and an increase in non-verbal communication attempts, which in light of developing evidence, is to be expected when implementing tangible AAC supports, (Drager et al, 2006). In other settings when his objects were not always present, he developed the confidence to vocalise and use word approximations to

enable others to be aware of his needs. He also increased his vocabulary and developed spontaneous use for [bubbles/the researcher's name/ no more/ off/balloon/ music/paper].This increased confidence and developed social competence is also mentioned by other researchers when children are being introduced to a new system, (Mathy-Laikko et al, 1989).

Neither child generalised their skills spontaneously. This could partly be due to the fact that they had learning disability, and generalisation is one of the key learning challenges for this group. However, it was noted that for K particularly, photographs were not always present consistently, and this may have hindered his ability to consolidate his skills. B had significant changes in all areas, and this may be due to his ability to learn vocabulary/chunked phrases and contexts more easily than K, or his LSA and other support staff may have been more focused in ensuring his objects of reference were present consistently.

### 7.Conclusion.

Both students benefitted from the introduction of specific AAC supports to enhance their communication opportunities. There was fluctuating use with both K and B, and this is also highlighted by Light et al, (1985) as an issue due to the different adults involved and supporting the child, peripheral distractions, how easy it was for the child to access the system used independent of an adult's presentation and personal motivations of the child. The children's ability to access the selected AAC systems independently is still an area that requires further exploration and research.

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This study has demonstrated that there are some key themes emerging. One is that a thorough language and communication assessment along with an awareness of a person's functional communication in everyday contexts, plus an appraisal of what

they can do already is essential, (Lloyd et al;1983; Layton, 1990). Given the complex nature of each of the children's communication needs within this study, important assessment information was gained from a range of sources. These included careful observation of each child's responses during a range of classroom tasks, listening to teachers, LSAs and parent reporting of how each child responded in a range of contexts and use of a hypothetical approach to ascertaining each child's communication abilities by the SLT. The use of shared frameworks agreed between team members such as the checklist derived from The Pragmatics Profile and the PVCS ensured a unified focus within the multi-disciplinary team. Within the SLT assessment sessions, introducing a range of strategies to enable each child to maximise their communicative effectiveness was a major part of the process. It was felt important that these sessions took place within the class as part of the daily curriculum with staff members present so that information could be shared immediately.  A key aspect of  the success of this  isstudy is linked to the rationale of focusing on each student's receptive language abilities as an important foundation for planning. Also, having an and agreement  within the team that  the focus would be on consolidating and thereby maximising current  skillscommunication skills was essential. The issue of fluctuation in AAC use is one that could be evaluated further through exploring training for staff using AAC and how this is of benefit to the AAC user, (Light et al, 1985; Light, 2007). Further opportunities to measure spontaneous use in line with ensuring access for the children is maximised is also another important area that would contribute to the evidence base, (Millar et al, 2006). Certainly, the AAC used with K was perceived by staff as reducing his challenging behaviour, (Charlop-Christy et al, 2002).

This paper has attempted to quantify the time taken during a 5 week period to implement AAC for two children with complex needs. No other studies have clearly considered the context of the intervention as well as actually quantifying the time aspect of the approaches used. Each child received a 3 week assessment period followed by a 5 week intensive AAC intervention. The intervention involved 30 minute sessions with the SLT and another staff member in the classroom for 30 minutes twice a week, therefore totalling 5 hours AAC implementation and strategy management over 5 weeks. For the free play session, music session and lunch time session, each child received 30 minutes each per day from any of the staff team involved, therefore each child received 2.5 hours specific intervention for each topic area per week. This meant that 7.5 hours per week were devoted specifically to implementing new AAC strategies within a specific class-based topic known to be either functional or motivating for the children. In total, both children made progress with a minimum of 12.5 hours AAC support each. A tentative hypothesis could be to suggest that the joint working within the classroom throughout the intervention was crucial in enabling each child to succeed, and provided ample opportunities for on-line "checking" in relation to interpreting the child's needs, or in ensuring the AAC support had been implemented in the agreed way. Certainly, the collaborative planning and implementation between the school staff, SLT and parents was an additional strength in this intervention.

Rationales underpinning how AAC systems are implemented and used, and how people who work with those who have PMLD facilitate communication is an area that is worthy of further exploration and development. Further evidence around the areas described above can provide more information to promote greater communication opportunities for clients with complex communication needs.

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