Abstract: - This research compares conventional speech and language therapy to computerised multimedia therapy. This is to establish if multimedia software aids the speech and language development of infant children with communication problems in special schools. This paper stresses the importance of early intervention and the objectives of intervention, which needs to be considered prior to therapy. The effectiveness of conventional (traditional) speech and language therapy and high and low tech Alternative Augmentative Communication (AAC) systems have been established as being effectively used for speech and language development. This position paper has established how multimedia software is able to improve language learning through its variety of media, however, goes on to explain why further in-depth research should focus on the verbal language development of infant autistic children with communication problems. An explanation is given as to how A Theoretical Computerised Multimedia Therapeutic Intervention Model (TCMTIM) is established, resulting in the implementation and testing of a prototype Computerised Multimedia Therapeutic Intervention model (CMTIM).

Keywords: - Speech and language therapy, Intervention, Multimedia

1 Introduction

Can multimedia software, used separately, or as a combination of conventional (traditional) speech and language therapy be used as an additional effective therapeutic tool, in order to aid the speech and language development of infant children with communication problems in special schools? However, before looking into the aspect of multimedia software used therapeutically and educationally to aid the speech and language development we need to establish how therapy is acquired.

It has been established that the two primary ways in which infant children's speech and language development have taken place in Special school are, with the help of Speech and Language Therapy and the through the educational route via the teaching staff in the classroom.

I (Stokes) have shown from research evidence, my own findings from my research to date and my first hand knowledge, the importance of early intervention. It is important to acknowledge the consequence of early intervention, as by the age of five, theorists state that children have reached an important stage of their general and language development. Most of them are likely to be under 5 years of age and, therefore, passing through a period recognised as important for all aspects of their development, including language. (Larcher and Mitchell, 1995; Lees and Urwin 1994). It has been very difficult to ascertain what theories therapists follow, what objectives therapists take into consideration and which specific features of the therapy are in fact therapeutically effective.
2. Objectives of the Intervention

The Therapists need to decide the objectives of the intervention, whether it is for developing and/or increasing the use of:

- Spoken language
- Turn taking
- Signing
- A symbol system
- A communication aid or computers

Sage, (1992) claimed that everyone is different, so different type of activities and therapy will be needed for each child. Each child may have different expressive, receptive, comprehension, communication problems or a combination of these relating to or resulting from personal, psychological, medical and environmental needs. Webster and McConnel, (1987) rightly state that it is important to look at the extent of a child's global development delay, as this was an integral part of the child's learning programme when assessing children's speech and language problems.

Therefore, it is important to give consideration as to whether it is in fact that these children with language difficulties are perhaps unable to deal with language presented to them in obvious ways.

It is imperative when speech and language therapists assess children for therapy that all aspects of a child's needs are taken into consideration. They also need to take into consideration how the child interacts communicatively with their environments and this needs to be stated quite clearly by the speech and language therapists in a child's Statement. However, it is important to question what in fact are the obvious ways adults communicate with children?

Communication is not just done verbally, or in written form, but also by a combination of different methods such as pointing, gestures, facial expression and body language, which all help children with language and communication difficulties, comprehend their environment (Sage, 1992, Wright, 1994).

Recent experimental studies have proved that the speech and language intervention therapy programme, help a small number of children with learning disabilities acquire new vocabulary and language structures have been effective. It would be very difficult to establish which particular individual or group of children benefited from this or any speech and language intervention therapy programme. Each child varies in different ways and it is important to establish each individual's strengths and weaknesses in their communication development. Therefore, all the these assessment areas needs to be taken into consideration before a decision as to what speech and language therapy intervention can be used. (Lees and Unrwin, 1994).

3. Speech and Language Therapy

The focus of this research is not to fully analyse the effects and strengths and weakness of speech and language therapy, because, it is inevitable that this well established therapeutic method has undoubtedly been successful in the past and to date.

Sage (1992) claimed that the therapy was then used to help children express themselves and communicate with other people. Even carers of children with profound and multiple disabilities who may not be able to develop speech, could be taught to communicate with their child by being able to recognise and respond to their child's response through speech and language therapy.

The particular resources used for the intervention needs to be taken into consideration, e.g. flash cards, toys, etc. and as to how effective they are with individuals bearing in mind all the above considerations. Resources such as a manual, advice sheets, motor work sheets and 566 sheets of clear black and white line drawings (including lip shaped drawings) are used for children with Dyspraxia. Williams and Connery (1992) explain how consonant symbols are used for "artificial practice", "word building" "phonological contrasts in preparation for minimal pair work at the consonant and vowels level". They claim that these resources can be used for games for repetitive work which are not boring for either child and therapist and is effective in helping children overcome their difficulties in communication.

However, Speech and language therapy is sometimes considered as just a "group of prescribed and precise activates..." or "a single entity similar to a drug". Enderby and Emerson, (1996). However, it has been very difficult to establish what theorists therapist's follow and as to what features of the therapy are in fact therapeutically effective with individuals.

There is also published evidence claiming the effectiveness of conventional (traditional) speech and
language therapy for children with cleft palate. However, according to Enderby and Emerson (1996) for some children this form of therapy is only effective if the therapy is structured, implemented and used for children with an inadequate oral device. Two studies show that intensive structured and targeted treatment leads to a better outcome than speech and language therapy delivered on an "ad hoc basis".

Petrie (1989) claim that conventional therapy has proved to be beneficial when the therapy is interactively implemented face-to-face, as the therapist would be able to listen, observe, reflect and question their client. This form of encouraging therapy has resulted in increasing children's confidence in communicating to the best of their ability and developing interpersonal communication skills between them and others.

This investigation has indicated that speech and language therapy may or may not be effective, but it does not indicate clearly as to which particular children this relates to by giving explanations as to all the assessment areas such as:

- Whether the children have severe learning difficulties (SLD), Moderate learning difficulties (MLD) or are within the normal range e.g. Physically impaired children.
- Their medical conditions e.g. physical abilities affecting vocal production/breathing
- What developmental stage they have already reached
- Their existing speech, language and communication capabilities.

This would indicate which particular children the conventional (traditional) speech and language intervention therapy is being the most effective in aiding their speech and language development.

Larcher & Mitchell, (1995) claimed that "section 5 of the Code of Practice" referred to the importance of a multidisciplinary assessment, which should be done, in order to find out as much as possible about the child. This would establish the need, suitability and possible provision (e.g. high and low tech Alternative Augmentative Communication (AAC) Systems) and most appropriate therapy suited to the individual.

4. Alternative Augmentative Communication (AAC) System

NCET (1997) state that before deciding on a communication aid it was important to establish if the child has "the desire to communicate, something to say and a means to say it". Communication systems comprise of high and low tech aids. Low-tech aids consist of signs, symbols, charts, books, etc, which are also needed as a back up. High tech aids consists of e.g. electronic aids able to speak on the press of a key, computers, etc. Some children need the use low and high tech aids in order for them to understand and be totally understood by others. It is the speech and language therapists who decide upon the appropriate communication aid after an assessment has been made on the child's speech, language and communication ability by a multidisciplinary team.

However, for some children it would be very difficult to decide on which communication aid would be suitable for them. These children may have:

- poor manual dexterity with difficulty in pressing the keys
- sensory difficulties as in a visual and hearing loss
- poor receptive skills-difficulty comprehending a sequence of events such as the cause and effect of pressing a key to produce sound (speech) or in order to make something happen.

However, for this form of therapy to be effective it must be endorsed by the user and strongly supported and encouraged by the therapists. Therefore, if a child is able to use any part of their body to operate a switch, this is turn will result in operating a voice output communication aid (VOCA), which in turn will give them a voice. Some have been programmed to ask the child a question, e.g. ‘How are you?’ Gosnell (1995) rightly states, “An aid which will only restore a voice is the equivalent to providing a disabled person with a wheelchair which won’t steer round corners”. Some therapists have indicated that some children consider themselves as “speaking”, but owing to problems fails to communicate effectively. They can copy the language heard on AAC system and improve clarity and thus develop independent communication. Although some children need to use an AAC system for communication, it is however, very difficult identifying the correct system for each
child’s particular needs. Therapists feel that AAC systems need to be trialed and there needs to be very experienced assessors plus good back up/training for all concerned.

1992 saw the launch of Initiative for Communication Aids for Children (ICAC) three-year project between Education and Department of Health. Studies show non-verbal children are able to communicate effectively using high-tech AAC systems, which have synthesized speech freeing them from being socially isolated. (Larcher & Mitchell, (1995), Todman & Alm, (1997)). Many children are acquiring AAC system through LEAs and are being taught to expertly make use of the pre-stored phrases for retrieval and to form sentences for them. This form of intervention is said to be effective, however, it does not indicate the assessed individualistic abilities of these non-verbal children in the study, and therefore, once again it would very difficulty to establish the effectiveness of this type of therapy in relation to which specific children’s difficulties. The research to date on AAC systems shows that this type of therapy is also not suitable for flowing conversation, as AAC system are used for simple pre-stored non-interactive routine phrases, which has a slow speech output. Gosnell (1995) reports that research showed that “up to 70% of communication aids are, at best, not used properly, or at worst, not used at all”. It is important to make a thorough assessment of the users abilities, capabilities, disabilities, environment, medical and social problems as already stated and that the user and all working with the communication aid should be thoroughly trained. However, speech and language therapists themselves state that many speech and language therapists are not trained to use AAC systems.

Bozic, (1995) and many other theorists believe that “language is most effectively learnt if children are placed in naturalistic social situations”. Therefore, language intervention programmes for language-delayed children should provide a natural, real and meaningful clues or situations in which children are encouraged to communicate by participating cooperatively, with social repetitive games, joint activities, etc. Reid, et al., (1996) claim that new clinical areas in speech and language therapy are now opening up to innovate “technological advances such as computers, augmentative and alternative communication aids, video and videofluoroscopy”. Therefore, can multimedia software be used within this naturalistic social setting in our society today and is it able to give these real and meaningful clues and help language delayed children participate with social repetitive games, thereby aiding their speech and language development?

5. Computerised Multimedia Software

This investigation needs to look into whether multimedia software could be used alongside conventional (traditional) therapeutic programs, using sound, animation, graphics and text, within a naturalistic setting. This could result in an additional, effective, therapeutic tool, which could aid the speech and language development of infant children with communication problems in special schools.

It can be envisaged how programs incorporating different media (multimedia) used with speech therapy could be an aid to speech and language development. Northwood (1991) claim that multimedia libraries were around in the mid 1970s. Jones, (1994) draws attentions to the fact that another opportunity to promote the development of language is through multimedia.

The IT co-ordinator in the special school in the small-scale case study (Stokes 1995) said

“IT has been seen in our school as a major source of support for pupils with various physical disabilities and special needs. It has enabled greater access to learning for many of our pupils. Good software needs to be set up and continually changed according to pupils needs”. (p25)

Multimedia software can be used widely to support children with communication disorders. Onions (1992), Jones (1994) and Kameneva (1999) all claim that multimedia technology can improve language learning through various ways. First of all multimedia is a very visually effective form of communication as compared with the written and printed word. Videos are able to “give the viewer a glimpse of feelings or complexity” which again the written and printed words cannot quite fulfil to the same extent. Sound can give the printed words a voice, whilst the software becomes alive, animated and interactively stimulating for therapists and/or students working on speech and language development.

Burton, et. al.’s (1991) research showed that children’s motivation grew due to “the nature of the medium itself and from the variety that an additional form of presentation” which the multimedia software
is able offer the user. However, if the child’s assessed and diagnosed abilities and disabilities are taken into consideration and they are then given the correct multimedia software, this in turn should then interactively helping the user become a more self-directed learner of their own academic, social and speech, language and communication skills. They go on to verify that this aid would alter the client/therapist relationship, resulting in them working together in partnership “on computer presented tasks” rather than the therapists always being in charge and therefore not making the activity just therapist-directed. They stress strongly that “computers can and have been made for the clinical use of computers in therapy”, which they offer as such an alternative and useful form of therapy.

Bozic, 1995 claim that therapists need to be trained in order to use multimedia software effectively and efficiently and become aware of their full capabilities. This will take time and although some therapists are still apprehensive of this new technology at present, they are interested in being trained and will become less “prejudiced”. “as in the pace of development in computer technique accelerates”. The Speech and Language Therapists who attended the talk I (Stokes) gave at the Royal College of Speech and Language Therapists in London confirmed this. I began the talk by establishing that only a few of the 70 therapists were au fait with computers and therefore had not considered using them as a therapeutic tool for speech and language intervention. The therapists were enlightened of the findings of this investigation and explained and demonstrated how multimedia software could be made use of as an aid for speech and language therapy. At the end of the talk I established that the majority of the therapists present stated that they would now be interested in making use of multimedia software as a therapeutic tool to aid infant children’s speech and language development as part of their speech and language therapy program.

Alm et. al. (1998) studied whether the computer and its applications had the ability to captivate the user’s attention. They proved that all the subjects “showed an intense interest in what they were doing” and that the clinical therapists thought that the program the children used provided them with “much more control over their environment than they would experience within a game normally”. However, these studies do not seem to specify fully each child’s strengths and weaknesses prior to giving results of their studies.

Gosnell, (1995) also explained the advancement in technology resulting in pre-recorded sound/s, word/s or phrase/s being stored in a speech generated systems, enables the computer to output the word/s, phrase/s on the screen and have a voice synthesizer which is able to produce different clear sounding (almost) human-like voices. NCET, (1997) are in agreement of this and claim that multimedia software is able to reinforce speech therapy by visually showing the child their speech and vocalisation patterns on the monitor whilst therapy is in process, with the therapist working on their sounds.

Computer technology is greatly improving in that the “production of programs which give speech prompts are comparatively easy to produce”. Computers are not just a matter of giving a non-verbal child a voice, as a speech systems which is now able to “read” instructions from the child’s “retina or by detecting the tiny electrical current generated by thought patterns in the human skull”. Children’s ideas can now be formulated and organised prior to writing, which could be facilitated and given a new dimension with “high-quality digitised speech input, scanned pictures and photographs”. This could also prove a beneficial speech and language aid for children with communication disorders such as autism, learning disorder. (Singleton, 1992)

Johansson, (1994) pointed out the difficulties some children have in hearing and comprehending sound and speech just through their ears. They should therefore, be given information also through their other senses such as the eye and through touch which would help them communicate. Some children with physical disabilities, dysphasia and/or learning difficulties may be unable to touch the computer peripherals or be unable to comprehend letters, words etc. These children may, however, be able to use graphical image/s and a specialised single switch with e.g. their elbows, feet, fingers or their breath. (Davidson & Noyes, 1995; Gosnell, 1995).

Software has changed from the overloaded drill-and-practice type, which is still in use, to word recognition, word processing, data handling, etc which are usually cause and effect programs in colour, together with graphics, animation and sound effects (symbolising achievement). Multimedia software should now be considered as a communication aid for
therapists to use, to help children’s speech and language develop. I (Stokes) would now like to give an explanation of how I intend to further my investigations. My research studies will show how a multimedia computerised prototype therapy could be effectively implemented and tested as a therapeutic tool, by speech and language therapists in special schools, for the verbal language development of infant autistic children with moderate learning difficulties (MLD) and communication problems.

6. Further research

This position paper goes on to indicate my (Stokes) proposed future study which will reflect on all the above areas contemplating the effects of multimedia software on infant children with communication problems and whether this technology could aid the speech and language development by being used as a therapeutic and/or classroom tool.

The focus will be on verbal language development of infant autistic children with moderate learning difficulties (MLD) and communication problems is due to the brief history of applying technology to the communicative problems connected with Autistic Spectrum Disorder (ASD). Efforts have been centred on providing augmentative technology for children who remain essentially nonverbal….for those who show some verbal behaviour (echolalia or productive) little in the way of interactive software that is specific to their language problems have been available unless and until they begin reading (Lehman 1999).

Aims of this further research is:

- To identify which infant MLD autistic children, with verbal language difficulties, have benefited or could benefit from multimedia computerised therapy.
- To show how conventional (traditional) speech and language therapy have influenced multimedia computerised therapy models, which are being used or, can be used today.
- To identify and testing the elements of multimedia software e.g. sound, animation, graphics and video as whether they are or are not able to aid verbal language development.
- To identify a school that is using computerised multimedia therapy in order to develop a theoretical Computerised Multimedia Therapeutic Intervention Model (TCMTIM) (Model A).
- If no computerised multimedia therapy is established then to Model B would be used is for this purpose.
- If Model B is not suitable, then Model C would be used for this purpose.
- To analyse and consider whether the theoretical Computerised Multimedia Therapeutic Intervention Model (TCMTIM) (Model A,B or C) changes when removed from a theoretical context into a practical one. This is done through the implementation of a small theoretical piloted case study, which will be used as a prototype in a small case study investigating MLD autistic children with communication problems in Hertfordshire LEA Special Schools).

Methodology

One of out of the three possible models, one will be used as the Theoretical Computerised Multimedia Therapeutic Intervention Model (TCMTIM), used as a small piloted theoretical case study in order to investigate, implement and test out a prototype of a Computerised Multimedia Therapeutic Intervention Model (CMTIM). Both case studies will be collecting and analysing data from questionnaires/ interviews/diaries, non-participant and participant observation techniques.

MODEL A

An investigation into whether multimedia software has been shown to be used efficiently therapeutically for verbal language development in a particular school this could be used as a theoretical Computerised Multimedia Therapeutic Intervention Model (TCMTIM) or

MODEL B

If multimedia software has not been shown to be used efficiently and therapeutically for verbal language development in a particular school, I intend to investigate if the software used in classroom (e.g. for the National Curriculum) could be used as a theoretical Computerised Multimedia Therapeutic Intervention Model (TCMTIM) or
**MODEL C**

If no multimedia software has been found to be used effectively and therapeutically for verbal language development by a particular school and the multimedia software in the classroom has also not proved to have been effectively used for language development, then I will develop and produce a theoretical Computerised Multimedia Therapeutic Intervention Model (TCMTIM) based on conventionally speech and language therapy which could be used for the purpose of this research. Data from the pilot case study with the literature review will form the basis of the analysis and investigation. The findings from the prototype case study would demonstrate whether the theoretical Computerised Multimedia Therapeutic Intervention Model (TCMTIM) could be effective when put into practice.

**CASE STUDY**

**Prototype of a Computerised Multimedia Therapeutic Intervention Model (CMTIM)**

**Plan/Develop**

The plan of action for the prototype would then need to be put into effect, so that each particular area is covered substantially and in depth in a systematically and logical process. A small case study will be investigating the possible implementation of the theoretical model into a specific SEN special school under the Hertfordshire LEA and will monitor the record the effects.

**Action**

Pilot and main questionnaires will be submitted. I intend to use interviews and administrate diaries for monitoring to teaching staff and the speech and language therapists to all the Special Schools in the Hertfordshire LEA who have MLD autistic infant children with verbal and communication problems. Models A, B or C will be investigated in depth in order to analyse data in connection with areas such as:

- Has the software been monitored?
- The monitoring of the software whilst being used by child, child and teacher, child and therapist and the child and their peers
- In depth interviews with Teaching staff and Speech and Language Therapists to establish as to whether the theoretical model is appropriate or whether adjustments need to be made.

**Observe/Monitor**

Participate and non-participate observation techniques will be used, with audio and video recordings and monitoring. Ultimately the interpretation and analysis of the observation and the part multimedia software plays in this in order to produce generalisation about the ‘wider population to which that unit belongs’. Speech and Language Therapists will be observed using non-participate observation techniques working with children on their verbal language development using multimedia software. To reduce biased assumptions made from the observations and my analysis, an impartial observer will add their findings to the data collection and analysis for the case study. Some of the data will be collected by teachers and therapists who will be monitoring and recording the effects using diaries over a period of time.

**Evaluation**

Evaluation of the findings from the questionnaires, interviews, observations and diaries will be analysed and the evidence will be used as a methodological triangulation techniques. In-depth analysis and a critique of each element of multimedia of this computerised multimedia therapeutic model. The context for this analysis and critique will be the factors associated with the use of multimedia software and how teachers and speech and language therapists use this or can use this for verbal language development.

**Data analysis**

The analysis of the data will take place once all the data has been collected. The nature of the analysis is likely to be both quantitative and qualitative; the purpose of the analysis is to provide evidence to address the initial aims of the research. The analysis of the piloted and prototype case study will be carried out immediately after data was collected. The triangulation of data from the questionnaires,
interviews, observations and diaries, audio and video tape recordings will all provide a compilation of validated evidence from the quantitative analysed data from the questionnaires and qualitative data from the interviews, observations and diaries.

**Reflection**

A decision will be made as to whether modification is necessary.

**Modification**

Adjustments may have to be made. It will be noted what should be learnt from this and thereby modified for the future.

**Implementation**

The prototype case study will be implemented and tested in a Hertfordshire MLD Special School for infant autistic children with verbal and communication problems.

**Updated**

The information will be monitored and kept undated regularly.

**Future**

Further investigation could be made as to whether this could be used Nationwide.

**7. Conclusion**

There is, therefore, theoretical and analytical evidence to prove how multimedia software has been used as an effective aid to therapy.

Some of the research mentioned may not have been directly aimed at looking into the benefits of multimedia software to aid children’s speech and language development, however, the advancement of computer technology proves to have calculable possibilities for children with speech language and communication disorders, who may become more dependant on this technology as their computer-aided communication medium. Therefore, research shows that multimedia software should be considered as a supplement to conventional therapy and thus provide more intensive treatment without extra demands on the speech and language therapists, this will be investigated further in the follow-up research.

The follow-up research would be testing interactive multimedia software in order to establish if sound from the speakers, the animated graphics and the printed words on the screen could be used effectively, therapeutically by therapists. I will be narrowing down the focus to autistic infant child’s verbal language development.

IT has come a long way from the one computer per school with drill and practice software to multimedia systems. Voice recognition lets children with special educational needs talk to their computers and in turn the computer writes down what has been said. This and multimedia gives the word processor a voice which will give an extra aid to the development of language for children with Special Educational Needs.

Though the theoretical model and the prototype case study of the CMTIM, I hopes to be able to put forward the CMTIM as an effective tool for implementation to be used by speech and language therapists and teaching staff, thereby contributing to the body of knowledge and to become a useful tool to aid verbal language development.

The findings from this investigation and the follow up research will make a valuable original academic contribution to the Computer Science, Special Educational Needs, Education and Therapeutic fields.

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