A Case for Computerising Syntactic Transformations in Augmenting Communication Development

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Abstract

Augmenting speech communication *by providing alternate means* **even in** *Us most* **sophisticated forms is cumbersome mainly compared to oral output.** *The mechanisms of* **augmenting** *mainly provide* **for the form of expression which are fixed and generally** *less generative. To that extent it becomes difficult for* **the language delayed children to express their** *intent in appropriate syntactic* **forms.** *It is proposed* **that automatising the transformation would make** *it easy for delayed children to express.*

Facilities for helping the communicatively handicapped are increasing in India. The technological improvement is also contributing to the facilities offered from various agencies. Improved technology makes it easier for the speech handicapped to communicate with little effort and there are various computer assisted communication boards. Further changes and improvements in such a process is imminent on par with the research and development in the area of language and communication technology.

The need for helping the speech handicapped increases with severity of the speech disabling conditions. The severe speech disabling conditions generally are those which adversely affect child's language acquisition and usage. These are generally caused by sensory handicaps (Hearing loss); neurological disorders (cerebral palsy, brain damage) ; mental disorders (mental retardation) ; and emotional disorders (Autism). Increased gravity of any of these disorders or a combination of these disorders bring about such a situation that speech therpay *perse,* alone, may not be of help to the affected children. Then comes a need for assisting the available oral expression. This assistance can be from the use of aids and/or by additional bodily movements like gestures and signs which is really augmenting the residual expression. Sometimes the disabling condition may

leave the person so affected to depend entirely on a non-oral system of communiction.

Generally the augmentative systems of communication have been developed predominantly for the intellectually normal physically handicapped. However, they arc used with some degree of success among the speech disabled mentioned earlier (Graham 1976). "There has been some fear that introducing augmentative nonvocal communication channels might decrease vocalization or discourage speech development. However, studies to date have shown that introduction of nonvocal communication techniques has not decreased functional vocalization of speech development in these children but, has, in many cases, increased both their attempts at vocalization and their intelligibility" [Vanderheiden and Vanderhejden, 1976 (p.610)]. Also a Qualitative improvement has been perceived among children who have started using the augmentative aids. The ability to communicate independently had a good effect on their self concept. Teachers and parents have reported of a "deeper" personality developing in their children.

In reviewing, Graham (1976) states that some children may respond to the use of signs when they are apparently unable or unwilling to respond to oral language. These children may become more manageable when a manual communication system is established and eventually some children may acquire oral language. Also leaching manual or gestural system seems to be accomplished more easily than attempting to progress oral language as the earlier involves easier physical manipulation as compared with the complex and fine movement of oral structure required for speech.

Our experience here at All India Institute of Speech and Hearing is similar to that reported by Shaffer and Gochi 1974 (Cited by Graham 1976). A severely mentally retarded child who failed to acquire many words over several months of speech therapy started with more of vocalizing and articulation when taught to use general gestures with hands for various common nouns. We also agree with the finding that such a means of communication results in a decrease in behaviour problems and an increase in appropriate responses to other in the environment.

Complementing speech therapy with any useful method of augmenting has become acceptable to speech therapists. Like speech therapy, augmenting methods also need planning using functional analysis. Teaching the use of these non - oral methods lake as much time as for speech therapy but may not be of equal semantic value as of speech sounds. After Premack and Premack (1974) who taught chimpanzees to use tokens representing various words, it was shown that leaching nonspeech - language systems to non - vocal children is a working idea (Carrier, 1976). However, it is important to note that what is taught is the surface structure of sentence using paired associa-

tion / learning. Carrier has reported very good results in tenns of severely language handicapped children having learnt using seven word sentences using nonspecch language system. It is heartening to note thai children who use this nonspeech system could also get to speak subsequently in many cases.

This paper proposes that the use of programmed transformations would be more conducive in language learning compared to the other nonspeech programs. Providing computer programmed transformations would ease the child's learning of surface structure and reduces the burden of learning various inflections one at a time. The earlier nonspeech programs implicitly regard that the language handicapped have relatively normal receptive language and cognitive abilities of comparable normal level. Using such a developmental strategy for leaching expression to language disordered children, employing paired associate learning, may not become as helpful as a program wherein the transformations are already programmed may become reinforcing in themselves.

Before describing the proposed approach it is necessary to look at some of the important aspects related to child's learning of expressive language. It is proposed to make use of a computer assisted system where the children alter the syntax by using single response for each intent. It may suffice here to say that "language, afterall, is what provides the child with a means of \encoding and communicating his percepts and thoughts about the world around him" (Clark, 1973, PI 10). Children initially use words whose full meaning is unknown Since many of the semantic features belonging to a word are as yet not learned the child will misuse and over extend it. Gradually, however, as additional features are perceived by the child, he learns to refine the general meaning too until it corresponds to the adult usage. However, most developmental language teaching programs base their strategies as the way in which normal child is thought to acquire language. Some are of the opinion that the developmental data available on language is insufficient and that it may not necessarily mean that the developmental strategy is the mosteffective means of leaching a language disordered child. According to Guest, Sailor and Baer (1974) a deviant population by definition demonstrates the inapproprialcness of the developmental sequence for that group. Cromer (1974) hypothesized that the very fact that the language is delayed may indicate that subnormal individuals utilize different processes in the acquisition of language than do young normal children. Thus it may be most useful to teach a child such language forms which he can use for communication. It is important for him to control and interact with his environment than learning the components and their hierarchy of the languagcsystem (Graham, 1976). Programming transformation makes iteasy for the child to communicate and does not necessitate the hierarchical learning that is

emphasized by the conventional methods.

As for the child / individual is concerned it is important for him to use language than seeing it as a system opaque at a metacognitive level. According to Chomsky "When we say that a sentence has a certain derivation with respect to a certain generative grammar, we say nothing about how the speaker or hearer might process in some practical or efficient way to construct such a derivation. These questions belong to the theory of language use - the theory of performance" (Quoted by Moore, 1973). Most of the research on language has been on the acquisition of syntax: grammatical markers such as articles and interjections, word order, and the undergoing grammatical relations such as "subject oF' and "verbs oF' etc (Clark 1971). The child who is learning language, though, has to find out exactly what aspects of his experience (his percepts and feelings) can be represented in words. He is faced with the puzzle of assigning meaning to words at a point when he still knows very little about the language he is learning and at a stage where his world knowledge is still rather limited compared to the adults. When this is true of a normal child what can we assume about that of a language disordered child? Most strategies of language training make use of imitation and reinforcement to institute that training a set of language skills, will result in spontaneous acquisition of other skills that arc not speeiFically trained. Generally the child is taught to emit a response representing a word or words and then he is reinforced for that. In the beginning he is trained with words of nouns and verbs and later for plurals, adjectives etc. It would be advantageous for the child if he could have single commands for plurals, negations, questions etc. In his later stage at least. It would solve the problem for the child to find various nuances of inflections in each sentence, if such transformations are already provided in single commands. It is hoped that there can be faster interactions, which reinforce themselves, if the child need not grope to produce one word at a time and is able to produce precise inflections and transformations quickly.

The development of language and cognition arc thought to be parallel particularly in the early childhood where experience is of primary importance. The process of acquiring language is seen as more than just the acquisition of words and their subsequent use in various combinations. The child is said to acquire language as a result of various interactions with his / her environment, and these interactions are thought to precede and directly influence the acquisition il language (Cromer cited by Graham 1976). Graham (1976) opines that the area of normal language acquisition has undergone a change in emphasis from a syntactic explanation to semantic explanation of early child language. The semantic intent of early utterances of a child are to be considered along with specifying the structural form of these utterances. (It has also been

noted that same expression can serve different grammatical functions and semantic functions). In a language training program it becomes important thus to help the child find some ways to express his intentions. What the therapist or care giver can do is lo assume the child's intention (if the stimulus is not provided by them) and provide an expression, which is simple, (as a mother does with an infant) to be learnt in paired association. Then it is expected that the child learns to associate the intention (stimulus) and the form of expression. It is important to note that every child has experiences similar to this from the early childhood. Generally when caregiving adults speak to the child their utterances arc not limited to words but phrases which can be quite longer though simple.

When the child imitates to express, generally he is successful in communicating his intents using even short phrases or single words in earlier stages and longer phrases as he develops. In case of the language disordered child not only there is a delay in the initiation of communicative attempt but there may also not occur the expansion of spoken words in to phrases. It will work out to be a natural exercise if the child can be trained to put his intents inio longer syntactic expressions. If the child is .trained to change transformations automatically on a computer using a single com - mand according to his intent it would not only facilitate his.communication but also help him learn the syntactic form of such expression.

An augmentative method can be as simple as the subject having cards with him on which most of his needs are written down. Whenever the subject indicates for communication the cards list is read. On hearing the correct item he can nod his head or by such simple means may affirm the need for which he can be helped. The augmentative method can be as complex as having the subject type each letter at a time on a computer screen making sentences, conveying his intentions. There are also programs like'voice' (by phonic ear) which can produce speech sounds as one types on the Keyboard. The 'voice' also has provisions for programming words and sentences and storing them to be recalled. None of the augmentative programs are "generative" at any level. One has to write a phrase and re - write to change them. Even for simple transformations like negation, pluralising, questioning, one has to change the whole form as needed. It is proposed, for the reasons given, that syntactic transformations be computerised and make it possible lor the subject to transform the sentence on a single command. Transformational analysis of various Indian languages have been made and the data is available which makes the process feasible.

The proposal

Augmentative methods used with children having normal receptive language do not require 'language' training. All the

augmentative methods used with language disordered children will have the children learn words, in the beginning at least, using paired associate learning which is an indispensable behaviouristic technique. It is proposed that this be exploited in the first level of learning of words viz., nouns, verbs etc. In the beginning the child will have a limited set of names (nouns) to be learnt. All the child has to do would be to push a button on a keyboard, to open the 'dictionary 'of some names on the compulcrscreen. The therapist (later any caregiver instead) would read out the word for the child and explain if necessary. After the required numberof trials and once the paired associate learning has taken place, the child would have learned to 'call' the word he needs to express. This dictionary of names can be enlarged or many such dictionaries of 'names ' can be opened depending on the child's

ability and needs.

Once a set of names are learnt the child can be introduced to a dictionary of verbs. Starting from this level the learning becomes complex and a need for programming automatic transformations becomes necessary. For example, it becomes necessary to use tense markers with verbs. To start with one may use all the verbs in present tense. Later the child would be provided to operate another key for changing the tense. Every time the child operates the key, therapist will read out the form of expression and explain. It can be expected that with enough operations the child would appreciate the use of tense marker along with verbs. The child may become able to notice the nuances in the use of tense markers in course of training or in furthered practice.

The program is provided schematically in the figure below.
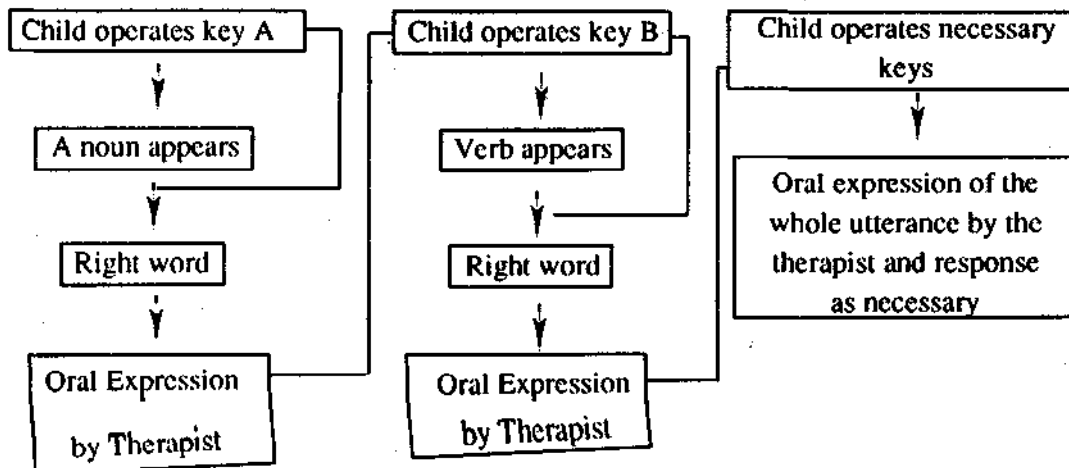
On similar lines training to use another noun as object: changing inflections for plural; use of adjectives; use of gender markers, etc. can be taken up. For learning each syntactic form the child will have to learn operating a separate key. At each operation the adult attending would read the outcome format which forms the child's expression and also the feedback.

Once the child has learned to form kernel sentences he can be trained to transform sentences on the whole into negatives and interrogatives (including 'wh' questions). It has been observed by Carrier (1976) that it was not necessary to train even severely affected language handicapped (Mentally Retarded) children above the level of seven word sentences. After learning the first sentence structure most children were ready to make the transition to speech and conventional speech and language training programs. Carrier had used (non-speech) visual symbols in his training procedure and found that most children, except some with severe motor or severely deformed atticulatory mechanisms, could make such transitions at least partially. Carrier's pro0 gram was least programmed and used only paired associate learning, children used lo place chips (symbols) for which the thera0 pist used to provide the words. The proposed automation should be able to hasten the process of learning language expression.

Material

Computer : Hardware required would be a Persona-l Computer. Soil ware required would be a machine language that has the required regional language as its script and a compatible computer language to write transformation packages. The machine language available is only computable with BBC computers, (used mainly in schools). It is expected that it becomes available for IBM system soon.

Language material: Identifying the words that are familiar and of immediate use for the children undergoing training. Some 'dictionaries' withlimited number of words are to be created. This has to be done in consultation with the family of each child to be trained.

Writing transformation rules, to be incorporated into the computer language at each level, needs to be done in consultation with linguists.

Changed Keyboard: A hard cover over the Regular Keyboard with a cut out exposing a single key would be appropriate for the child to operate the first dictionary. As learning progresses new areas may be cut in the board exposing the needed keys for various functions.

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