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ABSTRACT

The paper describes an innovative treatment approach to severe learning disabilities in use in St. Gallen, Switzerland. The multisensory approach is based on the assumption that learning disabled children have perceptual cognitive deficits. Reality based problem-solvng events connected with tactile-kinesthetic input become the primary foci of treatment. Guided movement during daily life problem-solving activities allows the child to learn in naturalistic contexts. A 1-month fellowship visit to St. Gallen lends greater understanding to a description of the four main theoretical principles: the importance of perception to learning; the complexity of the situation as a factor in learning; the primary role of tactile-kinesthetic sensory input in achieving adequate perceptual/cognitive organization; and the common root of verbal and nonverbal skills. A second section discusses application of the theories in assessment, work with families, and treatment strategies. Implementation is reviewed in an educational and rehabilitation hospital setting. The final section considers application of the theories to the United States, noting that a perceptual hypothesis about language impairment requires broader definition than the auditory modality. To encourage further learning, a working relationship with the St. Gallen team has been initiated. (CL)

FELLOWSHIP REPORT

NEW DIRECTIONS IN THE TREATMENT OF SEVERE DEVELOPMENTAL DISABILITY: ST. GALLEN, SWITZERLAND'S MODEL OF GUIDED MOVEMENT THERAPY

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Table of Contents

INTRODUCTION

MOTIVATION FOR FELLOWSHIP VISIT

This report is the outcome of a one month fellowship visit to the Center for Perceptual Disturbances in St. Gallen, Switzerland where an innovative approach is being developed for remediating the verbal/nonverbal performances of children with severe developmental disability. This work has significant implications for rehabilitation disciplines in the U.S. that focus on children whose deficits cannot be explained by the well known etiologies of blindness, hearing loss or mental retardation. Such children have been viewed broadly as learning disabled. The proliferation of diagnostic labels for this clinical group undoubtedly reflects its diverse symptomatology. These labels include dyslexia, aphasia, autism, specific language disability, attention disorder, etc. Although definition of learning disability continues to be debated (cf. Ames, 1983; Keogh, 1983; Ysseldyke & Algozzine, 1983), the literature suggests that these children, unlike the mentally retarded, present uneven skill development and perform lower than their judged potential to learn. Despite the broad spectrum of behavioral difficulties presented by the learning disabled, the difficulty of acquiring one or more language modalities stands out as a unifying theme.[1] It is estimated that at least 3% to 5% of U.S. children are learning disabled (see review of prevalence and incidence data in Mercer, 1983).

Over the past two decades, the strides made in characterizing learning disorders have not been matched equally by strides in treatment. Longitudinal follow-up studies (e.g. Rhea & Cohen, 1984; see also summaries in Maxwell & Wallach, 1984) show that learning disabled children do not catch up with their age peers even with intervention and that their performances appear more depressed as they get older. The prognosis for achieving a functional level of adaptive behavior is particularly bleak for children who present 'severe' learning disorders. Here reference is made to those who are nonverbal several

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[1] Throughout the text, language refers to a conventional system of spoken, written or signed symbols. It is used synonymously with verbal in contradistinction to nonverbal behavior which may or may not have semiotic value.

years after expected age of language onset and who, in addition, exhibit apparent difficulty on a nonverbal level in the daily life activities of self care, play and social interactions. Current rehabilitation approaches in the U.S. offer little hope of achieving even minimal adaptive functioning with an autistic child who still is nonverbal at 5 or 6 years of age.

The passage of handicapped legislation has sharply focused the need for more adequate treatment approaches for the severely learning disabled in the U.S. For example, Public Law #94-142 mandates equal educational access to handicapped children under the least restrictive conditions. Its implementation, undoubtedly, has caused fewer children to be placed in residential institutions. The assumption of responsibility for the child by the home, community schools and health care agencies has elevated sensitivity to treatment efficacy since service delivery is more glaringly accountable to public scrutiny.

There currently is no consensus about the best way to manage severe learning disability. The lack of consensus is particularly apparent for language habilitation which is widely viewed as a necessary goal of any treatment program. The diminishing theoretical and practical appeal of behaviorist models of learning has ushered in an era of electicism in clinical practices. A basic criticism of the behaviorist approach to treatment is that its highly structured tasks are contextually isolated from real life events. Language becomes words or phrases on paper or labels for pictures or objects on a table. The child must sit at attention and deliver set types of clinician prescribed and reinforced responses. Learning is measured by counting the number of responses emitted under specific stimulus conditions. While the relative 'straightforwardness' of such an approach has obvious practical appeal to the day-to-day reality of clinical work, repetitive skill routines may not be functional in natural situations. Guess, Keogh and Sailor (1978) comment on this problem below:

> "There is unanimity among language practitioners, however that a problem frequently faced in language programming is the generalization of what is taught in the classroom or laboratory to spontaneous use in a less constrained nontraining environment...It appears easier to establish a rudimentary language repertoire in language deficient children than it is to teach the

spontaneous use of the skill in nontraining situations." (p. 375)

The shift away from a strict behaviorist framework has been motivated further by expanding knowledge about the complexity of language and its acquisitional processes. In the last decade, research has led us to appreciate the influence of semantic and pragmatic knowledge on the learning of phonologic and morpho-syntactic forms. In addition, it has exposed the possible prerequisite and co-occurring influence of cognitive and social factors on language acquisition. This expanding knowledge base has pointed to the need for dynamic, integrative treatment models that encourage the teaching of language forms in contexts having semantic and pragmatic relevance to the real world.

Emerging U.S. treatment alternatives to a strict behaviorist approach have attempted to increase the naturalness of therapy by making it more child centered and pragmatically interactive (see reviews by Seibert & Oller, 1981; Yoder & Calculator, 1981; Fay, 1986). This trend has translated into therapy methods such as facilitative play (Hubbell, 1981), pragmatic games (Conant, Budoff, Hecht, & Morse, 1984) and focused stimulation (Leonard, et al., 1982). However, such approaches, while laying the groundwork for moving beyond the restrictions of behaviorism, do not appear to be appropriate for every child. Given their verbal foci, pragmatically motivated strategies seem most effective for the child who is already at a cognitive level for language discovery or the child who can respond to verbal input in socially interactive contexts.

On the other hand, a verbally oriented focus, albeit in more naturalistic contexts, is not likely to help the nonverbal child (i.e. one who has not reached the stage of semiotic function, and therefore has no symbolic means to externalize thought). Neither is it likely to help the child who functions on such a low level that he/she does not play or interact with people. In fact, Conant, et al. (1984) reported that the pragmatic game approach was not effective with severely impaired children. Fay (1986) argues further that it is counterintuitive to advocate naturalistic approaches which merely replicate the dynamism of the environment since the child has already shown that language cannot be learned in this way. This argument seems particularly relevant to the severely disabled children. Yet, if communication is to be applied outside of therapy, attention must be given to naturalistic events. The notion of naturalistic context poses an unresolved dilemma for current strategies.

There is another limitation of current strategies. Like the behaviorist approach, pragmatically focused strategies do not take into account the fact that low functioning children present maladaptive nonverbal behavior on a semiotic and nonsemiotic level. For example, one may observe difficulty in recognizing or drawing pictures, structuring play, completing a puzzle, getting dressed, retrieving a ball from a hole. Although all such observations point to cognitive limitations, current language treatment approaches, are not designed to build the cognitive base needed to remedy these behaviors nor to help the nonverbal child discover language except in an incidental way.

It is surprising that treatment modeling has not moved closer to a cognitive mode given the evidence for at least a weak language/cognition link (Rice & Kemper, 1984). In fact, the results of just one study (Steckol & Leonard, 1981) led rather quickly to the conclusion that working on a nonverbal cognitive task such as means/end does not facilitate language progress. The view that the cognitive aspects associated with nonverbal behaviors have no place in language therapy suggests that language impairment, both written and oral, evolves from a different root than do co-existing nonverbal deficits. The resulting fragmented treatment perspective is reinforced by professional turfdom that allocates written language skills to the special education teacher, oral language skills to the speech/language pathologist and nonverbal behaviors to counseling psychologists, physical and occupational therapists.

However, Maxwell & Wallach (1984) suggest that new treatment models must move toward a more integrative perspective.

> "Recent advances in the study of language acquisition suggest that the theoretical and clinical model for the 1980's must be dynamic, interactive...Furthermore, a system of symbols such as verbal language, cannot be understood independent of development in other behavioral domains which coincide with it..." (p. 32)

Such an integrative perspective is offered by yet another treatment alternative to behavior modification therapy, which is being developed in St. Gallen, Switzerland. Although Affolter and Stricker called attention to this approach in their 1980 English publication, Perceptual Processes as Prerequisites for Complex Human Behavior, it is not well known in the U.S. Their brief description introduced a radically different treatment approach that was the focus of the fellowship visit.

The treatment is based on the assumption that learning disabled children have perceptual-cognitive deficits. While this is not a new notion, complementary theoretical aspects of information processing and developmental cognition converge to shape broader definition of perceptual impairment than the auditory processing hypothesis that historically has dominated attention in the U.S. St. Gallen's multisensory treatment model not only goes beyond an auditory processing hypothesis, but it regards reality based problem-solving events connected with tactile-kinesthetic input as the primary focus of impairment and remediation of verbal and nonverbal behavior. Guided movement during daily life problem-solving activities offers augmented sensory input that allows the child to learn in naturalistic contexts. Both verbal and nonverbal behaviors are expected to improve simultaneously by focusing on the organization of underlying perceptual-cognitive processes.

A process oriented treatment strategy that evolves from a well motivated hypothesis about an underlying connecting root between different behavioral domains offers a potentially powerful approach to treating severely impaired children who often have multiple deficits. In principle, therapy can achieve more efficiently a wide range of behavioral changes by freeing its focus on specific skills that merely are symptomatic of a shared underlying difficulty. Guided movement as the principal source of input for learning, means that the clinician can directly facilitate learning by imposing the child's movements on the environment, thereby inducing contact with it. One cannot, on the other hand, induce a child to look or listen. The shift away from a strictly verbal learning approach should lead one to expect progress even when working with a nonverbal child.

GOALS OF THE FELLOWSHIP VISIT

The St. Gallen approach raises new questions about the nature and treatment of developmental disability that encourage further exploration. The primary purpose of the fellowship visit to St. Gallen was to obtain more specific information about the principles of this treatment model and how it translates into actual treatment practices. A secondary goal was to explore the possibility of establishing a collaborative research/clinical relationship between the St. Gallen team and a Language Sciences Laboratory that currently is being developed at Michigan State University.

GENERAL ACTIVITIES DURING THE FELLOWSHIP VISIT

This report incorporates information gathered from several activities during the intensive one month fellowship visit, which extended from June 21 to July 19, 1985. A global impression of the treatment framework was formed during my participation in the culminating week of a two year course offered by the St. Gallen team to about 25 persons that included parents, speech/language pathologists and special education teachers. Throughout the week, lectures were interwoven with participant self-experience in guided movement and case demonstrations. The case demonstrations focused on two severely learning disabled children who presented different clinical profiles. The participants were responsible for making the initial evaluation of the children as well as planning and executing therapy sessions for each child. Each participant had the opportunity to guide one or both children while being videotaped. The videotapes were replayed for analysis and feedback about the adequacy of patient contact. The week offered many opportunities to discuss the treatment framework with persons who use or desire to use the St. Gallen treatment model.

Information obtained in the course was supplemented by three weeks of video and live observation of patients at three sites: (1) the Center for Perceptual Disturbances in St. Gallen, (2) the School for the Perceptually Handicapped in St. Gallen and (3) the Rehabilitation Hospital at Bad Ragaz. At each site, I discussed my observations with professionals who were directly involved in applying the St. Gallen model to their treatment practices.

This report of my observations is presented in three sections. The first section describes the main theoretical principles of the treatment framework, whereas the second section attempts to paint a picture of how the treatment is implemented in three Swiss rehabilitation settings. The third section considers application of the St. Gallen model in the U.S. The report necessarily suffers from the oversimplification that results when complex concepts are treated in a few pages and have been grasped within a few weeks of observation.

I. TREATMENT FRAMEWORK

St. Gallen's treatment framework has evolved from more than a decade of clinical and research observations by Dr. Felicia Affolter and a multidisciplinary team of clinical psychologists, speech-language pathologists, audiologists, teachers of the deaf and the blind. The team is currently based in St. Gallen, Switzerland at the Center for Perceptual Disturbances, which it founded in 1976 along with a pilot school for the perceptually handicapped (The Sonderschule).

The team's work has been shaped by the broad theoretical perspective of Dr. Affolter, a clinical psychologist, who also is trained as a speech/language pathologist and teacher of the deaf. Having studied psychology at the University of Geneva, Dr. Affolter's orientation to learning theory has been influenced strongly by the work of Jean Piaget. But, the Piagetian framework has been integrated into a larger picture of learning theory that incorporates the information processing focus growing out of her study in communication sciences and more current versions of cognitive theory in psychology.

FOUR BASIC THEORETICAL PRINCIPLES

The Importance of Perception to Learning

The St. Gallen team's view of language impairment and treatment evolves from theoretical assumptions about the nature of learning complex behavior. Within its framework, perception plays a critical role. According to Affolter and Stricker (1980),

> "...perception includes all mechanisms used in processing the stimuli of an actual situation, including the different sensory modalities, supramodal organization levels, respective storage systems, and recognition performances..." (p. 12)

The definition points to perception as a complex process involving more than the stimulus detection and processing of sensory data; it also involves comparison of sensory data in an actual situation with stored experience, thereby enabling one to judge their familiarity. Perception occurs when the stimulus events are <u>recognized</u> as having been experienced before.

Recognition activity is a requirement for learning and development. Recognition that a situation is familiar means that the presenting stimulus events are assimilable to existing knowledge, and therefore can be treated in the same way as previously experienced events of the same kind. Failure to recognize a situation should elicit new responses that adapt to the new stimulus events, and as a result, expand the existing knowledge base for responding to subsequent situations. One quickly recognizes that the basic premise of the treatment model is tied to Piagetian theory in which "learning" is viewed as the adaptive effect of the complementary relationship between processes of "assimilation" and "accommodation".

To discuss further on a more concrete level, the St. Gallen treatment model assumes that two requirements must be met in order for learning to occur. First, the environment must present new situations in the sense that they offer problems to be solved. A problem is created when one's existing response repertoire is inadequate to achieve a goal in an actual situation. For example, a child, who is accustomed to getting the lid off a cup by only pulling up on it, suddenly is faced with a problem when a screw-on lid cannot be detached in the same way. Similarly, a child is faced with a language structure problem when exposed to an utterance whose syntactic structure is perceived to contradict an existing rule. During the course of development, the natural environment offers many daily life problems for the child to solve: Can I put this stick in the tiny hole, take the top off the cup to drink, climb the tree to get my ball, how do I tell Mom I've wet my pants, what is the name of this object, or the meaning of this word, and so on.

Having potential problem situations available for learning is not enough. The amount and type of information that the child can extract, compare and store in relation to existing knowledge are equally important. The child first, must have enough information to perceive the situation as having an unfamiliar aspect, and therefore presenting a problem to be solved. Failure to recognize a problem results in the use of the existing response repertoire. Consequently, the behavior appears maladaptive when the existing repertoire does not meet the requirements of the situation. In the above hypothetical example, the child would repeatedly apply the familiar 'pull up' action used for a pop-on can lid if she/he fails to notice that the screw-on lid is different.

Having recognized an existing problem, the child must then explore the situation to solve the problem-imposing first one action and then another on the situation in accord with hypotheses or plans arising from stored experiences. In the above example, let's assume that the child perceives that there is a problem getting the screw-on lid off the cup. The problem is detected either (1) by making pre-inferences about the lid from just looking at it and noticing its unfamiliar appearance relative to pop-on lids handled in the past or (2) by quickly observing that the lid does not come off when the familiar pulling action is applied. Among the alternative actions that can be taken, the child may now adjust his movements so that he/she pulls harder on the lid if past experience has shown that this action can change an object's state. Perceptual activity is again important to the exploratory activity.

Sensory feedback provides a check on response execution and informs about goal achievement. In order to judge the effect of the "pulling harder" action (i.e. whether it achieves the goal of getting the lid off the cup), the child relies on tactile-kinesthetic and visual feedback. For example, lifting the lid off the cup will be experienced as a change in resistance to movement. Such tactile-kinesthetic information may be complemented by visually observing the lid's separation from the cup. When the child perceives that the goal is not achieved with a given action, one can predict continued attention to the task if stored experiences are rich e ugh to offer new action possibilities or hypotheses to be tried. A normal baby with little experience may quickly move on to another object after trying one or two unsuccessful action strategies. Something new is learned though when a problem is solved (i.e. goal reached) by applying and adapting a new combination of actions. This new learning experience now expands the mental schema for perceiving and responding in subsequent situations.

To summarize, learning results from the child's interactions with the environment. The perceptual-cognitive schemes that guide one's response to the environment are not innate, but acquired as a consequence of the child's continual exploration of the environment in response to countless daily life problem situations. The normal baby, observes the St. Gallen team, is continually active--trying to stick a finger through a hole, pulling off an earring, putting it on again, pulling pots and pans from the cabinet, etc. A child who deliberately goes through rather than around a water puddle shows how new experiences or problems are sought out. In fact, it is taken as axiomatic that all human beings want to be active. When there are no problems to solve, even the adult reports boredom. Perceptual activity is required to detect and solve problems.

From all sensory input associated with successful problem-solving activity comes knowledge about the world--the functional properties of objects and their relationships, how to plan events, change and reconstruct them, and finally, what aspects of events are encoded through language. Hence, problem-solving exploratory activity is viewed as the developmental root for verbal and nonverbal behavior.

<u>Implications for Language Impairment and Treatment</u>. The St. Gallen learning model implies that understanding the basis for learning disorders must evolve from assumptions about how the child interacts with or explores the environment. The St. Gallen team argues that developmental problems for many children can be traced to their inability to explore the environment adequately for learning because of perceptual handicaps. If the amount or type of sensory input and/or its organization are inadequate, then the child will not be able to detect problems to be solved. Consequently, maladaptive stereotypic behavior will be observed because the child applies the same response repertoire to situations that are perceived as familiar but which, in reality, have unfamiliar aspects that he/she does not detect. No new learning occurs if the same response repertoire is applied all the time to different situations. Reduced learning experience restricts the range of existing knowledge and the types of hypotheses that can be generated to solve problems even when detected.

Learning also will not occur even for those children who get enough information to detect problems, but fail to explore the situation adequately to solve the problem. The lack of adequate information can prevent the child from detecting if a problem is solved or goal reached by a particular response. For example, a child, who applies a turning strategy to getting off a screw-on cup lid, will not be able to judge the effect of the action if he/she cannot feel changing resistance as a result of the turning movement. If the lid does not come off right away, the child is likely to conclude that the turning strategy does not solve the problem or achieve the goal. Such a child may move on to strategy after strategy without success--giving the appearance of hyperactivity and/or frustration intolerance. Naturally, no new learning occurs in the absence of success.

Therapy for such children must provide situations that offer problem-solving exploratory activity in connection with language. Moreover, deliberate steps must be taken to increase the adequacy of sensory input so that problems can be detected and success experienced in solving them.

<u>The Complexity of the Situation as a Factor in Learning</u>

The requirements of adequate problem-solving exploratory activity vary with the complexity of stimuli in the actual situation as determined, for instance, by their number, order and modality of presentation. Situation complexity introduces the notions of <u>attention</u> and <u>channel capacity</u> as important aspects of learning given limitations on the amount of information that can be processed at one time (Miller, 1956). Intuitively, one can assume that the more complex the stimuli are in terms of information processing load, the longer will be the developmental period required to extract the relevant information.

The St. Gallen team argues that language, like many nonverbal skills, offers very complex stimuli for learning because of its <u>multisensory</u> and <u>sequential</u> nature. To illustrate, it is known that language typically is presented to children in the presence of some event that is being experienced. An utterance such as "the dog is jumping off the chair" offers auditory information about the phonologic and morpho-syntactic <u>forms</u> of the language. Visual information also is offered about linguistic form and about the <u>content</u> of the corresponding event which involves a changing relationship between the dog and chair. In addition, tactile-kinesthetic information is offered if the child, at the same time, is poking the dog to get it off the chair. In such a situation, several sensory channels are stimulated simultaneously. The highly sequential nature of language is reflected by the concatenation of basic units (i.e. phonemes, graphemes or manual movements) into larger syntactic units, not to mention linkages across utterances from the same or different speakers during discourse. Similarly, a nonverbal act such as making a sandwich, which some may regard as a simple activity, involves several sensory modalities and connected action sequences.

In order to detect and explore such complex verbal and nonverbal stimuli, the child must bring to the learning task, a capacity to extract, store and perceive information from more than one sensory modality and to sequence such multisensory stimuli in time and space. Just how such a large amount of information is organized by the nervous system becomes an important theoretical issue.

The St. Gallen team capitalizes on the early work of information processing theorists (e.g. Broadbent, 1958) and psychophysicists (e.g. Hirsh & Sherrick, 1961) who argue for a two stage model of sensory-perceptual organization. The first stage registers modality specific information about stimulus properties (e.g. color in vision, tonicity in audition and pressure in touch). But, the acquisition of many aspects of verbal and nonverbal skills, including their sequential properties, depend especially on the second stage, which organizes sensory data across modalities. A supramodal organization requires a nervous system that first can connect information from different modalities and then extract the properties that are common to them. Hence, the two hierarchically dependent stages of perceptual oragnization include (1) an elementary modality specific stage and (2) a more complex supramodal stage with intermodal and serial-sequential sub-levels.

Cross-modal perceptual organization means that one learns about sequential properties of language not only from audition, which is exclusively temporal, but also from vision and taction-kinesthesis, which are temporally and spatially based. This reasoning led to the hypotheses that (1) verbal and nonverbal deficits are associated with sequential deficits that reflect reduced multimodal perceptual organization, and (2) reduced multimodal organization can occur when peripheral sensory input from one or more modalities is absent or reduced or when at a central level, one has difficulty connecting sensory data across modalities or extracting the sequential features of such connected input.

To test these hypotheses, the St. Gallen team (Affolter & Stricker, 1980) compared the performances of various clinical groups on a sequential pattern discrimination task. The task offered analogous stimuli in the auditory, visual and vibrotactile modalities, and incorporated four levels of stimulus complexity. The simplest stimulus set required subjects to judge if two successive stimuli were the same or not. Stimulus contrasts varied along two levels of intensity and quality. The remaining three stimulus sets required comparisons of patterns having two, three and four stimulus elements. The tasks were normed on nonlanguage impaired children at 5-14 years. They were given to congenitally deaf children and blind children and to severely learning disordered children with verbal and nonverbal dysfunction. The latter group included three subgroups whose clinical profiles were derived from longitudinal observation. One subgroup had been judged to have tactile-kinesthetic sensory deficits while the second and third groups were judged to have intermodal and sequential difficulties, respectively. (Refer to pp. 23 and 24 of this report for brief clinical descriptions of these subgroups.) In addition to these three subgroups, the sequential tasks were given to dyslexic children and to right and left brain damaged adults. All groups exhibited severe developmental or acquired language deficits.

Two striking observations were made. First, <u>all</u> clinical groups exhibited difficulty in processing sequential stimuli relative to normal controls. Performances became more depressed with increased task complexity. On tasks requiring the comparison of patterns with three and four stimuli, performances plummeted for the deaf and the blind even in the nondeprived modalities. This meant, for example, that deaf children's sensory deprivation reduced the amount of sequential organization that could be achieved and expressed in vision and vibrotaction.

The second observation was that sequential performances for all clinical groups were depressed in every modality and not just in the auditory modality. Score depression was present in every modality irrespective of age.

The pattern of sequential deficits observed supported the expectation that language impairment is associated with reduced multimodal perceptual organization created by dysfunction at a variety of levels.

<u>Implications for Language Impairment and Treatment</u>. The more complex the verbal or nonverbal learning situation is, particularly with respect to its sequential and multisensory features, the more likely will perceptually handicapped children experience difficulty. Perceptual difficulty with sequential information is not restricted to a particular subgroup of the language impaired with auditory processing problems. Sequential processing problems are common to many different clinical groups that show deficits in both verbal and nonverbal function. Treatment for the perceptually handicapped must take steps to reduce the complexity of learning situation in certain ways while

at the same time preserving the opportunity for multisensory input and organization to occur.

The Primary Role of Tactile-Kinesthetic Sensory Input in Achieving Adequate Perceptual/Cognitive Organization

A third major finding from St. Gallen's aforementioned sequential pattern research suggested that all sensory modalities do not contribute equally to the multisensory organization underlying complex performances. Although all clinical groups scored lower than normal children on sequential patterns, the deaf and the blind scored higher than children who appeared to exhibit tactile-kinesthetic deprivation. In fact, children in the tactile-kinesthetic group scored just as poorly or poorer than those with presumably more central difficulties in connecting and sequencing information from more than one modality. The difficulty of all three latter subgroups was expressed on the simplest vibrotactile task that required the comparison of just two stimulus events. On the same simple task, the deaf and the blind performed successfully--their scores surpassing those of some normal children possibly due to a compensation effect. Of course, their vibrotactile scores also were considerably lower than normal children's on complex sequential tasks.

These differences between the deaf or blind and other clinical groups were made especially obvious in the comparative study of their tactile form recognition performances (Affolter & Stricker, 1980). Moreover, the clinical observation of group differences in overall functioning were consistent with the well-known claims that deafness or blindness per se does <u>not</u> preclude adaptive learning. The deaf with no associated impairments, for example, develop many adequate nonverbal skills and easily acquire nonaural verbal forms as well. On the other hand, children with tactile-kinesthetic difficulties, and those with more central perceptual difficulty can see and hear, but fail to develop adequately on a nonverbal and a verbal level. The verbal deficit is basic in that meaning is impaired, in addition to linguistic form.

It was reasoned that tactile-kinesthetic deprivation and its lack of central integration with other sensory systems has a more adverse impact on the learning of complex skills than do visual or auditory deprivation. Affolter and Stricker (1980) acknowledged that little is known about this relatively unexplored sensory channel, but it seems to offer different information about the environment than do audition and vision (Gibson, 1966).

St. Gallen's theoretical assumptions about the critical role of tactile-kinesthetic input in learning are shaped further by arguments for a strong link action (in the sense of movement) and cognitive development. Casual observations reveal how difficult it is for a normal child to sit quietly in places where adults look and listen or to keep from touching objects that are off limits in a new situation. Although the child also can look and listen in such situations, neither seems to be an adequate substitute for being active by moving, i.e. touching, handling or even talking or singing out loud. When one considers the physical properties of movement, tactile-kinesthetic sensory input becomes important to learning.

Within the Piagetian framework (Piaget, 1960), goal directed movement is a dominant feature of the exploratory sensorimotor activity leading to complex intelligent behavior. During the sensorimotor stage, the child's movements with its accompanying tactile-kinesthetic feedback are important to constructing reality. The child discovers early on that something else exists besides his own body by encountering changes in resistance to body movement as a result of contact with different objects. For example, poking a hole in thin tissue paper offers different resistance to movement than poking a hole through cardboard. Tactile-kinesthetic sensory feedback about changes in resistances connect with input from other modalities. Associated visual feedback is obtained by inspecting if a hole is created or not. Connections between movement and its effect on object states leads to knowledge about cause-effect relationships (e.g. the child hits a ball, and it rolls; the child pushes a pencil through the paper, and a hole results; the child drops a bottle, and the mother picks it up; or the child makes a vocal sound, and the mother responds with a vocal sound or another visible reaction). These cause/effect relationships between actions and changing states of objects become the basis for perceptual inferences--i.e. the ability to predict or anticipate changes in states of objects before an action occurs or to make a judgment about a probable prior action based on the visual state of the object. Such pre-inferences initiate plans for action in a situation.

More current versions of action theory fill in some of the gaps of Piaget's theory by showing how the physical or 'cinematic' features of movement and its sensory systems provide evidence for perceptual cognitive inferences. For example, Mounoud and Hauert

(1982) used arm swing amplitude during grasping to measure adaptive movement changes in response to handling objects of different weights. By 12 months, babies could already regulate lift/grasp patterns in relation to anticipated weight changes based on the visual appearance of object size. Such perceptual inferences reflect the child's ability to store motor plans that incorporate cross-modal connections between tactile-kinesthetic and other sensory inputs.

From handling objects (opening, closing, reaching and mouthing them), the child discovers a lot about the functional properties of objects. These functional relations become coordinated into longer and longer sequences of cause-effect action events that are connected to a goal. For example, dressing one's self is a very complex event involving different combinations of object relations and movement routines. Just putting on a shoe involves several movement sequences--reaching for shoe, making contact between foot and shoe, moving into shoe, and lacing or buckling it, etc. The St. Gallen team holds that such organization of movement has multisensory representation with tactile-kinesthetic input as its base. It is the tactile-kinesthetic system which offers the dynamic transforming aspect of perceptual/cognitive organization. According to Affolter and Stricker (1980, p. 115), one cannot change or create real events by merely looking or listening. But rarely can one touch the environment without changing it.

<u>Implications for Language Impairment and Treatment</u>. Given what is known about the functioning of the blind and the deaf, one must look beyond audition and vision to account for severe learning disability among other clinical groups. The St. Gallen team argues that the perceptual handicaps that interfere with verbal and nonverbal learning are rooted in tactile-kinesthetic deprivation and/or the disconnection of tactile-kinesthetic input from other sensory inputs. For treatment then, tactile-kinesthetic input associated with problem-solving action sequences becomes obligatory if the child is expected to experience direct interaction with the environment.

<u>Verbal and Nonverbal Skills Evolve from the Same Root</u>

According to the St. Gallen team, problem-solving exploratory activity involving multisensory, sequential events, is the developmental root of both verbal and nonverbal skills. Multisensory schema, rich in tactile-kinesthetic representation, become the basis for recognizing and planning nonverbal behavior. Such schema also motivate the <u>meaningful</u> learning of linguistic forms. The predominance of action content in children's early utterances is well documented.

A common root hypothesis leads to the expectation that verbal and nonverbal skills emerge simultaneously and not in hierarchical dependency. It is true that children, typically do not say their first words until a year after they have begun cognitively to organize nonverbal behavior. However, there is now considerable evidence that during the first year when the baby is organizing nonverbal behavior, it also is learning attributes of speech sounds and aspects of communicative interaction that are continuous with the later onset of linguistic skill. See for example, the research on babbling drift (e.g. Oller, 1978) and mother-child interactions (e.g. Snow, 1977). More specific evidence for a nonlinear developmental dependence of verbal and nonverbal skills was provided by St. Gallen's longitudinal study of preverbal children (Affolter & Stricker, 1980, pp. 82-104). They observe that some children began to produce language before they could imitate directly. Others could produce language before they could produce a sequence of actions leading to a goal (event production). In fact, event recognition was the only nonverbal skill that was concurrent with or prior to language comprehension. These findings are consistent with those that support a homologous developmental relationship between language and nonlinguistic cognitive skills (e.g. Bates, 1979).

The St. Gallen team argues that the later emergence of some skills (e.g., spontaneous speech production) relative to others (e.g. means-end event production) does not occur because the earlier skill contains the prerequisite requirements for the later one. Rather, the developmental order reflects different complexity levels in underlying perceptual-cognitive organization. The more complex a task is in terms of its information processing load, the more problem-solving exploratory experience needed to extract all the relevant features given limitations on human attention and the amount of information that can be handled by the nervous system at any one time. The result is a longer developmental period, the more complex the skill. For the child who has difficulty processing sequential information, direct verbal imitation may be a more difficult task than spontaneous speech because it requires attention to the exact details of the model input. Consequently, the later development relative to spontaneous speech reflects the child's need to achieve a higher level of underlying perceptual-cognitive organization in order to reduce information load during an imitative task. The more knowledge the child brings to the task, the more likely can some details be ignored, or regrouped with others. For example, precise recall of a digit sequence, 121416 is easier if digits are regrouped and stored as three (12 14 16) rather than six bits of information.

The earlier appearance of complex nonverbal action skill relative to language in early life also can be explained in terms of information load. Meaningful language is more complex because it incorporates information about both the action events plus the linguistic code for representing the action. Prior to language, the child's nonlinguistic vocal output can be regarded as less complex in its information load because it can be guided by just oral tactile-kinesthetic and/or auditory information that is disconnected from action events. On the other hand, meaningful vocal output increases information load. Auditory/oral tactile-kinesthetic information now must be linked to information arising from action events, which include whole body tactile-kinesthesis, vision and possibly other sensory channels (e.g. smell, taste, etc.). Considering the amount of information that competes for the child's attention, it is easy to appreciate why the St. Gallen team stresses the complexity of meaningful language. In fact, so much is going on during a spoken language event that one should not be surprised that the normal baby extracts just some of the features at any one time...possibly focusing just on the auditory form during one linguistic event and just on action in another event. Language discovery may occur when there has been enough experience in each domain that attention can focus on both the form and action event at the same time in a situation.

Language discovery means that the child is aware that a particular auditory form (or in the case of the deaf, visual (manual) form) is associated with some aspect of an object or action in a situation. Even after language emerges, it is known that the normal child is able to connect just some of the features of its form with some aspect of an event. At first, just single words are connected to an event and not all the features of this word are extracted. For example, early word pronunciations are simplified by omitting some segments. The literature hints further at the possibility that in learning language, the young child may not focus on its form, content and use at the same time, e.g. Blake's (1984) dissertation showed that when children expanded their form, i.e. mean length of utterance (MLU), no new changes occurred in semantic relations or pragmatic functions. Conversely, expansion in semantic and pragmatic content were not coincident with shifts in utterance length.

The linguistic features extracted are determined by attention to stimulus saliency in relation to the prior knowledge that sets boundaries on what one might attend or expect in a situation. The work of Huttenlocher, Smiley, and Charney (1983) suggests that in observing an action event, children may focus first on those actions that they have already done themselves. The early linguistic coding of action events is well documented.

Further development is the consequence of exploring and extracting more and more information from actual situations about actions, linguistic form and connections between the two. According to the St. Gallen model, a relatively long period of language experience connected with actual situations precedes the child's ability to use language in a true symbolic sense in that it can refer to events that are absent.

The process of extracting new features is not a passive one. The new learning results from contradictions between hypotheses or expectancies imposed on the situation from prior knowledge and the kind of information actually experienced in the new situation. The problem-solving nature of language learning has been discussed by Menn (1976) in phonology and Miller (1984) for syntax.

Implications for Language Impairment and Treatment

The St. Gallen team holds the position that perceptual handicaps involving the tactile-kinesthetic system result from inadequate problem-solving activity in actual situations that impact on both verbal and nonverbal skills.

If verbal and nonverbal skills both are products of problem-solving exploratory activity, then it follows that such activity must be the focus of therapy and not the acquisition of specific skills. This means that one should focus on providing more and more input experiences that offer problem-solving opportunity to learn about the language in relation to events experienced. This does not mean that linguistic forms are referenced against a picture or object which are removed from direct experience. Rather, the child must actually be engaged in a reality type problem-solving experience and efforts made to represent this action through language. Problem-solving activity in actual situations should yield improvement in both verbal and nonverbal behavior.

However, one way to reduce stimulus complexity is to explore problem situations first without the verbal input. By working on a nonverbal action level, the treatment not only reduces the potential for information overload, but it provides the opportunity for the child to learn something from the situation that can build the <u>content</u> base onto which language forms can be subsequently mapped even in the same therapy session. It is assumed that language forms (words and grammatical patterns) will be acquired and retrieved most easily when they relate to some aspect of the situation that is familiar to the child's experiences.

II. IMPLEMENTATION OF TREATMENT FRAMEWORK

IMPLEMENTATION AT THE CENTER FOR PERCEPTUAL DISTURBANCES

The Center for Perceptual Disturbances is a privately financed non-profit clinic located at Florastrasse 14, in St. Gallen, Switzerland, a cantonal capitol city. The approximately 4500 square foot facility provides an audiometric testing suite, typical office and work space plus two kitchens fully equipped for storing, cooking and eating food. I was struck by the simplicity of the work environment, particularly the absence of special toys and materials that frequently adorn cabinets and tables in U.S. clinical environments. The large number of videotapes and films maintained on patients, in addition to the usual clinical records, equally focused my attention.

The significant rehabilitative role played by the Center is underscored by the fact that it thrives in a relatively small city of about 100,000 persons that also supports two other major clinical facilities serving children with developmental disability: the Kantonsspital St. Gallen (Cantonal Hospital) and the Children's Hospital. However, patients of all ages are referred to the Center from all over Switzerland and bordering European countries. They come with varying diagnoses including deafness, dyslexia, autism, aphasia, schizophrenia, mental retardation and emotional disturbance. The Center enjoys a reputation of helping children who do not respond to established treatment approaches. Children are most often referred in the age range of 4-10 years though a patient as young as 15 months has been seen.

The staff of about seven clinicians devotes time not only to diagnosis and treatment of developmental disability, but also to clinical research and the teaching of courses on the therapy method to parents and professionals who serve learning disabled children.

The Nature of Perceptual Impairment

The St. Gallen model views a perceptually handicapped child as one who does not explore the environment adequately for learning because of either reduced peripheral sensory input or abnormal central organization of such input. Strictly speaking, this group includes the deaf and the blind whose peripheral sensory deprivation leads to perceptual deficits for specific tasks. But, since their sensory deprivation effects do not prevent general adaptive learning, they are not regarded as learning disabled and for this reason, are treated less often than other groups at the Center. Among learning disabled children I observed three clinical subgroups.

One subgroup appears to present perceptual deficits due to reduced tactile and/or kinesthetic acuity. Children in this group show immature object grasp, release and manipulative patterns. They grasp with one hand and/or use just two fingers as opposed to the whole hand. Objects may be touched but not actively handled. Walking and climbing movements are awkward, and maximum tactile-kinesthetic support is required to execute movement or to alter body position during movement. Otherwise, the child may show panic. Some children refuse to touch objects--appearing tactile defensive and inactive. They create the impression of being mentally retarded or lacking in motivation. However, such children appear to understand more than they can do whenever the task can be performed on the basis of visual information. For example, such a child may quickly learn to visually match and sort pictures or objects or to associate an auditory form with a picture. Yet, the same child can show tremendous difficulty pouring water from a pitcher into different size glasses because the movements have to be referenced from the tactile-kinesthetic system. Although the child may observe visually that the action resulted in water on the table instead of the glasses, he/she is not able to solve this problem given failure to perceive kinesthetic sensory feedback about movement. The same child will have difficulty articulating speech sounds or adapting his/her walking movements to an unfamiliar situation. These children will also fail complex cross-modal and sequential tasks involving just vision or audition given that tactile-kinesthetic deprivation reduces the multisensory organization on which they depend. The tactile-kinesthetic subgroup is the largest and most frequently seen group.

Still other children are skilled in their movements, but present stereotypic, unconnected and disorganized movement sequences. They lack eye contact and appear socially detached. They do not always look at what they are doing, and some give the impression of being hyperactive. Such children's difficulties increase whenever the task requires connections between tactile-kinesthetic information and other sensory data. These children, labeled as the intermodal subgroup to reflect their difficulty in making cross-modal connections, are often referred to the St. Gallen team with the label of autism. Bryson (1972) is among those in the U.S. who have called attention to the cross-modal difficulty of autistic children. Intermodal children may quickly learn tasks that can be done by using sensory feedback within a single modality. Visual matching may be done successfully. An inlaid wooden puzzle also can be done if the child can detect when the puzzle form fits in the designated space by feeling a change in resistance, and does not have to look. However, since most human behavior depends on cross-modal connections, one can appreciate why intermodal children can exhibit such low levels of functioning. For example, the lack of cross-modal connections prevents the child from discovering that something heard is something that can be seen. Consequently, the child does not turn its head in the direction of a sound source. Yet, normal babies show auditory localization behavior as early as three months. Intermodal difficulty can account for some of the bizarre behaviors described in the autism literature. The lack of mother recognition and social interaction can be explained by the failure to link tactile-kinesthetic information obtained during feeding and body contact with the visual features of mother. Compulsive maintenance of the same objects in a given arrangement could result from an effort to create order from strong dependency on crystalized visual schema. Only by connecting visual information with tactile-kinesthetic information arising from object handling can the child discover that objects do not have a static visual configuration. Naturally, these children exhibit sequential difficulties inasmuch as sequential skills are assumed to rely on an integrated multisensory store of experience.

Children in a third clinical subgroup, labeled as serially impaired, appear similar to those labeled as developmentally asphasic in the U.S. It is not surprising that this group is least often seen by the St. Gallen Team. This group has no sensory deprivation and experiences adequately connected sensory input, but fails tasks once they involve a certain level of sequential complexity. Consequently, it appears that many develop enough skill to function in conventional special programs. However, these children are said to be easily frustrated probably because they can often take the first steps toward solving a problem but fail because of difficulty connecting sequences of actions or linguistic form. Difficulty is seen in all modalities, especially the vibrotactile one. Like the aforementioned groups, visual tasks are the easiest possibly because vision offers greater simultaneity of sensory data compared to audition and taction/kinesthesis.

In summary, children in all three clinical subgroups present normal physical appearance. They all show general difficulty with comprehension and production of verbal tasks and with planning or executing actions on nonverbal tasks. However, all show uneven skill development in both areas, with visual tasks yielding the best performance. Some children presented symptoms characteristic of more than one subgroup.

Assessment of Perceptual Impairments

The assessment of perceptual handicap at the Center, naturally relies on checklists to guide informal observations since many children are unable to respond to structured tasks at the onset of therapy. In addition, the staff relies on responses to three perceptual/cognitive tasks that they developed and normed. These structured tasks permit responses to be observed under different sensory modality and stimulus complexity conditions. The classic Piagetian seriation and haptic recognition task are offered in the visual, tactile and visual-tactile conditions at three levels of stimulus complexity. Analogous successive pattern discrimination tasks are offered in the auditory, visual and viorotactile conditions at four levels of stimulus complexity. Although case history report and medical records are obtained, the team relies heavily on its own observations of what the child is doing in an actual situation. Videotapes are frequently made of the child's behavior for purposes of reliable and detailed analyses. From observation, I inferred that the diagnostic process is designed to answer three questions:

1. What is the status of the child's verbal and nonverbal skills? The goal is to determine presence or absence of age appropriate skills. That is, does the child comprehend and produce spoken or manual language forms? Does the child recognize or draw pictures, exhibit symbolic play? On the social level, does the child initiate interaction with other people, recognize parents, show affection, smile socially, maintain eye contact or show fear of strangers? On a cognitive level, does the child recognize self in a mirror, identify common objects, adapt movements to unfamiliar situations, recognize and/or produce functional object relationships or daily life events requiring planning and execution of action goals? It should be pointed

out that the team not only determines presence or absence of various skills, but the specific conditions under which they are present or absent. Information about behavioral conditions is used to determine if and how behavior is influenced by the type of sensory information offered in a particular situation; e.g. does performance break down whenever the child has to plan a sequence of actions leading to a goal as opposed to executing a well practiced routine, or does performance break down (e.g. panic reaction) whenever the child has to perform an action without maximum support or use tactile-kinesthetic feedback to monitor movements as opposed to other forms of sensory feedback?

2. What kind of sensory information is the child getting? Auditory and visual peripheral functions are assessed using familiar formal and informal techniques. Much time is devoted to evaluating movement in order to infer tactile-kinesthetic input. In spontaneous informal situations, observations are made about how the child touches, grasps and handles objects, walks, negotiates stairs, etc. On a more formal structured level, I observed that the tactile conditions of the haptic and seriation tasks are used to obtain systematic data on how the child moves when solving a problem using just tactile-kinesthetic information. The haptic task requires the child to match forms of varying shapes and complexity whereas the seriation task requires the child to order wooden bars by size. Since these tasks have been normed, performances can be quantified against some standard.

3. How does the child respond to changes in information? Logging the situations under which age appropriate skills are present or absent is supplemented by observing if the child focuses attention during guided movement. The St. Gallen team maintains that a child who knows how to solve a problem will resist guiding and that even a normal child will permit guiding if he/she does not know how to act on the environment in a particular problem-solving situation. During my visit to Bad Ragaz, I observed that even the brain injured adult did not resist guiding. One can also observe how the child performs with added sequential complexity or added visual information, and so forth. The information in the latter category is important to revealing if performance success is uneven relative to the kind of information that must be perceived in an actual situation.

The answers to the above three questions over time allow the therapists to determine if perceptual impairment is probable, and the type of perceptual deficit exhibited. However, I observed no magic constellation of skills or a test score that leads to the interpretation that a child is perceptually impaired. Many groups of children, including the mentally retarded, fail to obtain the same score as the normative group on perceptual tasks. It seemed to me that the presence of perceptual impairment is judged primarily by the child's uneven performances in different situations. The child is likely to be perceptually impaired if successful performance is situation dependent, i.e. can be explained by the amount and type of information load. A mentally retarded child would not be expected to perform in such an uneven manner.

A more promising approach to diagnosis is likely to evolve from the St. Gallen team's current research on the different clinical profiles shown on seriation and form recognition problem-solving tasks (Affolter, forthcoming). The problem-solving model developed by Ruth Fitt and Mattie Janse-Brouwer at the University of Minnesota is being used to analyze detailed behavioral observations. For example, on the seriation task, such observations include the following: the child measures with two pieces, touches or looks at the display, measures top line resistance, etc. Using the Pitt/Janse-Brouwer Model, Dr. Affolter has been able to categorize behaviors according to the evidence they offered for various aspects of the problem-solving process such as making an hypothesis about how to solve the problem, evaluating feedback, etc. Preliminary results from the seriation analysis point to different clinical profiles for the mentally retarded and learning disordered children who fail the task. For example, the mentally retarded fail to generate hypotheses for solving the problem, i.e. one or two strategies are tried before concluding the task. Learning disabled children, on the other hand, generate many hypotheses but fail to solve the problem because they presumably do not get enough information to judge the adequacy of the strategy. Other features are emerging to distinguish the tactile-kinesthetic and intermodal clinical subgroups as well.

But, differential diagnosis is not important for the therapy process since all perceptually disturbed groups get the same therapy. However, differential diagnostic information is useful for predicting and explaining the child's response to learning situations. To illustrate, intermodal patients (those having difficulty connecting sensory information across modalities) may differ from tactile-kinesthetic patients (those having difficulty extracting sensory information from movement) in the kind of feedback cues that can be used. Consider the task of matching puzzle pieces to their corresponding inlaid patterns on a two-dimensional puzzle board. The intermodal child may have difficulty knowing when the puzzle piece is a fit because vision also must be used to check on the movement. On the other hand, the tactile-kinesthetic group can use the visual information to solve the problem because there is no intermodal problem. Adding depth to the puzzle board increases the possibility for the inter-modal child to just use tactile-kinesthetic feedback to monitor correctness of puzzle placement, i.e. the puzzle piece is inlaid correctly when it fits snugly against the inside of the board, and visual information, therefore, is not needed to verify goal attainment. The tactile-kinesthetic child, however, may not be able to use this new tactile-kinesthetic information, and consequently will continue to solve problems on the basis of feedback about what the puzzle looks like. To the extent that visual information, alone, is insufficient, task failure will also be observed for the tactile-kinesthetic subgroup.

Orienting the Family to the Treatment Strategies

Once the child is diagnosed as perceptually impaired and a candidate for guided movement therapy, the child's caretakers are trained to do the therapy. Conducting the therapy in the home is required since it provides the greatest opportunity for experiencing relevant daily life events. If therapists are hired by the family to work with the child in the home, they also are included in the training. Training has two goals.

The first goal is to develop skill at guided movement. This is accomplished by having family members experience guided movement by guiding each other and then the patient under supervision. Videotapes are made of guiding for feedback and discussion.

A second goal is to increase the family's sensitivity to the nature of the patient's problem. I found the use of self experience exercises to be a rather interesting approach to sensitizing the caretaker to the frustrations of the child. During my visit, for example, each member of one family participated in a writing exercise during which visual feedback was deliberately distorted to induce frustration. Afterwards, discussion of the family's frustrations on the task was used as a basis for orienting it to the child's problems.

The family orientation can last a week or more for families who travel from other countries. The child is then returned to the center at periodic intervals for monitoring and evaluation. Some patients may be seen at the center once or twice per week whereas others may be seen every six months depending on the family's location and needs. The Center's staff clinicians also make field visits to patients' homes to monitor progress when needed.

Treatment Goal

Therapy strategies are consistent with the view that language and nonlanguage delay are due to perceptual-cognitive deficits. The goal of the therapy is to offer problem-solving exploratory experiences that can make perceptual-cognitive activity more adequate for interacting with the environment. Given the theoretical framework described above, two aspects of the treatment focus stand out as different from most U.S. approaches.

First, the therapy is geared mainly toward comprehension rather than production performances. Consequently, the child is not required to emit particular responses, especially at the early stages. This treatment practice follows from the theoretical assumption that all patterned, adaptive behavioral output is guided by some kind of prior established mental schema or principle. For example, the act of getting a drink of water will be guided by already internalized rules for moving in the environment to accomplish the goal. A meaningful verbal response to the same event (e.g. I want a drink) will reflect stored grammatical rules and articulo-motor programs connected with stored tactile-kinesthetic experiences of drinking. If observable behavior is the product of already formed schemes, it follows that the way to change the output is not by working on the output, but by altering input experiences that can change the existing schema for acting.

A second feature that stands in contrast to U.S. approaches, is the lack of focus on specific skills. That is, the treatment is not structured to teach colors, picture recognition or grammatical constructions if such skills are lacking. Neither does the treatment attempt to teach nonverbal skills such as object permanency or means-end relations. Rather, treatment focuses on facilitating perceptual-cognitive representation through problem-solving experience that is assumed to be at the root of a wide variety of complex skills. Hence, the treatment is process oriented.

Treatment Strategies: The Technique of Guided Movement

The goal of stimulating perceptual-cognitive learning is achieved through guided movement. This means that the therapist takes the child's hands or body and guides their movements during activities. The assumption is that the same sensory feedback is experienced whether the child moves on his own or is moved by someone else.

The clinician's hands are positioned on those of the child such that input to the whole hand including the fingertips can be experienced. Typically, the therapist guides from a standing or sitting position behind the child. The body movements of the child and the clinician are synchronized and naturally paced (not too slow or too fast) with smooth positional transitions. The therapist moves with the child in the same way that he/she might move naturally in the activity. This means that the therapist does not prestructure the precise movements to be made when solving a problem, although the materials ought to be familiar to the therapist. In fact, the therapist should expect and welcome problems that may arise naturally in trying to solve a problem. For example, if the instrument used to cut the apple or an apple piece falls to the floor, the therapist guides the child's movements to pick up the object. Such detours are part of natural events and create a new problem with its own cause-effect sequence of action subroutines embedded in the larger problem context of cutting the apple. Similarly, if the object needed to complete the task is not on the table, the child is guided to the cupboard to get it. Consequently, the whole body, and not just the hands, are involved in purposeful guided movement.

The movements involve both hands. Routinized or stereotypic patterns are minimized by varying the movements on different objects or on the same object. For example, when cutting apples, one does not structure the movement to cut every apple in the same way. A large apple may be managed most easily by cutting it in half before preparing smaller pieces while small pieces may be cut from the whole of another apple. The variation in movement encourages adaptive learning.

The therapist does not verbally announce what movements are going to be made. In fact, the therapist does not talk during the problem-solving activity so as not to overload the child with too much information. During my own attempts at guiding someone, I noticed how difficult it is for the therapist to talk and focus on the guiding at the same time.

Guided movement is structured so that the child experiences maximum tactile-kinesthetic feedback about movement. This is achieved by executing the guided movement such that the child experiences maximum changes in resistance created by the opposition between movement and no movement. Recall that this sensory feedback is important to evaluating when an action goal is reached, and consequently, establishing a causal relationship between one's movements and their effects on the environment. When slicing an apple, to use St. Gallen team's frequent example, the knife's vertical movement through the fruit continues until it reaches the stable support of the table at which point, movement is met with maximum resistance. Since the movement cannot continue, the child can use the input of information to judge the completion of an act or the attainment of a goal. On the other hand, it is more difficult to judge the completion of a movement when slicing the apple by moving the knife horizontally such that the movement never makes contact with the table. Much less resistance is offered to movement in the latter than in the former situation. At the extreme end of the continuum, spreading butter or jam on bread offers hardly any resistance to movement that can be used to judge the completion of an act. In amazement, I observed even adult brain damaged patients continue their spreading movements indefinitely after the bread had been covered visually. The movement was stopped only when the therapist intervened. Such patients with severely reduced tactile-kinesthetic representation could not even use the available visual information to monitor act completion or goal attainment. Just this small clinical observation adds support to the St. Gallen team's claim that visual perception is supported by the prior perceptual organization of tactile-kinesthetic input.

To provide maximum change in resistance, the patient must have stable body support from beneath and along the side since any change of stimulus information is perceived relative to some reference point. A stable support anchors the body in order that tactile-kinesthetic feedback associated with a particular movement can stand out. Tactile-kinesthetic feedback in the form of felt resistance is experienced as a change in the relationship between the support and one's body and/or object. For example, if the body moves around continually, then any new movement superimposed on this general movement is difficult to detect--under ordinary conditions--i.e. unless it presents extraordinary contrast with the ongoing movement. Simply put, the movements of one's arm is accentuated when the body is in a resting position. It is also difficult to detect the arm movement if one cannot feel where the body is in space.

Consequently, guiding is not done with hands or feet up in the air. All movement is guided along a stable support so that the patient knows where the body is at all times. Maximum changes in resistance also are facilitated by choosing stimulus material that offers instant rather than gradual opposition to movement (cf. apple and peach), and those that maintain from consistency (cf. sand vs. paper).

A child who tries to take over the movement and perform the task without help, is allowed to do so, but not at the expense of reinforcing maladaptive response habits. During my visit, I observed one child who had a rich repertoire of habit responses based on visual patterns. During a dish washing task, the child resisted guided movement. However, his habitual movements were nonadaptive in that each dish, regardless of size or debris, was put into the tub, stroked once with a dish cloth and taken out. It appeared that the child had visually extracted the proper sequence of activity without connected tactile-kinesthetic representation. Consequently, once the child's hand was in the water, the therapist imposed guided movement in order to create a more adaptive response to the task.

Strategies also are used to connect tactile-kinesthetic effects of action with feedback from other sensory systems (e.g. visual, gustatory). I observed that a child often was guided to taste food after a movement goal had been reached (e.g. after cutting an apple piece) or the child was encouraged to touch and/or look at the changed state of the apple following each slicing attempt. Establishing such intersensory feedback connections allows the child on subsequent occasions to view a cut apple and make inferences about how the apple got in its state or to see an apple and judge what kind of actions could be imposed on it without first having to act on the apple. It should be clear that this is the kind of knowledge that supports the search for linguistic forms, for asking questions, and commenting on the states of objects, and their cause-effect relations, both probable and real.

The Role of Daily Life Problem-Solving Activity

The guided movement always occurs in the context of reality based problem-solving events. A problem-solving event involves a sequence of actions leading to some goal in a situation having an unfamiliar aspect. Such daily life events may occur in preparing a snack, eating, dressing, constructing objects that have functional use--beads or hat to wear, a present for mother--washing, and retrieving a toy from a shelf for play, etc. Thus, the therapy setting is the natural environment.

At the Center, I observed that the kitchen was a frequent setting for therapy. It is one of the few settings that offers so many natural problem-solving events in a restricted clinic environment. Every meal or snack, for example, provides different sensory information and sequences of events leading to a goal. Cutting an apple offers a different problem than cutting a slice of bread. Even the cutting of an apple offers different problems depending on its size or the type of countertop or instrument used, etc. It should be clear that the goal is not to teach the child specific cooking skills, but to offer the possibility to experience different types of reality-based problem-solving activities involving cause-effect relationships. But, the bulk of therapy takes place in the child's home which provides a much broader context for natural problem-solving activity. The child's caretakers are instructed to do with the child just what other people are doing in the home.

Care is taken to select daily life problems that allow the child to function at his/her performance ceiling. The ceiling is most likely to be reached when the situation includes familiar features to the child with some novelty to create a new situation. For example, putting on shoes becomes a new problem when they are new and have an unfamiliar buckle that must be handled in order to get the shoes on. The child is assumed to be functioning at performance ceiling when he/she attends the task--i.e. does not talk or focus on other stimuli in the sensory field. In structuring the activity, the therapist can exert further control over the stimuli in the situation to encourage success. For example, some or all items can be presented in the perceptual field to facilitate recognition (pre-inferences) about how to solve the task. In such cases, objects also communicate the activity goal to the child.

Choosing daily life problem-solving events offers three necessary features for development that can be missed by contrived or artificially created tasks. First, they are dynamic--always changing. The stimulus properties of real situations are never the same even when one experiences the same events. For example, the type and sequence of movements associated with getting dressed change depending on the number and types of clothing used, the rate at which one has to act, etc. These changes in the natural situation offer problems that force the child to adapt his movements and thus stimulate further development. At the same time, events stimulate perceptual-cognitive organization at modality specific as well as cross-modal and sequential levels of integration.

Second, reality events are rich in their sensory inputs offering the possibility to connect movement to different kinds of associated sensory inputs (e.g. auditory, visual, etc.) that co-occur with the movement and offer additional channels of feedback about the effect of movement.

Finally, daily life events that reoccur--eating, preparing food, dressing, etc., offer some regularity of experience that cuts across the specific variations in the specific stimulus events. This regularity offers the opportunity to initiate the learning of response patterns having meaningful consequences.

Working on Language

An assumption of the St. Gallen treatment model is that talking to the child is not the essential basis for organizing adaptive cognitive behavior. Meaningful use of symbolic forms externalize what is known about the world already. Consequently, the teaching of language forms is always done in relation to guided movement experience. Thus, the therapy is especially tuned to the semantic base of language. Prior to language discovery, no attempt is made to relate verbal forms to guided movement events. The focus is on establishing a content base for linguistic form. This does not mean that no talking occurs during a therapy session. Even though a child does not understand language, talking does occur, but simply as part of natural social interaction with the child before and after guided movement. From these spoken language events and countless others in the environment, the children presumably detect whatever rudimentary auditory features of linguistic form that they can, provided that no hearing loss exists. In some cases, recognizable words and phrases may be learned by the child though they are not used meaningfully. After some critical level of action representation occurs in response to guided movement, children begin to connect on their own, particular features of linguistic form to some aspect of an object or action in a real situation, i.e. they discover language. Language discovery means that the child connects a verbal form with a present or past action event.

Once language emerges, therapy helps the child to map symbolic forms onto the guided experiences offered in a treatment session. However, during the guided activity, the clinician does not speak in order that full attention is focused on movement events. As soon as possible after the problem-solving activity, the clinician may draw pictures to represent some aspect of the child's activity during the guided movement. Later pictures are combined with written or spoken words, and at still a later stage, words alone are used. It should be noted that symbolic mapping can take place after each movement goal is reached in an activity and need not be postponed until the very end of the session. For example, if the child's task is to cut up an apple, symbolic mapping can occur after each piece is cut.

The verbal patterns and the particular aspect of the guided event are drawn, written or spoken by the clinician at the early stages when the child is working mainly on comprehension. At least two principles are followed in selecting verbal stimuli. First, it is assumed that symbol properties are more likely to be learned and used if they represent the most salient aspects of the guided experience, i.e. those which accentuate movement or object attributes that are perceptible to touch and feeling. For example, after cutting an apple, grammatical constructions such as "I cut the apple," "the apple is hard," are more appropriate than constructions such as "the apple is red."

A second consideration takes into account the form of the construction. The clinician uses verbal stimuli that reflect an action event as opposed to single words. This practice is supported by theoretical arguments that the normal child's use of single words are intended to convey an underlying relationship among objects (e.g. Greenfield & Smith, 1976). The practice gains further support from studies, which suggest that language is tied to the dynamic aspects of sensorimotor intelligence; e.g. event knowledge or means-end activity as opposed to the more static notions of object permanency. Kernel sentences are constructed that include the basic grammatical constituents representing the object relations involved in an action event. Constructions such as "John cuts the apple," "John eats the apple," are more appropriate than phrases such as "eating apple," "the big, red apple," etc. Naturally, the fully formed constructions are kept simple.

As the child's language production increases, the child also selects verbal responses to represent the guided experience. Therapy encourages drawing as well as writing and speaking. Clinician responses to the child's productions serve the goal of social-pragmatic interaction rather than specific skill reinforcement. As the child's stored experience becomes more complex, comprehension and production of symbolic representations are expected to increase in complexity. Naturally, speech articulation is not a primary goal.

Evaluating Patient Response to Therapy

There are both short and long term measures of a child's response to therapy. Short term gains are judged by a child's response to a given therapy session. The clinician examines the frequency and duration of focused attention during guided movement. The child is judged to be at attention when the eyes are focused on the task or give the appearance of a blank unfocused stare, and the child is quiet on the chair or floor; i.e. does not talk or cry, nor move the body aimlessly.

Changes in muscle tone from the beginning to the end of the guided activity is another measure of input; i.e. muscle tone is increased for patients who are flaccid initially, and it decreases for those who initially are hypertonic. These changes in state are taken as evidence of adaptive response to stimulus input that becomes more familiar.

The clinician also looks for signs of beginning representation or recognition of stimulus events during the guiding by noticing, for example, if the patient takes over some of the movement steps leading to a goal or the patient's eye gaze tracks or precedes a guided movement in anticipation of the next step. Moreover, the clinician can observe if the the patient initiates the first steps toward solving a problem on his own or if the patient is willing to touch unfamiliar material used during treatment.

With exception of changes in muscle tone (only detectable by the clinician who is guiding), all these changes were observed across child and adult patients during my visit. It was fascinating to observe hyperactive children maintain attention for indefinite time periods during guided movement.

The fellowship visit was not long enough for me to observe long term gains for any patient. From the course and various discussions, I learned that long term gains are measured in several ways. First, one examines whether or not the number and types of specific verbal and nonverbal skills increase after a period of therapy. However, clinicians specify the conditions under which the skill initially was not performed earlier and look for change in skill with respect to a particular set of conditions. For example, a child at a prior time may not be able to cut objects (e.g. apple) except when maximum feedback support is provided. After a period of time, the child cuts this object and others without such support--thus moving the behavior closer to normal. With respect to language, attention is given to whether the child constructs utterances that refer to action relations as opposed to loosely organized phrases.

Second, they look for changes in the frequency of spontaneous exploratory activity. The child begins to notice or become more aware of the environment, will approach objects on his/her own and attempt to incorporate them in a spontaneous problem-solving activity. In other words, the child becomes an active learner on his/her own.

Equally important, progress is measured by changes in the level of planning a sequence of action steps leading to a goal. Six planning levels have been identified (see Affolter & Stricker, 1980); e.g. the child may begin at a level where recognition of the action steps required in a situation occurs only when all stimuli needed to solve the problem are present. On higher levels, recognition is still possible even when some or all stimuli connected with the problem-solving event are absent. For example, in one therapy session, I observed a child functioning on the higher level. He was simply told that he and the clinician would prepare some tea for me, as a guest. None of the material for making the tea was present in the therapy room. The boy walked to the kitchen and brought back much of what was needed to make the tea and also knew a great deal about the steps required to make the tea but required partial guided movement. Another boy on the same morning needed some of the items already present before he comprehended what was to be done, and did not have a good idea about how to proceed with the tea making. For example, in trying to make tea, he put the teapot on the hot plate without water and seemed not to understand why this act was inappropriate. However, both children had language forms.

Treatment Efficacy

The problems involved in determining efficacy of remediating complex psychological functions also apply to the St. Gallen treatment approach. Schery (1984) in a cogent review of U.S. efforts at determining efficacy of language therapy, noted that, "Extremely few studies have examined the effectiveness of educational or clinical programs specifically for language-disordered children" (p. 33). She goes on to suggest ways of overcoming some of the obstacles involved in determining treatment efficacy. The problems associated with predicting the type and timing of treatment outcomes become exaggerated for long term treatment of severe patients who make up the bulk of the clinical population served by the St. Gallen model.

The St. Gallen team has judged treatment efficacy by individual patient gains over time as opposed to controlled group experiments. This means that a child's progress is measured against his/her own performance baseline and not in relation to a criterion or norm referenced standard. The Center for Perceptual Disturbances maintains copious written and videotape clinical records that document progress in nonverbal and verbal performances. The amount and rate of progress vary with severity, age at treatment onset and family's skill in implementing the guided movement therapy. Naturally, the clinic has less control over the therapy conducted at home than in the clinic. The amount of patient progress also has been influenced by changes in the treatment protocol over the past 10 years.

The most dramatic evidence of treatment efficacy exists for preverbal children (4-6 years or older) who begin to talk while receiving the therapy. The St. Gallen team reports that nonverbal behavior progresses as well. Children become more aware of the environment and begin to explore it spontaneously. They begin to solve problems independently, even when no language exists. I was told how one boy, who I observed, was able to prepare something to eat for himself when left alone on one occasion. There is also evidence of phenomenal changes in severely brain damaged adults who lose verbal and nonverbal function.

While progress in language reportedly occurs, the specific changes that occur after its onset are less clear. No time has been yet allocated to systematically collating clinical data to determine if therapy, for example, favors changes in the semantic as opposed to the structural features of language. For children who attend the School for Perceptual Disturbances, there is more control over the types of guided movement experiences that are obtained. It can be predicted now that on the average, severely disordered children will make enough progress in all areas of functioning after about three years at the school such that they can follow an existing special or partially mainstreamed normal school program. The younger the child, the better is the prognostic outlook. There are anecdotal reports that children who enter other programs following guided movement therapy respond more adaptively than do children whose treatment has emphasized specific skills.

IMPLEMENTATION IN AN EDUCATIONAL SETTING

The Center for Perceptual Disturbances is closely affiliated with the School for Perceptually Handicapped Children (The Sonderschule fur Wahrenehmungsgestorte), which is located at MuhlenStrasse 3 in St. Gallen. Like the Center, the school was founded by Dr. Affolter and the clinical team in 1976. Headed by Frl. Doris Clausen, it is a state approved and financed pilot school, and the first of its kind in Switzerland. All children admitted to the school are evaluated first at the center. Admission is reserved for just those whose functioning is too low to meet placement criteria in an existing special program.

As a day facility, the school follows the calendar of regular schools in the St. Gallen canton. A maximum of 30 children are enrolled at one time. The children's ages range from 5;0 years to about 17;0 years, and their grade placements span kindergarten through high school. The physical space of the three story facility provides for typical staff working quarters, classrooms, a gymnasium and one kitchen/dining area on each floor. The staff of 30 people includes the classroom teachers, speech-language pathologists, classroom aides, cooks and a volunteer parent corps. Professional staff credentials and curricular content must conform to state guidelines, but an unconventional instructional mode is used. The choice of specific activities and stimuli used to teach content is influenced strongly by the kind of tactile-kinesthetic input they offer for learning. As an example, for physical education classes, a ball having a hard textured surface may be chosen over one which is soft and smooth. During my visit, three additional instructional features stood out as unconventional.

First the 1:1 student/staff ratio makes guided movement possible for every child at some time during each day. Some children require almost total guided movement throughout the day whereas others do not. Instructional groups of three to five children are formed according to level of function. Any child is given guided movement if he/she experiences difficulty with a task. The children are guided for the total range of activities including those related to self care, eating, dressing, etc.

Second, the curricular content is tied to naturally occurring daily life events. I noticed that the children participated in many aspects of running and maintaining the school. For example, they prepared all snacks and lunches. They also helped to clean up the kitchen afterwards. Instructional groups on each floor are assigned one or more tasks for the lunch on their respective floors. Depending on level of function in planning events, a child may be responsible for cutting one carrot or all the carrots needed for the lunch on his/her floor. Some children may have the task of cutting or washing vegetables, others may prepare an entire dish depending on the level of functioning. The task is completed in the classroom using total guidance or even no guidance if the child already functions on a production planning level. Other chidren at higher levels help to shop for food and use this as a focus for more formal arithmetic, reading and writing lessons. During my week of observation, one or more instructional groups went into the town every day.

Third, everybody is trained to do guided movement, even the cooks. Each staff type does the guiding with his/her content in mind. In addition, every child receives one or two hours of weekly therapy from the speech/language pathologist who monitors overall response to guiding and the language skills in relation to nonverbal problem-solving events.

The children's daily behaviors are logged routinely into standard notebooks kept by classroom teachers and their aides. These written observations are used to track and evaluate students' progress every six months. After about three years at the school, at least 75 percent typically can qualify for a more traditional special program or a partially mainstreamed normal program.

IMPLEMENTATION WITH BRAIN INJURED ADULTS IN A REHABILITATION HOSPITAL SETTING

The Affolter treatment model is applied to adults with brain injury secondary to stroke and head trauma. The St. Gallen team's clinical observations revealed that some brain injured adults have problems in planning and executing daily life activities in addition to language problems. Their research (Affolter & Stricker, 1980, pp. 70-81) has shown further that both left brain damaged aphasic adults and right brain damaged nonaphasic adults score lower than adults without brain damage on sequential pattern recognition tasks in all sensory modalities, particularly the vibrotactile modality. Guided movement therapy is expected to facilitate retrieval and reorganization of existing function by recruiting the action patterns that presumably represent the base or 'root' of stored experiences related to adaptive behavior.

Much of the work with adult patients is done through the center's consulting affiliation with the Rehabilitation Clinic at 7311 Valens, and the Rehabilitation Hospital at 7310 Bad Ragaz in Switzerland. I accompanied Dr. Affolter and the leading clinical psychologist from the center on one of their two day consulting visits to Bad Ragaz. At the rehabilitation hospital, I was told that only the most baffling patients are referred to the St. Gallen team. Some patients show global loss of function and do not progress with conventional therapy while other patients have retained some functions but perform at a lower level than their neuromotor status predicts. The latter group often is judged to lack motivation or emotional health because they sit alone and do not become involved in daily life activity.

During the evaluation, Dr. Affolter and her staff determine the types of maladaptive behavior exhibited, and equally important, the specific conditions under which it occurs and varies. Information about context allows them to determine if the behavior can be explained in terms of the amount and type of sensory input offered and the planning demands of the situation. Behavioral variation as a function of the situation offers an important cue about the probable presence of perceptual difficulties.

Information is gathered by observing patient responses to a problem-solving task with and without guided movement during a therapy session. It also is gathered by talking to the floor nurses and other persons who have contact with the patient, and directly observing the patient while he/she eats, gets dressed for the day, sits in the lounge, etc.

All therapies (physical, occupational, recreational, logopedic) implement the recommendation for guided movement therapy within the context of daily life activities that relate to their respective foci. For example, physical therapists may focus on "walking" in the context of going to the lounge to watch television or the dining room to eat--all the time, drawing on cognitive activity associated with the spatial relocation of one's body in reaching an action goal. Similarly, the occupational therapist applies guided movement to relevant problem-solving goals involving manual control. Although all therapists may work on language, the speech/language pathologist specifically monitors language input in relation to guided movement involving the same kinds of daily life problem-solving activities focused on by other therapists.

III. APPLICATION TO THE U.S.A.

The Center for Perceptual Disturbances offers an alternative to current U.S. treatment approaches that can be applied to severely learning disabled children and adults, particularly those who are nonverbal and do not respond to conventional strategies. Widespread U.S. application of the St. Gallen treatment, however, will depend (1) on further research which documents the efficacy of guided movement as a therapeutic strategy and (2) the availability of instruction on the treatment approach. The treatment model is likely to have the most immediate U.S. impact in the area of research. It encourages research along several lines.

Although patient gains in response to guided movement therapy have been documented clinically, efficacy studies need to be conducted. The focus of the St. Gallen treatment on underlying process rather than specific skills, makes it difficult to link co-existing performance changes directly to the therapy. Thus, group comparative research, though frequently messy to do, would provide the most convincing efficacy data. Such research would aim to show if children or adults who receive guided movement therapy show greater verbal and/or nonverbal gains than a comparable group that receives a conventional skills approach.

With respect to language, efficacy studies are needed to document the types of specific changes that co-occur with therapy. While guided movement appears to be effective in facilitating language emergence for the preverbal child, it is not clear what specific language changes occur after language onset. The latter issue becomes critical in the context of recent findings that support an indirect rather than a direct link between emerging cognitive competency and the types of grammatical constructions acquired (see a review of these issues in Rice and Kemper, 1984). For example, it has been argued that the mastery of alternative forms for expressing the same content (e.g. the opposition between pronominal/nominal and passive/active reference) cannot be motivated entirely by cognitive concepts. Hence, the claim that cognition may account less for the structural than the semantic features of language.

The efficacy of guided movement therapy will be determined further by basic research that is relevant to testing its theoretical claims. Decades have passed since Piaget proposed action as a critical link to understanding the development of intelligent behavior, but still little is known about the functioning of the tactile-kinesthetic system as a channel for learning. Despite the difficulty of studying tactile-kinesthetic sensory input relative to audition and vision, research bearing on its role in normal and clinical children's learning is critical to understanding how and why it might be useful to habilitation.

Fortunately, the emerging body of research on the cognitively related action patterns of normal children offers a beginning point for expanding the focus on tactile-kinesthetic systems of developmentally disabled children beyond the traditional study of oral and manual stereognosis and two point-tactile discrimination. To my knowledge, the kind of 'cinematic' features of normal children's action patterns that are described in Forman (1982) have never been applied, systematically to a study of clinical children. Yet, the comparative study of normal and clinical children using, e.g. Mounoud and Hauert's (1982) arm drop amplitude measure of adaptive grasp, could be very instructive. Children who are thought to have tactile-kinesthetic deficits would be expected to differ from normal children and other clinical children in the rate of grasp adaptation to objects of varying sizes and weights. Group differences also would be expected in the extent to which grasp is altered in anticipation of weight changes based on visual appearance of size since this type of perceptual pre-inferencing depends on cross-modal organization of sensory input. Moreover, with respect to articulatory function, adaptation to altered tactile-kinesthetic feedback might be less complete among children judged to have tactile-kinesthetic deficits than among those who do not display this difficulty. For example, comparative studies involving the external imposition of artificial loads on the tongue surface may show that impaired children do not recover customary function at the same rate as those who are normal.

Equally promising for understanding the nature of language impairment in an action context, is the St. Gallen team's current research focus on the movement rules that clinical children use in solving classic form recognition and seriation problems (Affolter, forthcoming). Preliminary results suggest that, unlike the mentally retarded, perceptually handicapped children show profiles that suggest a search for information.

Although guided movement therapy was developed in the context of treating severely learning disabled children and adults, it offers a framework for asking new questions about the nature of language impairment among children who perform at the less severe end of the continuum. Here reference is made to the rather large group of U.S. children who are labeled as specifically language impaired. It is known that some of these children who receive spoken language therapy in the preschool years show up later with problems in reading, writing and calculation and may present a host of other maladaptive areas of functioning subsumed under the learning disabilities category. Yet, the underlying basis for the problem is not known.

We have come full circle in our speculation about the underlying basis for the problem. Since the shift from auditory processing to a cognitive representation hypothesis has not yielded entirely defensible answers, a perceptual hypothesis is being entertained once again (see Rice & Kemper, 1984, p. 46). However, the recent arguments for innate perceptual processing mechanisms suggest a lack of clear direction about how to frame such an hypothesis--if auditory mechanisms are not the answer.

The St. Gallen treatment model expands our thinking and research directions in several critical ways. First, it suggests that perceptual hypotheses should not be framed in isolation of cognitive representation. This notion raises questions about the theoretical claims that have evolved from U.S. research that focused on revealing either an auditory processing or a cognitive representation deficit. Research typically has not considered both aspects when observing the same children. To the extent that perception and cognition interact, future studies may show that deficits in both areas are exhibited by the same language impaired child. Such an outcome would point to the need to conceptualize broader and more dynamic perceptual hypotheses than those which have been generated so far.

Second, the St. Gallen model suggests that a perceptual hypothesis about language impairment requires broader definition than the auditory modality. For example, meaningful comprehension of a construction such as "John hits the ball" draws on knowledge about movement and action effects on objects that is not gained essentially through the auditory channel. The need to move beyond a strictly auditory input becomes even more critical if the perceptual hypothesis also is to account for deficits in nonverbal problem-solving performances such as preparing a sandwich, putting a puzzle together or locating an object.

St. Gallen's learning model encourages observation of the language impaired performances in all modalities. While a few attempts at comparing auditory and visual performances have been made in the U.S. (e.g. Tallal, et al., 1981), the tactile-kinesthetic channel has been virtually ignored. Yet, according to the St. Gallen model, tactile-kinesthetic sensory input offers the dynamic and reality transforming aspects of one's cognitive store of experiences. In fact, the tactile-kinesthetic clinical subgroup, which has been identified in St. Gallen, looks suspiciously like some children with specific language impairment that are treated in the U.S. The children of focus here are those who present general language delay and articulatory difficulty. At the risk of being overly simplistic, it appears that tactile-kinesthetic difficulty could explain a number of the problems observed. Obviously, a tactile-kinesthetic deficit could account partly for severe articulo-phonologic problems. But, the broad role of tactile-kinesthetic representation in the development of action creates intriguing possibilities for explaining delay of other language features as well. If children normally acquire language by mapping linguistic forms onto what they do, or experience in a situation, then a tremendous amount of information involving the tactile-kinesthetic system must be detected and coordinated with information from other sense modalities. The information load may be too great for the child who has difficulty acting on the environment because of tactile-kinesthetic problems. Such a child would miss more of the information offered in an actual situation than a normal child. If the child reduces information load by focusing just on actions of the event or just on linguistic form, then it is clear that form-content correspondences will be difficult to make very quickly; i.e. more experiences would be required to get the relevant input. Consequently, a longer and delayed development will be observed.

This line of reasoning leads to a number of questions. Do language impaired children talk at the same time as they are acting on the environment? Do they focus more often on action aspects of the event or its linguistic forms? What are they doing all day long in their natural environments? How do they approach problems and explore the environment in daily life activity? In typical therapy sessions, do we offer too much information to the child by always presenting verbal information simultaneously with some event? Do we offer the right input when we assume that language is learned from just verbal input? The answers to some of these questions will not be obtained by continuing to give language impaired children structured elicitation tasks or taking a spontaneous language sample at a single time point under semilaboratory conditions. The same kind of longitudinal naturalistic observation strategies that have been used to unravel some of the mysteries of the normal child's development need to be applied to the language impaired child in future research.

Fortunately, we have begun to call attention to the issue of problem-solving among the language impaired. But, there is a need to expand the current focus to include attention to the way language impaired children solve problems in relation to the kind of sensory-perceptual information offered in the situation including the tactile-kinesthetic information. To the extent that the base of cognitive development is tied to action, tactile-kinesthetic deficits may explain why some language impaired score poorer than normal on some cognitive tasks and yet pass visually oriented intelligence tests such as the Leiter International Scale (Leiter, 1979). It is noteworthy that of the six nonlinguistic cognitive tasks on which Kamhi (1981) compared normal and clinical children, just the haptic task which is dependent on tactile-kinesthetic sensory input, yielded noticeable differences between normal children and language impaired children who score in the normal range on the Leiter scale. Moreover, given the St. Gallen team's claim that sequential knowledge is derived from multi-sensory input, observed auditory sequential deficits may not express a primary deficit of the auditory system as we have always assumed. Rather, auditory deficits may co-exist as a secondary effect of sequential difficulty arising from tactile-kinesthetic problems. This interpretation is consistent with observations that the deaf and the blind show reduced sequential processing performances in their respective nondeprived modalities. Future research is needed to test these hypotheses.

The research aimed at framing perceptual hypotheses about language impairment also needs to be focused broadly enough to deal with the notion of connecting roots among different behavioral domains. One issue is whether or not verbal and nonverbal behaviors constitute a different problem space. This issue can be addressed partly by determining if differences exist in the problem-solving strategies that are used to approach verbal and nonverbal tasks.

Another issue pertains to the connections among different verbal skills (e.g. spoken or signed vs. written). St. Gallen's research indicates that some dyslexic children present the same performance profiles on sequential tasks as those with spoken language impairment. Ironically, dyslexics' scores were observed to be better in vision than in audition or vibrotaction. In the U.S., there is theoretical sentiment for the notion that a general linguistic deficit underlies reading disability. See, for example, Siegel & Ryan (1984). However, a "common root" hypothesis must explain why reading disability co-exists with what seems to be normal spoken language.

Again, the St. Gallen model encourages a search for the explanation by considering the perceptual-cognitive requirements of the situation. It is clear that the child must bring to a reading activity <u>internalized</u> information about action events since pictures, if they are used, already are an abstraction of actual situations. Spoken language carries the same demand only when it references events that are not present. However, since one's spoken language often is tied to actual situations, it could appear more normal than it actually is at older ages. One may wonder then, if reading impaired children would show the same level of spoken language skills as nonimpaired children were more sophisticated observations of their spoken language made; i.e. observations that go beyond rule descriptions of phonologic and morphosyntactic form to include performance aspects that reflect different demands for information processing and situation dependent cognitive representation; e.g. how well does a reading disabled child track spoken lecture or discussion? Does the understanding of spoken language break down in the absence of actual situation or with the use of long syntactic constructions?

Unfortunately, we do not have much of this kind of information available even for the older normal child because research has focused on early language development. The spoken language of the older normal child needs further study. In addition, to comparative research on older normal and clinical children, the search for common performance trends among clinical populations that present different skill defined impairments also may be instructive. The latter point calls attention to the possibility of revealing more about the specifically language impaired when they are studied not just in relation to normal children, but also in relation to the dyslexic, mentally retarded and other clinical groups.

A serious response to the kind of questions and issues, which the St. Gallen approach raises about language impairment and learning disability, requires multidisciplinary-multiperson effort. The university research laboratory provides a recognized vehicle for mounting such an effort. The laboratory space at Michigan State University has been expanded to represent the language sciences. A language sciences laboratory is being designed to meet research, teaching and service delivery goals within the context of basic and applied issues that relate to language impairment. For example, some aspects of guided movement therapy have been used with encouraging success to treat a severelv delayed child at the MSU Speech and Hearing Clinic. We are in the process of evaluating the treatment effect and identifying problems in administering the treatment. Research on the semantic features of impaired language is also underway since the semantic aspect of language is assumed to have the closest link to one's cognitive representation of experience. It is speculated that the failure of prior studies to reveal real semantic differences between clinical and normal children occurred because global descriptive frameworks were used. Consequently, the laboratory is in the process of comparing clinical and normal children using the kind of fine grained analysis of semantic-syntactic categories that have grown out of detailed analyses of global categories such as action (Huttenlocher, Smiley & Charney 1983), and location (Stockman & Vaughn-Cooke, forthcoming).

Michigan State University houses several resources that could be tapped by the Language Sciences Laboratory to bring a multidisciplinary force to bear on the research issues raised by the St. Gallen approach. Among these resources are several service facilities for learning disabled children that include (a) the Speech and Hearing Clinic, (b) the Learning Center and (c) the Motor Skills Clinic. In addition to its service programs, the university maintains a magnetic resonance imaging facility at its Clinical Center. This facility offers the most advanced technology for conducting brain studies and for the first time, makes it almost routinely possible to study the anatomical features of brains without known risks. The technique is particularly advantageous because it allows one to obtain brain scans during conscious states, while talking or reading. The current search for ways to measure neurochemical features of brain activity holds the promise of unlocking knowledge barriers about brain function during learning. For example, this kind of technology may lead to understanding of the neural correlates of "attention" during learning.

A multidisciplinary team of professionals is expected to exist for the purposes of asking research questions that bear on the focal area, and generating resources to address the questions posed. Such resources may include shared grant writing activity, lectures, seminars and student focused research.

In keeping with the second goal of the fellowship visit, a working relationship has been initiated with the St. Gallen team. As a first step toward developing a collaborative effort, arrangements were made for Dr. Affolter and another team member, Mr. Walter Bischofberger, to conduct a workshop and lecture on their method at Michigan State University during their recent U.S. trip. In addition to the workshop, Dr. Affolter observed the child who currently is being treated at the university clinic using the St. Gallen approach.

Further discussion with the St. Gallen team is expected along the lines of shared research goals and responsibility. Since the Center for Perceptual Disturbances currently has the least amount of resource for research, it may be possible to channel some of its research projects through the MSU Language Sciences Laboratory. The laboratory also will be involved in efforts to disseminate information about the St. Gallen approach. Discussion already is underway regarding my participation in the preparation of an English translation of Dr. Affolter's forthcoming book, <u>Perception, Reality, and Language</u>, to be published later this year in German by Neckar-Verlag. The English publication of this new book should stimulate a topical graduate seminar at the University.

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