PROMPT: A TACTUALLY GROUNDED TREATMENT APPROACH TO SPEECH PRODUCTION DISORDERS

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The purpose of this chapter is to describe the evolution and use of prompts for restructuring oral muscular phonetic targets (PROMPT), Chumpelik [Hayden] (1984), as an integrated, multisensory approach to the assessment and treatment of speech production disorders in a variety of clinical populations. A speech production disorder refers here to delayed and/or abnormal use of expressive speech for meaningful functional communication.

From its beginning, PROMPT has embraced "touch" as a primary sensory modality that can be used to: (1) develop or re-establish speech motor control; (2) provide a foundation for integrating sensory modalities (audition and vision) in developing concepts and expressive language; and (3) enhance social-emotional interaction and trust between clinician and child. As a tactually grounded treatment approach, PROMPT clinicians stimulate muscle activity and guide articulatory movement by touching and manually manipulating a child's external physical structures (torso, head, jaw, face, lips, and so on) that are used for speech production. Clinicians use their own hands to give postural support to a child's body and tactile-kinesthetic input about the place, manner, voicing, and sequential and temporal features of speech sounds in addition to auditory and visual input.

This chapter provides an overview of PROMPT's framework for assessing and treating speech production disorders. First, the history of PROMPT is described. Then PROMPT's conceptual framework and the clinical assessment and treatment principles that follow broadly from it are summarized. In the final section, a single clinical case is used to illustrate how PROMPT's clinical principles are applied.
THE HISTORY AND EVOLUTION OF PROMPT

THEORETICAL FOUNDATION

PROMPT has evolved over a period of 30 years. In the 1970s, the systematic manipulation of tactile-kinesthetic-proprroceptive input to oromotor structures for changing speech targets was begun with children who presented with severe motor impairment. These children did not respond to traditional treatment approaches that rely predominantly on auditory and visual input. The development of PROMPT treatment for them was grounded in theoretical and clinical perspectives that cross several disciplines concerned with physical, mental, and social development. Its focused use of tactile-kinesthetic input was influenced by the early work of scholars and practitioners who explored the tactile system in the neurological organization of normal and diseased brains (Head 1926; Jackson 1958; Mountcastle and Powell 1959; Mysak 1968) and embraced its use in the clinical treatment of motor disorders, including speech articulation (Stichfield and Younge 1938; Ayres 1974; Bobath 1971, 1980). As PROMPT evolved over time, it was influenced more broadly by scholarly work that included the neurobiological (Abbs 1988; Gracco 1990; Fletcher 1992; Kent 1981, 1992, 1997; Schmidt 1975; Kelso and Tuller, 1983), the cognitive-linguistic (Vygotsky 1978; Bruner 1977; Piaget 1954; Menn 1982; Nelson 1986; Thelen 1991; Strand 1992; Thelen 1995), and the social (Bates 1976; Gallagher 1991; Wetherby 1991) aspects.

Taken together, these multiple theoretical perspectives stimulated questions about how motor systems typically develop; how dynamic interaction and equilibrium among whole body systems affect speech, language, and social interaction; and how damage to the neuromotor pathways can unbalance the motor speech system and affect physical, mental, and social functioning either directly or indirectly. Answers to these questions have led to a much broader conceptualization of the speech production process than is described typically in the literature. PROMPT's multidimensional approach to speech production disorders has come to embrace not only the well-known physical-sensory aspects of motor performance but also its cognitive-linguistic and social-emotional aspects, as described later in this chapter.

EVOLUTION OF THE CLINICAL APPROACH: EMPIRICAL FOUNDATION

In the 1980s, the first empirical studies of PROMPT's treatment efficacy were done. The first study (Chumpelik Hayden and Sherman 1980) focused on an 8-year-old non-speaking child with autism and cognitive impairment. Using PROMPT, this child gained 30 functional words over a 4-month period. This study led to the development of the first manual describing the technique of prompting.
A later study (Chumpelik Hayden and Sherman 1983) was done with eight male patients (ages 6 to 11 years), four with normal cognitive and gross motor abilities and four with cognitive deficits and motor impairment. All participants had severely impaired speech and served as their own controls in a multiple baseline study design. They were randomly assigned to receive the traditional auditory-visual treatment condition or to the PROMPT treatment condition, which applied tactual in addition to auditory-verbal input. The results revealed that all the children significantly changed their productions of target words in the PROMPT treatment condition. Even the typically developing group changed more with the PROMPT than the traditional auditory-visual treatment condition. However, the motor impaired group changed only in the PROMPT treatment condition.

In 1984, the first publication describing PROMPT appeared (Chumpelik Hayden 1984). It described the technique and use of “surface” tactile prompts. They provide input about place of articulation, the amount and type of muscular contraction, movement transition, and timing needed to produce speech sounds. At the same time, the issue of how a three-dimensional “intraoral” target movement system might affect coarticulatory reality began to be explored. This exploration focused on how phonatory, mandibular, labial-facial, and lingual movements worked interactively in speech production and how these subsystems could be rebalanced using tactile input to develop clear speech.

During the 1980s, collaborative research also began with Paula Square, whose research at the University of Toronto focused on acquired speech dyspraxia in adults (see Square-Storer and Hayden 1989). Two initial studies investigating PROMPT's treatment effectiveness were done. The first study in 1985 included a single participant (Square-Storer, Chumpelik Hayden, and Adams, unpublished) and the second study included three participants (Square et al 1986). The adult participants in both studies had been diagnosed with Broca's aphasia and symptoms of speech dyspraxia. Participants were at least 1 year poststroke and severely limited in functional speech. They had been discharged from other speech and language therapy programs because of lack of progress. A multiple baseline design with two treatment conditions (PROMPT and a traditional auditory-visual approach) were used. The results revealed significantly more changes in sound, word, and phrase productions in the PROMPT condition than in the auditory-visual condition. These studies led to formalizing the Motor Speech Hierarchy as a framework for assessing the motor speech system and organizing PROMPT treatment (Hayden 1986; Hayden and Square 1994), as described later in this chapter.

In the 1990s, standardized assessment protocols were developed, and PROMPT treatment was refined. The Verbal Motor Assessment for Children (VMPAC) (Hayden and Square 1999) was standardized on 1095 typically developing children from ages 2 to 12 years and 394 children with speech disorders, ages 3 to 12 years. This test assesses motor speech subsystem development in three main areas: (1) global motor control, (2) focal oromotor control,
and (3) verbal and nonverbal sequencing of movements. Performance on the VMPAC showed that development of the speech subsystems (i.e., mandibular, labial-facial, and lingual control and sequencing) was consistent with the hierarchical, interactive model of the Motor Speech Hierarchy. Children with normal and disordered speech developed motor control, flexibility, and integration of the motor subsystems as age increased, although the disordered group was slower to develop than was the normal group.

Using the Motor Speech Hierarchy as a framework for intervention in a later study, Square et al. (2000) measured PROMPT's effectiveness in treating children with oromotor deficits. The participants were six males (ages 4:2 to 4:6 years) with unintelligible speech who had made minimal progress in traditional therapy. They were seen in a 90-minute group session twice weekly for 15 weeks. Standardized tests of phonological, motor, language, and social skills were administered before and after treatment. The results revealed that PROMPT treatment resulted in perceptually improved speech even on untrained words. In support of PROMPT's effectiveness across multiple domains of functioning, it also was observed that the participants' overall behavior, social interactions, and language skills improved significantly as measured by the Speech and Language Assessment Scale (Hadley and Rice 1993), the Systematic Analysis of Language Transcripts, SALT (Miller and Chapman 1993), and the Social Skill Rating System (Graesham and Elloitt 1990).

In addition to the VMPAC, development began on another assessment tool, the Early Motor Control Scales (EMCS) (Hayden, Wetherby, Cleary, and Prizant, forthcoming). The EMCS, also based on the Motor Speech Hierarchy model, assesses infants at ages 12 to 24 months. Limb and oral development are assessed in relation to speech production.

With respect to PROMPT treatment in the 1990s, emphasis began to be placed on the concept of "planes of movement" (vertical, horizontal, anterior-posterior) used in coarticulated speech and on how these movement planes become coordinated in normal speech. Attention was given to how much motor control was needed to produce words (i.e., a lexicon) in either one or more movement planes. PROMPT treatment was refined with respect to selecting speech, language, and social interaction goals.

The empirical validation of PROMPT as a clinical approach continues into the current century. For example, a current project headed by Dr. Sally Rogers of the MIND Institute is an NIH-funded study comparing PROMPT (a holistic, multisensory, naturalistic approach), and the Denver Model (a developmentally, socially based, instructional approach) with nonverbal autistic children ages 24 to 50 months of age. The project is designed to gather data and develop research protocols that will allow for replication with a much larger subject group. The proposed replicated study will compare each model and a third integrated model of the two approaches. Currently, the results for PROMPT
subjects are promising. In three subjects, with an average of 15 treatment sessions over a 6-month period, pre- and post-testing revealed an increase in expressive language from 9 months to 17 months. Other gains in visual reception and fine motor skills were also noted across subjects. They ranged from a 7-month gain to over 18 month’s gain.

The rest of this chapter describes, in greater detail, PROMPT’s conceptual model and its underlying clinical assessment and treatment principles, as they have been applied to the speech production disorders of children.

PROMPT’S CONCEPTUAL FRAMEWORK

A basic assumption of the PROMPT Conceptual Framework is that all behavioral outcomes, including speech production, result from the interaction of external and internal factors. As is shown in Figure 10.1, the factors external to the child include those that define the social and physical world in which speech production occurs. The internal factors include the physical, mental, and social-emotional resources that a child brings to all learning, including the acquisition of speech production skills.

![Figure 10.1 PROMPT's Conceptual Framework.](image-url)
As a physical act, speech production requires peripheral and central (i.e., neurological) anatomical body structures inclusive of the skeletal structure that supports muscles, nerves, skin, and initial sensory information processes. As a mental act, speech production involves the cognitive-linguistic domain, namely the ability to perceive and interpret sensory input relative to stored experience, form concepts, reason, problem solve, represent, and express ideas in verbal and nonverbal forms. As a social-emotional act, speech production involves the use of socially acceptable rules for interacting with others in conversations and other forms of social discourse as well as one’s affective attitude or feelings about self and others.

All three of these domains (namely, the physical, mental, and social-affective) are assumed to be interdependent in human functioning and to contribute to speech communication. Consequently, speech production may not be normal if any one of these global domains is disordered or delayed. All three domains should be considered when assessing and treating abnormal speech production. Consequently, PROMPT is about the holistic way that a client’s speech production is viewed and treated from a developmental or acquired damage perspective. This broader viewpoint, along with an assessment of motor speech skills, drives decisions about when to use the tactile prompts and for what purpose.

Within PROMPT’s philosophy, tactile information is viewed as the single most connecting and organizing factor in human development. Touch is “the variety of sensations evoked by stimulation of the skin by mechanical, thermal, chemical, or electrical events” (Cholewiak and Collins 1991, p. 23). In the PROMPT framework, however, touch involves more than passive surface skin deformations encountered from passive contact with another object. It also encompasses the sense of movement and body awareness perceived continually as we move, namely the kinesthetic senses generated by muscle, joint, and tendon receptors (Thelen’s Chapter 3).

As an approach, PROMPT provides guidance about the type and depth of knowledge needed to assess speech production and how to conceptualize and organize the obtained information for intervention. As a technique, PROMPT prescribes the various technical or mechanical manipulations or operations (types of tactile cues among others) needed to actually change speech production performance.

As PROMPT has evolved, several interrelated ideas have become prominent:

1. Oral language is part of a dynamic system influenced by internal and external factors that interact to determine an individual’s development over time. As Fogel and Thelen (1987) suggest, “There is no formal difference between endogenous and exogenous changes in components and their relationships. Emergent states can be created either by means of environmental support or as a result of changes of components within the individual” (p. 248).
2. It is necessary to evaluate external and internal factors that may affect a child’s speech performance. The internal physical-sensory, mental, and
social-emotional domains in particular help us to understand what a child brings to the intervention and what a therapist needs to do to restructure or change speech production performance. In stressing the contribution and interaction of each of the three internal domains, PROMPT is consistent with the principles of dynamic systems theory which "...views motor systems as belonging to a larger class of complex systems that produce patterned behavior" (Thelen 1991 p. 342).

3. Using tactile stimuli, the embedding of information within and across sensory and motor systems can be used to create motor schemas and associations for cognitive-linguistic retrieval.

**CLINICAL ASSESSMENT**

It is assumed here that all human communication (irrespective of its symbolic form as speech sounds, body gestures, and pictorial or graphemic images) results from the interaction of multiple domains of function, as has been described for PROMPT’s conceptual model (see Figure 10.1). Consequently, the holistic understanding of a child’s functioning needed to plan intervention requires that assessment focuses on more than the integrity of the motor speech system. It also must focus on the global internal and external factors that influence speech production, as considered next.

**ASSESSMENT OF GLOBAL DOMAINS**

PROMPT begins the minute your client walks through the door. This phrase underscores the importance of holistic assessment in PROMPT. An assessment can take advantage of everything that is immediately observable about the child with respect to the internal (i.e., its physical-sensory, cognitive-linguistic, social-emotional aspects) and the external domains of functioning. In the physical-sensory domain, for example, a clinician can observe a child’s skeletal, cranial-facial structure and facial symmetry in addition to awareness of various forms of sensory stimulation. In the cognitive-linguistic domain, a clinician can observe a child’s nonverbal behavior (e.g., visual tracking of objects) and verbal behavior (e.g., a child’s understanding and use of some grammatical rules). In the social-emotional domain, a clinician can observe the child’s behavior toward familiar and unfamiliar people and the kind of symbol system typically used to engage social interaction. In the external environment, a clinician can observe how caregivers respond verbally and nonverbally to a child’s attempts at communication and social interaction in a given situation.

However, to systematically assess the global internal and external domains as shown in Figure 10.1, clinicians can use available assessment tools. They include the kind of norm-referenced and criterion-referenced tests frequently used to assess behavior and environmental conditions by a variety of professionals.
(e.g., psychologists, school teachers, social workers, physicians, speech-language therapists, physical and occupational therapists, and so on). The assessment procedures may also include the invasive and noninvasive diagnostic tests that physicians and other allied health professionals use to assess body structure integrity, including the brain and the larger central nervous system, as well as the peripheral and autonomic nervous systems.

The following discussion is structured around critical questions that guide a PROMPT assessment of the internal physical-sensory, cognitive-linguistic, and social-emotional domains. These questions take the assessment of function beyond the areas typically focused on in evaluating the motor speech system. In the physical-sensory domain, for example, the assessment goes beyond the cursory screening of the peripheral speech mechanism and auditory sensory system, which is typically done by speech-language therapists. Clinicians are required to consider the integrity of the tactile-kinesthetic sensory system in addition to neuromotor function generally. Assessing the cognitive-linguistic domain goes beyond a status check of general intelligence or language age. Clinicians must assess information processing constraints on the event contexts in which speech is produced as well as nonspeech communication efforts. In considering the social aspects, children’s emotional or affective attitude toward people and events in the environment is as important as what can be assessed about their knowledge of the social world.

The questions for assessing each domain are identified below and discussed briefly in terms of their relevancy to describing and treating motor speech impairment using the PROMPT framework.

The Physical-Sensory Domain

*Is Skeletal Facial Structure Development Normal for the Chronological Age and Symmetrically Aligned in the Vertical and Horizontal Planes?*

Skeletal structure should be examined in terms of how adequately it can or cannot support speech production. Skeletal structure is the foundation on which the muscles and nerves are overlaid. Therefore, undeveloped or misaligned skeletal facial structures (e.g., a small mandible and protruding maxilla) may create problems with if or how certain muscles contract. When muscles cannot contract normally, their motor performance will be inhibited, thereby reducing the "flexible tradeoffs" (i.e., "degrees of freedom") in the muscle activity needed for coarticulated speech. Reaching movement "targets" is achieved by a motor system that dynamically regulates muscle parameters such as tissue mass, stiffness, and dampening. These parameters can be unbalanced and are not easily modified in the face of structural damage or muscle contraction biases. Therefore, they may be difficult to change. This is because misaligned skeletal structures can create or perpetuate abnormal or immature "attractor" states that are very stable. Very stable motor behavior reflects preferred response modes (i.e., "rigid attractor states") that make it difficult for a speech system to reorganize
is itself by changing from an existing attractor state to another more flexible or advanced state (Fogel and Thelen 1987). When the integrity of the physical system is compromised, a therapist may need to use other speech subsystems to compensate or bypass the muscular systems that are inflexible because of physical constraints. Clinicians should consider that compensations cost the speech system a loss of flexibility to reach target positions for sound production.

Is a Child’s Body Tone Normal, and if Not, Is Either Hypertonus or Hypotonus Shown in the Whole Body, Trunk, or Face?

Tone is broadly defined here as the body’s ability to hold itself up against gravity while maintaining the coordination and flexibility of muscle activity. Generally speaking, tone is mediated by neuronal activity in the reticular formation that exists throughout the brainstem and in portions of the diencephalon in the central nervous system (Guyton 1971). Upper motor neuron lesions can cause an abnormal increase in muscle tone. The resulting spasticity is marked by increased resistance to passive movement of the flexor muscles. In contrast, lower motor neuron lesions can cause an abnormal decrease in muscle tone. The resulting muscle weakness or flaccidity is marked by decreased resistance to passive movement of the flexor muscles (Love 1992).

In some instances, though, increased tone in specific speech muscles result from the muscle biases created when compensatory actions are used to control the movement of specific body structures. For example, increased lip retraction can help control the range of jaw movement. This type of increased tone, though often habituated, may not result from neurological damage. Instead, it can result from a disproportionate relationship in the development of articulatory structures.

The type and amount of abnormal tone, regardless of the cause, is a critical diagnostic indicator of whether neurological damage exists that can affect the motor speech system. When upper or lower motor neuron lesions exist as described, the musculature of the entire body is compromised with global effects on speech production. Such lesions will impair not only muscle tone, but they are also likely to compromise respiratory support, the base on which all the other speech subsystems develop. Depending on the amount of neurological damage, a child may not have enough motor control to maintain balance when sitting, standing, or ambulating, let alone to control the musculature in the graded and refined way needed for clear speech.

In PROMPT, clinicians should understand that abnormal tone can affect speech production, whether it exists in the entire body or the specific muscle groups that support speech production directly. Body movement is not normal when too much or too little tone compromises the contractility of muscles. Clinical assessment should determine whether and how body tone can be normalized. In PROMPT, this is done by identifying the “best possible” body postures in which to normalize tone and/or change the pattern of muscular biases so that more flexible, interactive relationships among the muscle groups can develop.
Is Neurological Damage Significant Enough to Prevent Higher Cortical Function from Inhibiting Lower Level Behavior, Such as Early Motor Reflexes?

Clinicians who use PROMPT must consider how neurological structures develop, and what happens to development as a result of brain injury. In children with global tone abnormality or uncontrolled muscle activity, simple lower-level patterns of behavior may predominate because they are unchecked by higher cortical control. This outcome is predicted by Jackson's (1958) theory (see also Mysak 1968; Ayres 1974); namely that development progresses from lower brain regions (e.g., the brain stem), which are well organized at birth and mediate simple automatic behavior, to higher brain centers (e.g., frontal cortex), which reorganize continually throughout life and mediate the most complex and least automatic behavior. The reverse of this ascending developmental course of "evolution" is dissolution, which happens in atypical development and diseased brains. The least organized and most complex aspects of function are reduced before the most organized and simple automatic aspects. But given that neuroplasticity is a feature of all mammalian brains (Kaas 1991), clinicians should be able to influence the development of neuromotor pathways with experience. Kaas (1996) points out that "increases in the relative activity of parts of the pathways in any sensory system [by manipulation or therapy that increases sensory input] can increase the sizes of the representations of those parts in cortical maps."

The clinical implication is that lower-level reflexes must be inhibited when clinicians try to modify an abnormal motor speech system. In PROMPT treatment, clinicians try to inhibit lower-level reflexive responses. This is done in PROMPT by (1) restructuring the environment to support more facilitating body postures, (2) enhancing development of sensory-motor pathways and cortical maps by using tactile in addition to auditory and visual inputs, and (3) linking sensory input for speech production with those required for conceptual development.

Does a Child Exhibit Difficulties Processing Tactile-Kinesthetic-Proprioceptive Input?

Only in movement (as opposed to static touch) does the organism fully experience tactile-kinesthetic-proprioceptive stimulation. This sensory information, which also includes the dynamic interaction of the articulators in coarticulated speech, can only be obtained when the organism is in movement or when the body structures touch something continually while moving through space and time. This sensory input is most directly associated with movement perception and is critical to the development of motor speech schemas as is discussed later in this chapter. In humans, the neural pathways connected to peripheral body structures, for example, the skin and muscles, send information to the somesthetic cortex where it can be detected and remembered. This cortex lies in the postcentral gyrus of the parietal lobe. Its relatively large representation of the face, lips, and tongue suggests that these structures, which are heavily involved in motor speech activity, are especially sensitive to tactile experience.
In PROMPT, clinicians must assess a child's sensitivity to tactile-kinesthetic input, and how much work must be done to prepare the sensory-motor system for the more complex, discrete input needed for speech. For example, clinicians can assess whether and how well a child's motor speech system responds when they use alternating light to moderate but firm pressure to grade the movements needed for adequate speech production.

The Cognitive-Linguistic Domain

_How Does the Child Use and Coordinate Different Types of Sensory-Perceptual Information (Auditory, Visual, Tactile) for Learning Concepts and Producing Speech?_

Answering this question focuses clinical observation on the information processing demands of learning. According to Thelen (1991), "an utterance of even a simple one-syllable word requires the coordination in time and space of over 70 muscles and 8 to 10 different body parts... the achievement of human cognition, and motor coordination and control... is an essential component of this developmental landmark" (p. 339). Bloom (1996) also argued that the mental effort needed to produce words involves, at a minimum, "constructing an intentional state out of data from perception in relationship to what is already known in memory, the ability to recall linguistic units from memory and then to articulate or produce the motor movements from those words." She stated further that emotional expression, like speech, also has physical requirements that are dependent on the same limited pool of processing resources (see also Bloom's Chapter 7). Consequently, a child may sacrifice attention to some input or fail to translate input into its linguistic and/or motor equivalents depending on interest level in addition to task complexity and the efficiency of the neuromotor system for producing speech to get needs met.

Bates and MacWhinney (1987) proposed that, in the "competition" for limited processing resources, what gets attention and remembered may be determined by how important or relevant something is to the child. By knowing why a child is communicating and how processing factors impact task performance, a clinician can identify the variables that influence a child's attention and memories, and how a child may compensate for processing problems.

The clinical implication for PROMPT is that clinicians must focus on how and why a child approaches tasks in a particular way and not simply on the accuracy of performance. Furthermore, given a "limited resource" model of processing, clinicians should (1) restrict the input from competing sensory modalities for a given task at the same time (e.g., tactile and auditory input can be in the foreground as opposed to added visual input); (2) ensure that competing task demands for speech contexts are simple enough early on in the learning so that they do not interfere with the motor-speech planning and production requirements; and (3) increase the relevance of a task for the child socially and cognitively.
How are Perception and Action Schemas Used to Interact with the Environment?

Answering this question focuses the clinician's attention to how a child goes about learning and organizing information so it can be recalled with the least effort using limited resources. There is now a long history of regarding human actions as guided by some kind of stored mental plan or schema that is the residue of experience. Head, as early as 1926, proposed that a motor memory, or "schema," involves the process of extracting core elements from motor experiences. These elements reflect those rules that have led to success in reaching motor goals or performing a given action. A schema encompasses core properties of one's experience that can be tested continually and redefined by other experiences of a similar nature. These same features characterize successful speech schemas (Bellezza 1987). He proposed further that the rules underlying successful speech schemas are clarified through repetition. The larger the number and variety of experiences with a similar activity, the more effective a schema becomes. Variable but similar experiences across different situations allow schemas to become dynamic and usable. Patterns that require less effort and lead continually to more success are easiest to learn, particularly when they revolve around meaningful events involving real-world objects and routines (Nelson 1986; Fletcher 1992).

On a broader cognitive scale, Piaget (1954, 1964), like the contemporary scholars represented in Part I of this book (Thelen, Langer, Nelson, Bloom, and Affolter) proposed that children learn about the world from their physical and social interactions with the environment. Although social development was not emphasized in Piaget's framework, he did describe how in the first 2 years of life, a baby develops initial sensory-motor schemas (a well-defined sequence of physical or mental actions) into more organized and complex mental schemas. These action schemas almost always result from children's use of their own bodies to interact with the environment, behavior that naturally requires the use of touch for exploring and learning about the environment (see Affolter and Bischoberger 2000; Affolter's Chapter 8). Sensorimotor schemas increase in complexity as a child learns to experiment, predict, and control the outcomes from such interaction activity. For example, children progress from the ability to repeat one successful cycle of action during their physical interaction with the environment to being able to achieve new results by experimenting with the effects of the same or different actions on the environment (Piaget 1954). Such exploratory activity presumably provided the foundation for developing symbolic representation and more mature conceptual development.

The implication for PROMPT is that to develop speech schemas, or coordinative structures (patterns of movement that lead to meaningful expression), clinicians should use tactile-kinesthetic information within controlled but naturalistic conditions. It also implies that we be within the client's motor control ability, use repetition, employ variability, and use functional and motivational events, and that productions be made conscious.
How Tightly Structured Does the Event Context Need to be (i.e., Ranging from Highly Structured to Minimally Structured or Unstructured) for the Child to Maintain Successful Sensory Integration and Attention to Learning?

This question is motivated by the fact that behavior inclusive of speech production occurs in some kind of event context. Events are identified by their purpose, location, and the amount and type of human activity required to participate in them. Naturally, events vary all their information processing demands. The processing demands on all speech production events become important given the essentially limited cognitive resources for processing the multidimensional aspects of human activity. See Bloom (1996; Bloom and Tinker 2001; Bloom’s Chapter 7 in this book). Nelson (Chapter 6) argued that ordinary daily events are well suited to the development of all representational systems because they are routinized and experienced often enough to free up mental resources for paying attention to the words used in them. This means that the more difficulty a child has in detecting the presence of a given sensory input, the fewer mental resources there will be for discriminating, recognizing, or storing information at other levels of perceptual organization. The more difficulty a child has in accessing and retrieving information from memory, the fewer the mental resources may be available for executing motor speech targets correctly without a high degree of prestructured and familiar event contexts.

Tightly structured events, which are familiar, can make less processing demand on participants because the activities and social roles are prescribed, even routinized, as are the words used. Once routinized event roles and sequences of activities are learned, one can participate in them without expending a lot of cognitive energy. More of the attentional resources can be given to other tasks at the same time as would be required for learning new speech production skills. In contrast, unstructured or low structured events make more mental demands on attention, planning, problem solving, and the creative use of words. When the event contexts for speaking create attentional demands, it will be more difficult to devote attentional resources to learning new motor speech skills at the same time.

The implication for PROMPT assessment is that clinicians must determine how much events need to be prestructured and simplified to support improved speech and what happens when such support or “scaffolding” is not given. This assessment can capitalize on the information gathered in response to earlier questions.

Why and How Does a Child Express His/Her Needs and Wants?

Because speech is the oral expression of a linguistic system, it is obviously important to determine whether a spoken language system has emerged for a given child. If so, then clinicians should determine its level of complexity and whether speech comprehension and production skills are present. The complexity and amount of spoken language used affect the available repertoire of words that a child can learn to say.
If speech has not emerged, then clinicians should determine what is being used to communicate. At a minimum, it should be determined whether any vocal sounds are produced to communicate needs or whether a combination of sound and other bodily expressions (e.g., eye gaze, gesture) is used. Wetherby (1991) has described a range of early behaviors that children use to express various communication functions, such as requesting, protesting, showing off, and directing another’s attention to an object or event. Wetherby’s categories of communicative behaviors can guide the clinical assessment of children with little or no speech production. If little or no sound is used for communication, then clinicians can try to elicit voicing whenever a child expresses communicative intent such as requesting an object or action. Alternatively, clinicians can identify situations in which a child already uses voice to express intent and explore in the assessment whether this vocal output can be shaped into more usable speech patterns by using tactile prompts.

The broader implication of this kind of PROMPT assessment is that treatment must be focused first at the level of a child’s nonoral or oral expression before moving on to more complex motor speech production tasks.

SOCIAL-EMOTIONAL DOMAIN

How Does the Child Use Significant Others to Aid in Their Acquisition of Knowledge?

Proponents of social learning theory (Bruner 1977; Vygotsky 1978; Nelson 1986) assume that more sophisticated learning strategies and outcomes can occur when a more experienced adult participates in the learning event. Nelson (1986; Chapter 6) reminds us that “event knowledge” encompasses people, in addition to objects and actions. The assumption inspired by Vygotsky’s (1978) social-cognitive learning theory is that the children can achieve higher levels of performance potential when guided or scaffolded by mature caregiver input than when not.

Bates (1976) reminds us that the point of adult “scaffolding” and use of events to solidify word forms and a knowledge base about the world, is to finally engage in peer relationships. Hartup (1983) says that “peer interaction is an essential component of the individual’s development. Experience with peers is not a superficial luxury to be enjoyed by some children and not by others, but is a necessity in... socialization” (p. 220). In PROMPT, the point of creating scaffolded events is to teach social interaction skills that require certain word forms. These words can be learned and used by a child to engage peers and caregivers in social interaction.

How Does a Child React Emotionally to Persons and Events in the Environment?

All behavior is likely to have an affective dimension. Affect reflects one’s emotional state or attitude toward what is being experienced. Emotions can be
described on a continuum that ranges from a negative to positive state (Bloom’s Chapter 7). Like other behavioral domains, emotional or affective responses also require competing use of mental resources. A child in a negative emotional state, for any reason, may not have enough mental resources to produce accurate speech targets at the same time. So being tuned to how children feel about themselves and the ability to control situations and feel safe is essential for therapy. This understanding will set the tone of a therapy session, often leading clinicians to set boundaries on behaviors with consistent consequences. The need to provide a firm but gentle hand may be difficult for some clinicians to do. But it is essential for children whose inappropriate behaviors may reflect their way of coping with distrust and safety issues.

**Behavior**

In the PROMPT conceptual framework, behavior is viewed as the outward manifestation of a child’s reactions to the internal and external environment. Behavior reflects what a child has learned about the world from sensing and organizing sensory input. Behavior also reflects a child’s most intimate feelings about self and one’s relationship to the world. In clinical assessment, clinicians must recognize that one child’s behavioral expression may differ from another child’s, and a given child’s behavior can vary across different situations and communication partners. The implication is that clinical assessment procedures within the PROMPT framework must be adapted to the individual children and situations.

**ASSESSMENT OF SPEECH PRODUCTION**

This section focuses on what is entailed in assessing motor speech skills within the PROMPT framework. The importance of assessing skeletal and craniofacial structures has already been discussed. Therefore, a particular model of how the motor speech system functions in speech production guides the questions posed here for assessment. The Motor Speech Hierarchy (Hayden 1986; Hayden and Square 1994) was created specifically for PROMPT assessment and intervention and has been validated empirically using objective measures (Square et al 1999) and in part by kinematic data (Green et al 2000) (Figure 10.2).

The following questions posed for assessment relate primarily to each stage of the Motor Speech Hierarchy.

**The Motor Speech Hierarchy as an Assessment Framework**

The Motor Speech Hierarchy helps the clinician systematically evaluate a child’s motor speech system and identify the level or stage where problems occur. The Hierarchy identifies seven stages of motor-speech development and control, as described later. These stages are assumed to be hierarchically dependent and interactive. To change speech production, the lowest levels need to be changed before change can be expected at higher levels (Hayden and Square 1994).
**Stages 1 and 2**

These two stages of the Hierarchy represent muscle tone, which is distributed throughout the body including the trunk, neck, and face (Stage 1), and the structures that support phonatory control (Stage 2), which depend on adequate tone and breath support. Motor speech functions at these two levels are assessed first because they provide the infrastructure for speech sound articulation at higher levels of the Hierarchy.

The following questions are relevant to Stage 1 (tone) assessment:

1. Are head, neck, and trunk stable and maintained in proper alignment at rest?
2. Are head and neck stable and maintained in proper alignment during trunk movement?
3. Are postural control and tone within normal range during ambulation?
4. Are head, neck, and trunk maintained in proper alignment during phonation?

(For discussion on tone, see p. 261 this chapter). Answers to the following questions will help the clinician understand the relationship between voicing and jaw movement at Stage 2 of the Hierarchy. When speaking, the laryngeal valving pressure needed for voicing must be sustained while the jaw is moving, and voicing needs to be maintained even when the jaw is closed.

1. Can the child only initiate voicing with the jaw open (i.e., full open to closed position)?
2. Can the child continue the voicing through jaw movement?
3. Can the child maintain voicing with the jaw closed (e.g., produce the /m/ sound)?

**Stages 3, 4, and 5**

The following questions relate to the more discrete functions of individual muscle groups that get coordinated in a single plane of movement. They are relevant to assessing motor functions at Stage 3 (mandibular control or the vertical movement plane), Stage 4 (labial-facial control or the horizontal plane), and Stage 5 (lingual control or the anterior to posterior movement plane) of the Hierarchy. In this model, developing mandibular control is essential to the lip and tongue movements needed for speech, and to normalizing the coordination of jaw, lip, and tongue movement. Answers to the following types of questions will help the clinician understand at what level of the Hierarchy a child needs tactual support, and the amount and type of prompting needed to further individuate speech subsystem movements.

1. Can the child maintain jaw stability and symmetry during speech production (i.e., there is no jaw sliding)?
2. Can the child open and close the jaw while voicing by smoothly grading the movement within a normal range?
3. Can the child move the lips independently of the jaw? To produce bilabials, for example, does the whole mandible move to the upper lip with little or no independent lip contraction, or can the lips move independently or with little or no muscle involvement from the mandible?
4. Can the child move the tongue body independently of the jaw (e.g., from front to back)?

**Stage 6**

This Stage of the Motor Speech Hierarchy represents the ability to sequence speech sounds across all movement planes (i.e., vertical, horizontal, and anterior to posterior planes). In other words, speech productions reflect the temporal and spatial mapping of movement sequences. However, before trying to sort out whether a child can sequence three planes of movement and maintain these trajectories across space and time, it is crucial to know about the level of control at earlier stages of the Motor Speech Hierarchy. If jaw control
is poor, for example, then coarticulated movements across varying planes will be disrupted. The sequencing difficulty will be secondary to a more primary motor control problem. Essentially, the clinician can ask whether a child has difficulty maintaining a sound sequence across multiple planes of movement despite normal muscle tone and contraction.

It is important to separate underlying tone and muscle control/contraction difficulties within a single plane of movement from the ability to remember and produce action sequences across several planes over time. This information will guide clinical decisions about how to develop the lexicon to be practiced in therapy. The number of movement planes and manner of production constraints within each word need to be considered. For example, producing the word “mom” requires a single vertical plane, “daddy” a double plane (vertical/horizontal), and “pancake” multiple planes (vertical and anterior/posterior).

Stage 7

This final stage represents prosodic or suprasegmental sound patterns that include stress, duration, and so on. It is of note to remember that the development of some prosodic features begin much earlier—when motor control for phonation and jaw movement is achieved, or at Stage 3. It is hypothesized that this early prosody is created by a universal and underlying “movement generator” that is cyclic in nature and underpins all movement (Kelso and Tuller 1983). It also suggests that individual speech sounds are superimposed on this underlying prosodic rhythm. At the highest level, or Stage 7 of the Motor Speech Hierarchy, prosody can be described as related to the interaction and coordination of all the stages before it, thereby suggesting that the control of rate, stress, pitch, and pausing that lead to changes in semantic phrasing and meaning are controlled through motor and linguistic processes.

Overall Assessment

At each Stage of the Hierarchy, it is also important to determine whether speech production is differentially influenced by various sensory modalities (tactile, auditory, and visual) of input. Although all three sensory modality input sources are likely to be used in typical development, the children with speech production impairment may have more difficulty achieving accurate productions with some sensory modalities of input than with others. A PROMPT assessment is particularly geared to explore whether tactile information enhances the accuracy of speech production targets. The Motor Speech Hierarchy may also be used to look at how the development of movements at each Stage begin to create “phonemes” or “motor-phoneme links.” Clinicians should also realize that refinement of movement is not developed all at once nor is complete independence of movement control needed for many motor-phonemes, syllables, or word productions. For example, the word “mom” may be produced using holistic jaw movement from closure, through voicing, to closure and requires minimal valving changes (Stage 3). Whereas, the word “scissors” requires a tightly controlled
jaw, well-established valving, independent facial movements, and well-controlled, independent tongue movement (Stage 5).

The VMPAC; A Standardized Motor Speech Assessment Procedure

The Verbal Motor Production Assessment for Children

Hayden and Square (1999) offer a step-by-step protocol for assessing neuromotor integrity of the speech production system at rest and when engaged in vegetative and volitional nonspeech and speech tasks. A unique aspect of this test is that it systematically probes which modality of sensory input changes motor-speech performance the most. If auditory and visual input does not change a targeted production, then a prompted, tactile-kinesthetic cue is offered. The information obtained from scoring these modality sources of input helps to determine what treatment approach may be useful for changing target behavior.

The VMPAC, normed on 1050 normal children and 350 speech-disordered children, ages 3 to 12 years, is designed to assess a range of skills that influence the development of speech motor control. Developed from the Motor Speech Hierarchy, it assesses three main areas: global motor control, focal oromotor control, and sequencing. Global motor control corresponds to Stages 1 and 2, which represent the infrastructure for speech, namely, respiration and phonation. Focal oromotor control corresponds to Stages 3, 4, and 5, which represent the control of muscle groups that support movements of the jaw, lips/face, and tongue. All test items are assessed at increasing levels of difficulty within a stage. Production precision is assessed first in the vertical plane of movement (e.g., a-m), then the horizontal (e.g., m-u), and anterior-posterior (e.g., t-k) movement planes. The sequencing subtest (Stage 6) assesses ability to sequence movements in more complex contexts over time, while maintaining precision and accuracy of coordinated movements. Production of words, in meaningful linguistic sequences of events, is also tested using pictures to depict the actions of cartoon-like characters in various activities. The VMPAC does not include specific items corresponding to Stage 7 of the Motor Speech Hierarchy. Performance in this area is assessed throughout the test, including the supplemental ones.

Test observations can be plotted against normative data for children at ages 3 to 7 years for each subtest area. A child can be compared with typically developing children of the same age at either the 5th, 50th, or 95th percentile. The study described at the end of this chapter illustrates how VMPAC outcomes are used.

PROMPT INTERVENTION

The goal here is not to provide a detailed description of the prompts used in treatment. This information is available in technical manuals (e.g., see Hayden 1985; 1999). Instead, the goal is to describe the general characteristics of the
tactile prompts used in treatment and the principles and phases of treatment that support their use with children.

TREATMENT ASSUMPTIONS

To create speech production changes, the PROMPT clinician is expected to:

1. Match or slightly exceed a child’s developmental level with respect to learning goals and tasks.
2. Consider the type and amount of physical, mental, and emotional resources available to a child when structuring treatment events and evaluating a child’s response to them at any point in time.
3. Enhance attention to tasks by providing sensory input that includes tactile, kinesthetic, and proprioceptive experiences within structured learning events.
4. Provide speech production practice in functional activities that are relevant to social and physical interactions in the natural environment outside of therapy.
5. Take a child’s interests into account when structuring treatment activities that can support meaningful vocalization and social interaction.

Most of these assumptions are not unique to PROMPT treatment. But one of the unique features of PROMPT treatment is its systematic use of tactile input to facilitate speech production in addition to the auditory and visual cues relied on so often in traditional treatment approaches. It is assumed that a child can build motor schema or maps for producing speech sounds more quickly and accurately when the coordinated sensory input includes the tactile modality than when it does not.

POSTURAL SUPPORT AND TACTILE PROMPTS

General Postural and Head/Neck Support

In general, prompting requires that postural control of the body-trunk; the neck and head are stable and supported. The clinician normally uses his or her nondominant hand to support the back of the head at the nape of the neck. This support provides head and neck stability and acts as a counter balance for pressure applied in prompts that are directed at the mylohyoid or the muscular tissue under the chin. See discussion of the importance of a stable environment for moving and interacting in Affolter (Chapter 8) and Bischofberger and Affolter (Chapter 9).

Tactile input is provided by four types of prompts: parameter, syllable, complex, and surface. These prompts are distinguished broadly by the amount and type of support to the skeletal and neuromuscular systems and the type and number of simultaneous tactile cues provided to create motor schemas or maps
of sound targets, words, or phrases. Although each type of prompt is used for a different purpose, all provide the neuromotor system with tactile, kinesthetic, and proprioceptive input regarding the temporal-spatial aspects of speech movements. These aspects may involve the degree(s) of opening required by mandible or labial-facial musculature and/or the breadth, depth, and place of contraction in the lingual musculature. As prompting is dynamic input, it continually acts and reacts to shape and change the input to the child’s neuromotor system. Therefore, the clinician will continually change the type and combination of prompts needed for the child to: (1) stabilize skeletal and muscular systems; (2) recognize the input; (3) organize the motor speech subsystems to produce the movement(s); (4) associate the movements to the acoustic or cognitive-linguistic concepts; and (5) transition the movements for words, phrases, and sentences. A brief definition of each PROMPT follows.

**Parameter Prompts**

Parameter prompts provide maximal support and stability to the mandible or facial muscles, setting either the degree of opening of the mandible or the broad action of rounding or retraction of the facial muscles. See example Figure 10.3. Parameter prompts function to stabilize facial structures or musculature so that other smaller structures or muscle actions (e.g., lips, tongue, and so on) can be freed up for more independent movement and become perceptually salient.

**Syllable Prompts**

Syllable prompts shape beginning CV or VC syllables. They set and support the mandible (degrees of opening) and actions of the facial muscles (rounding or retraction) (e.g., /pi/, /bi/, /mi/, /pu/, /bu/, /mu/). The shaping postures provided by syllable prompts always reflect the vowel shape, for example, rounded or retracted, they effectively reduce the motor load for the child and allow for early independent actions to be established (Figure 10.4).

**Complex Prompts**

Complex prompts provide information about how to produce a “static” neuromotor or single motor-phoneme “map.” They provide input to the mandible about the degree of opening and specific information to labial or facial muscles for place, and if needed, the amount of rounding or retraction. They also give information about timing, degree, and breadth of lingual muscle contraction. The sensory input maps as many components of the sound as possible, so that a holistic motor schema for a phoneme can be constructed. Therefore, complex prompts are often given in isolation, and then re-embedded in the same or different word form (Figure 10.5).

**Surface Prompts**

Surface prompts provide the “most critical” but least information necessary for the neuromotor system to recognize or produce a phoneme and maintain its
Figure 10.3 Visual display of a parameter prompt for /i/ and /a/. A, Parameter prompt for /i/. B, Parameter prompt for /a/.

In essence throughout coarticulated movement transitions. When used in syllables, words, or phrases, surface prompts signal transition from one plane of movement to the next in addition to timing or place information. For example, in the word “mommy,” surface prompts would be given for /m/, /a/, /m/ (in the vertical plane) and /i/ (in the horizontal plane). As the movements are sequenced, the timing, pressure, and stress provided by the clinician can be combined to give input about the transition from one sound to the other (Figure 10.6). In Figures 10.4 through
10.6, it is important to realize that although some finger placements may look the same, they are not the same. One cannot see the differences between prompts in amount of pressure and changes in timing that are applied depending on the context in which the motor-phoneme is placed.

Thus, the specific prompts used within each of four PROMPT categories are distinguished by the particular tactile-kinesthetic cues needed to specify the place and manner of production for individual speech sounds or motor phonemes.
in language. The use of any combination of parameter, syllable, complex, or surface prompts will vary depending on the nature of the speech production problem and the linguistic or corresponding coarticulatory contexts in which a motor-phoneme occurs. For example, the clinician’s nondominant hand usually will support the back of the child’s head to provide postural support. Then, saying, “let me help you” or “let me do it” or “my turn,” a clinician may use the dominant hand to give a surface prompt (to provide cognitive-linguistic associations
and temporal “mapping”). The clinician may ask the child to “do it with me” followed by a syllable prompt (to provide postural shaping for beginning linguistic use). If clinicians feel that a child is capable of a more intricate production than a simple CV shape, but still needs mandibular midline control or stability so that finer muscles can act, then they may say to the child “now you do it” and provide just a Parameter prompt. If a particular sound, within a syllable or word, does not have all aspects established, a Complex prompt (a static prompt
that provides as much information as possible) may be given and the production honed to the neurological system's best effort. The sound then can be re-embedded in the CV and once more, the syllable or surface prompt can be given before the child produces it again. Normally in treatment, clinicians will use a combination of all prompt types.

Consequently, to do PROMPT intervention well, clinicians need to know the specific places where muscles insert and contract and how to apply deep pressure to soft tissue. They also must recognize that the length of time pressure sustained will affect how well the motor system learns to recognize when to set up and release muscle contractions, especially for movement transitions. As therapy progresses through the various phases, it becomes critical that a clinician has automatic skilled use of hand and finger placements.

PROMPT's tactile cueing system is now elaborate enough to create a motor map or schema for every consonant and vowel phoneme of general American English, and motor phonemes in other languages (e.g., French, German, Italian, Spanish, and Cantonese) have been created as well. Years of clinical experience now have revealed that the skilled use of PROMPT's evolving cueing system can help children learn to produce speech more accurately. Once they discover that prompt cues are helpful, it is not unusual for them to seek particular tactile input on their own when they have difficulty saying something. Children may bring the clinician's hand to their own faces or try to prompt themselves. They may also come to therapy sessions with a list of words to be prompted.

**PROMPT TREATMENT PHASES**

Prompt treatment typically consists of three phases presented in a structured progression. These phases are distinguished mainly by (1) the child's overall domain assessment and the chosen communication focus, (2) the complexity of the speech production movements required, and the (3) amount of clinician-dependent input needed to achieve good speech production. These broad criteria for distinguishing treatment phases are not unique to PROMPT therapy; but, PROMPT departs from traditional approaches with respect to how speech production complexity and clinician-dependent input are viewed. Speech production complexity is viewed in terms of the independence of the speech subsystems and the number of movement planes involved in producing a given speech output. For example, a word such as "mom" that requires just one plane of movement (a vertical plane) is developmentally easier to say than is a word involving two movement planes, such as "mommy" (vertical and horizontal planes). Complexity is also viewed in terms of the stages of the Motor Speech Hierarchy focused on in treatment (see Figure 10.2). Treatment, which focuses on just sustaining respiratory support and voicing for sound production at Stages 1 and 2 of the Hierarchy is at a more basic and simpler level than is treatment focused on coordinating respiratory support and voicing with the accurate production and sequencing of phonemes or prosody (Stages 2 through 7).
Clinician-dependent input can be described in terms of the amount of support needed to integrate tactile input with auditory and visual input when building motor-phoneme maps for speech production. For example, a treatment phase that requires fairly consistent tactile prompting to achieve good speech production is different than a phase in which little or no direct tactile prompting is needed; that is, a child can rely more on external auditory-visual cues that are already linked to an internalized motor map of the movement required. Clinician-dependent input is also measured by the degree to which communication events need to be prestructured or routinized for good speech production. For example, a child who produces good speech only in communicative events requiring highly prescribed ways of speaking and repeated word use is at a different treatment level than is one who flexibly uses new speech patterns in novel events with different levels of processing demands on attention. Treatment typically progresses from highly structured to unstructured events or activities.

A prior assessment determines the child’s strengths and weaknesses across domains. Considering the affects of these disordered or misaligned domains, realistic expectations are developed and with caregivers input a “communication focus” is chosen. In other words, what phase of treatment a child may enter, and how quickly a child moves within a phase or from one phase to another, will depend on his or her physical, mental, and motor deficits or how much core prelinguistic conceptual information is already in place. Regardless of the treatment phase, every therapy session is expected to:

- Provide a short “warm-up” period of mass and distributed “motor phoneme” practice. Within the context of PROMPT, mass practice refers to repeated productions of the same motor phoneme or word while distributed practice refers to productions of that same stimulus now within altered coarticulated contexts and different but functional situations. In very young children or those without well-developed prelinguistic strategies, this step will be altered. Instead, voicing, sounds, or functional syllables will be targeted and used as frequently as possible within the context of appropriate activities or routines.
- Combine minimally two speech subsystems in a single plane of movement for production practice. For example, the jaw and lips are involved in producing the syllable, “up” in one plane of movement (the vertical plane).
- Promote a child’s use of new motor patterns in functional, socially interactive, routines, games, or activities that require expression of communicative intent, turn taking, decision making, and so on.
- Prompt treatment rarely requires therapists to work inside the mouth. The use of specific oral-motor exercises, nonsense syllables, and mirrors is not typically recommended. These activities have not been shown empirically to normalize speech production for functional communication. When done incorrectly, they may even encourage abnormal or exaggerated movements during speech attempts.
Treatment Phase I

General Motor and Treatment Goal

The goal of Phase I treatment is to develop speech motor control in a single plane of movement (vertical or horizontal) for use in communication within tightly structured activities and routines. Children who must begin treatment in this phase may have minimal speech production skill.

Sensory Considerations

Some children who begin treatment in Phase I are not accustomed to being touched. Clinicians should touch the gross body structures (head, chest, or limbs) before touching the jaw and other facial structures. Touch should be natural and gentle, with sustained pressure through large joint areas such as the shoulders, head, and neck. The goal of the touch is to normalize the body’s tone and readiness for movement, as well as increase conscious awareness of movement.

Occasionally, a child may show that he or she does not want to be touched. For example, he or she may jerk away from being touched or avoid contact. Such responses almost never have anything to do with the touch itself or with a neurological “tactile defensiveness,” which may be seen by blanching, sweating, projectile vomiting, etc. However, such responses do indicate that the child is not ready or aware of the reason for being touched. Expectation and predictability of events will have a calming effect on the child. Touching, if natural and in context, will provide the stability and boundaries for cognitive and emotional learning. It is, therefore, important that children are approached and “touched” in an easy and natural way by the clinician and without preset clinician expectations of rejection. If therapy begins by naturally incorporating touch as part of helping children to produce some meaningful speech that they initiate themselves, then most of them quickly learn to use the help they get. Later on, some children will even bring a clinician’s hand to their own mouths for additional help or attempt to prompt themselves and others.

Before asking a child to produce the targeted speech sounds, the PROMPT clinician identifies the motor phoneme targets to be produced. A child is asked to produce the targeted sounds following several trials of clinician-delivered tactile prompting coupled with the corresponding auditory and visual inputs about the targeted sound. This means that the child should be positioned in close enough proximity to the clinician to access such input. The visual input will be particularly enhanced if the child is positioned at eye level. Clinicians also may increase successful responses from children by slowing their speech rate and lengthening the response or production time required.

A child’s independent production attempts may be preceded by a “doing with” production phase. That is, a given target word or phrase is spoken and prompted by the clinician at the same time that the child is attempting to produce it. The prompts are faded as soon as possible, and the child’s independent productions are elicited in a variety of functional interaction routines.
THE MOTOR SPEECH HIERARCHY AND PROMPT SUPPORT FOR SOUND PRODUCTION

Phase 1 relates to motor control at Stages 2 (phonation) and 3 (jaw movement) and 4 (facial retraction and rounding) of the Motor Speech Hierarchy. Stage 1 (Tone) is omitted for brevity's sake, as the purpose of this chapter is not to describe activities or postural positions that will enhance or "normalize" tone throughout the entire body. However, as has been stated many times throughout this chapter, if there are abnormal tone issues that exist throughout the whole body, they will greatly affect speech subsystem development. How tone affects the neuromotor system's integrity and its flexible use must be considered in all therapy plans (see Mysak 1968; Bobath 1980; Love 1992, for more information on this area).

At Stage 2 (phonation) several areas need to be considered. First, issues with tone that may be influencing vital capacity so that phonation is weak, strained, or produced through laryngeal tension need to be considered. If so, tactile support and compression can be given to the thoracic area to enhance and prolong breath stream and to normalize speech breathing. Second, phonation needs to be considered along with valving (pharyngeal and labial) and jaw gradation that help to maintain air stream control. To work at Stage 3, vowels and consonants are selected so that motor control can move from whole jaw movement to finer, graded jaw movement. Control of voicing (phonation) through graded jaw movement is essential for vowel production. So, the initial work is on vowel and consonant productions that require jaw movements ranging on a continuum from a fully open mouth position (e.g., /a/, /æ/) to an almost closed position (e.g., /o/, /i/, /u/). Production of the consonant /m/ requires moving the jaw to a fully closed mouth position. Then bilabial speech sounds (/b/, /p/), which require the coordination of jaw and lip movement can be added. Voiced sounds are targeted for production before voiceless ones because they require less motor speech control.

Stage 4 of the Motor Speech Hierarchy allows therapy to target coordinated lip rounding and retraction without changing jaw grading or plane of movement. Consonant-vowel (e.g., me, no) and vowel-consonant combinations (e.g., up, on) are created to make useful words for communication interaction. Thus, all movement is simplified in Phase 1 treatment. It is kept on either the horizontal plane (e.g., me and moo) or on a vertical plane, that changes from an open to a closed mouth position, (e.g., up, on) or a closed- to open-mouth position (e.g., ma). In this treatment phase, until motor control is established within one plane, it is not recommended to combine both planes of movement in the same word.

STRUCTURE AND CONTENT OF TREATMENT SESSIONS

Although all PROMPT treatment sessions are structured to engage participation in social interactions, the sessions in Phase one include highly motivating activities that have concrete beginnings and endings. The child also practices
speech productions in simple visual-motor activities that require repetitive actions. Such activities may require putting blocks into a box, putting pegs into a peg board, putting large puzzle pieces into a form board, or hitting balls down a ramp to accomplish some goal of functional social interaction and play. In a game involving reciprocal social interaction, the child and the clinician take turns performing an action such as putting a block into the box after saying a target production. A repetitive action routine allows a child to easily comprehend the structure of the activity; the next step of the event sequence can be executed without a lot of mental effort. A child also can anticipate the boundaries of the event, for example, “I am done when all these blocks are in,” and the interaction goal is reached.

When a child refuses to participate in activities or expresses either frustration or anger, these feelings are acknowledged, but therapy continues. With supportive boundaries, children typically begin to relax and trust that the clinician can help them.

Even the nonspeech like initial vocalizations attempts can be used to meet a child’s immediate wants and needs as long as expression of communicative intent in some form (vocal or not) has emerged. A child with communicative intent but no usable speech can be taught a single vowel sound as a response class that can be used to get attention, ask questions, request actions, and so on. Single sounds may constitute an acceptable response for making requests or responding to them. For example, /m/ can be used to code “more,” /a/ to code “yes,” and /o/ to code “no.” As the child begins to imitate or spontaneously initiate a vowel-like production for communication interactions, productions are shaped further, using tactile prompts.

During this initial intervention phase, a clinician begins to help the child to put simple syllables together from the isolated motor productions being practiced. If the child cannot yet produce such syllables or word forms, the clinician “maps” in the movements using surface prompts but expects only a production within the child’s motor capacity. Mapping is used consistently in all phases of PROMPT treatment. It provides feed-forward information about motor plans and their variations and associations of motor movements to cognitive-linguistic information. Such syllable structures can include, for example, /ya/, /ba/, /bo/ or /ma/, and /mu/. Combining different vowels with initial and final consonants (e.g., /bo/ vs. /up/) allows the motor speech system to experience variable movement trajectories, transitions, durations, and degrees of muscle tensions that occur in ordinary functional speech. Therefore, clinicians should select linguistically meaningful sound sequences for production practice because they can be used immediately in social interactions. The closer the practiced sound combinations are to meaningful speech, the easier they will be learned.

Even at this early treatment phase, caregivers are expected to observe intervention sessions and spend the last 15 minutes in the session. They also are expected to participate in the intervention effort. The clinician guides caregivers
to learn one activity in which the child has learned to use the turn-taking and the newly acquired sound and word forms. The caregiver is expected to play with the child using the activity to support and encourage the newly learned sounds or words minimally once a day in the home environment. The main goal of caregiver activities is to support “competence” and create successful social interactions. When a caregiver is asked to focus on successful interactions (supported by routines and functional word forms within the child’s cognitive and motor levels), the dynamic of the relationship begins to change. The change occurs when caregivers can focus on what the child can do instead of what he or she cannot do.

**Treatment Phase 2**

**General Motor and Treatment Goal**

The goal of Phase 2 is to further refine and develop speech motor control by combining two planes of movement (i.e., the vertical and horizontal planes) in a speech sound sequence and embedding these new productions in short phrases for communicative interactions.

**Sensory Considerations**

When children reach this treatment phase, most of them recognize that touch helps them. They may even request tactile input when attempting a difficult production. The clinician moves among parameter, syllable, complex, and surface prompts to maximally support the child’s production of more complex syllable structures and phrases.

**THE MOTOR SPEECH HIERARCHY AND PROMPT SUPPORT FOR SOUND PRODUCTION**

Phase 2 includes treatment at three levels of the Motor Speech Hierarchy: Stage 3 (jaw movement), Stage 4 (labial-facial movement), and Stage 5 (lingual movement). The use of more refined jaw movements facilitates the independence of lip and facial movements and tongue and jaw separation. Lingual-alveolar stops and continuant s (e.g., /t/, /d/, /n/, /s/) and the vowel /i/ are now incorporated into therapy. In addition, the clinician can now begin to “map in” the sensorimotor schema or pattern for midback tongue sounds such as /ʃ/ and /ɹ/.

As PROMPT treatment refines the motor control at each stage, new roles emerge for all the speech subsystems. This evolutionary process shifts from developing anterior to midtongue control and continues with the development of midback and posterior tongue control. This refinement of movement develops from the child’s changing motor speech systems interactions. It represents a type of evolutionary change in motor control that continues throughout the first 7 to 8 years of a child’s life.
Structure and Content of Treatment Sessions

In this second treatment phase, the words and phrases added to the practice repertoire should require vertical and horizontal planes of movement. For example, in the word “happy,” there is a change from the vertical plane in the first syllable (/hæ/) to the horizontal plane in the second syllable (/pi/).

Another goal of Phase 2 treatment is to produce words with closed-syllable structure (e.g., boo versus boot) and combine words in short phrases (e.g., my boot; boot up). Producing such words within phrases or with more complex motor requirements can be simplified initially. This may be accomplished by embedding the newly practiced word in a motorically simplified carrier phrase. For example, “I want (vertical plane) bee” (horizontal plane). Once learned, such prestructured carrier phrases can help a child to reduce the motor and linguistic load of speaking when saying new words in longer utterances. Phrases such as “I want toy” or “I want ball” are perceived as more advanced productions and are functionally useful for social interactions.

At a still later stage, the words learned separately in either the vertical or horizontal planes of movement (e.g., “me, you, up go, more, hi, bye, yeah, ball”) may be used to express a variety of communication functions and are flexibly combined in phrases and simple sentences to code early semantic-syntactic relations, such as agent action (e.g., ball go), agent-object (boy ball), and action-object (up ball) relations. Simple turn-taking games are appropriate activities in this phase of therapy as is the creation of “take home” activities or stories that include the words practiced in therapy. The practiced lexicon should include multiple classes or words and should not be restricted to just nouns.

Still more elaborate communication events can be identified with input from caregivers. As well as the activities carried over into the home, habitual daily life routines around food, games, or outings are good contexts for using new sounds and words outside of therapy. However, the motor complexity of each new word must be evaluated to determine whether it can be produced without clinician-supported input. If not, then it is replaced by another word with similar meaning and function but less complex motor production requirements. For example, a child may be able to say “me” in a turn-taking routine rather than “my turn.”

Treatment Phase 3

General Motor and Treatment Goal

The general goals in this phase are to (1) further refine speech motor control by producing words and phrases involving three planes of movement (the vertical, horizontal, and anterior-posterior planes); (2) expand the complexity of the linguistic phrase structures produced; and (3) develop enough flexibility in motor speech skill so that the child has increasingly less need for concrete routines or structured clinician support to produce intelligible speech for functional communication.
Sensory Considerations

In Phase 3, direct tactile input and sustained control for motor execution begins to be reduced. Tactile input is faded by using “surface” and “air prompts.” Surface prompts allow clinicians to give tactile input about transitions and main trajectory changes of coarticulated productions. In contrast, air prompts do not require the clinician to touch a child. Instead, a clinician may visually show the end posture or movement for a tactile input. The visual cue should remind the child of how to produce the sound if it has been previously integrated with tactile-motor schema in previous learning events.

MOTOR SPEECH HIERARCHY AND PROMPT SUPPORT FOR SOUND PRODUCTION

Phase 3 focuses the treatment on Stages 5 (tongue control), 6 (sequenced movements), and 7 (prosody) of the Motor Speech Hierarchy. By the time this phase is reached, the child should already be able to control and combine speech movements (on two planes) requiring controlled valving changes, (e.g.,onation), jaw, independent labial-facial movements, and moderate anterior to posterior lingual contractions. For example, as in the words “got,” “good,” “take,” and “can.” To progress in Phase 3, the jaw must be stable or move with fine, graded control and have established independence of tongue from jaw. This type of jaw control is needed to produce such motor phonemes as /l/ and vowels /a/ and /e/. The therapy now focuses on continuing to refine lingual control in the anterior to posterior plane of movement. Broad to very specific narrow contractions are required as the speech subsystems move toward the complete individuation of movement needed by all physical structures involved in speaking. Individuated movement allows the lips to move independently of the jaw and one lip to move independently of the other one, as is required for producing /r/ and /w/. Intrinsic tongue muscles also are used to refine movement trajectories. Production practice can now include words that require narrow tongue contractions (e.g., /get/, /kick/) and those that require mall, finely graded movements with good valving control and air pressure e.g., consonant blends such as /sp/, /st/, /kl/).

Production practice also includes words and phrases that require the coordination of multiple planes of movement and changes in manner of production. A common characteristic of more complex productions is that all three planes of movement may be required plus several changes in manner of production. Consider the phrase, “I need scissors.” Producing the word “I” involves primarily a vertical plane of movement, whereas the word “need” involves mostly horizontal plane movement. Producing the word “scissors” involves an anterior-to-back plane of movement. These types of productions require more flexible and refined motor control than do words and phrases produced in a one-movement plane or io more than two movement planes.
Structure and Content of Treatment Sessions

During Phase 3, the scope of a given treatment session expands. The changes include (1) increased variety and complexity of linguistic material to be practiced and (2) increased flexibility in the structure of treatment sessions so that speech production experience gets embedded within more complex social interaction routines and event sequences. As greater control is demonstrated over physical-motor, mental, and social-emotional domains of function, children assume more of the responsibility for changing their speech performance. The clinician now can become less directive.

In Phase 3 (and even as early as Phase 2), small group activities with other children can provide opportunities for peer practice, turn taking, and transfer of skills to more naturalistic environments. Motor and language goals are more often interrelated and codependent. Although often initiated in Phase 2, activities may now include grapheme-phoneme associations and the development of a lexicon for use in early literacy skills.

CONCLUDING COMMENTS ABOUT TREATMENT

The overall goal of PROMPT therapy is to move the child’s speech motor system from a pre-existing “attractor state” (Thelen’s Chapter 8) to a phase that allows new dynamic movement relationships to evolve. In Piagetian terms, this means that new schemas are developed (assimilated) as part of the child’s response repertoire (accommodation). The information presented here for each treatment phase may apply more readily to some children than to others. Children come to therapy with unique learning profiles and varying levels of impairment in speech motor control and in other domains of function. For this reason, the rate of therapy progress varies from child to child. Progress is also dependent on how skilled the clinician is in bringing about the necessary changes.

By the second treatment phase, clinicians should be able to judge how much and how quickly a child’s motor speech system has responded and developed. But not all children have the potential to achieve normal speech. For these children, the words that may be easily produced in a therapy environment may never be used outside of therapy without environmental-contextual support. If a child’s motor or cognitive system is severely compromised, then it is crucial that clinicians develop a core lexicon from the motor movements possible and maximize their use in isolation or in short phrases for social communication.

However, years of clinical experience have revealed that the speech of many children (with adequate cognitive-linguistic and physical sensory domain strengths) can be normalized to a level typical for their ages within a year’s time when given one or two sessions per week of approximately 30 to 50 minutes. The children who benefit from PROMPT treatment include those with various clinical diagnoses. They include children with delayed speech, developmental speech apraxia, cerebral palsy, and pervasive developmental delay inclusive of autism as well as those with hearing loss and fluency problems.
PROFILE OF A CLINICAL CASE

The following clinical case illustrates how all of the information presented throughout this chapter can be applied.

PRETREATMENT PROFILE

Jamie, a 2-year, 9-month-old male, was referred for PROMPT treatment with a diagnosis of developmental dyspraxia. Speech was profoundly unintelligible. Spontaneous productions consisted of isolated vowels and occasionally undefined stop consonant-like sounds. However, prelinguistic communicative intent was well established. Jamie used gestures (e.g., pointing) for most communication attempts. His birth history revealed full gestation with no complications and a birth weight of 7 lbs, 3oz. Hearing and vision were within normal limits. Before receiving PROMPT therapy, Jamie had been treated approximately twice a week for 40 1-hour sessions of speech therapy at school and a local university clinic. The clinical profile obtained after extensive diagnostic testing at age 2; 7 years or 31 months of age is described below.

The Physical Domain

Standardized Test Results

Jamie scored within normal limits for his chronological age on the Peabody Developmental Motor Scales (Folio and Fewell 1990). His age equivalency scores for gross and fine motor skills were 35 and 31 months, respectively. No neuromotor difficulties were reported.

The Verbal-Motor Production Assessment for Children (VMPAC) (Hayden and Square 1999) yielded the following scores as shown in Figure 10.4: global motor control, 85%; focal oral motor control, 32%; sequencing, 15%; connected speech and language, 22%; and speech characteristics, 57%. These scores ranked below the 5th percentile for Jamie’s age group in all areas except global motor control. The modality scores, which indicate speech production accuracy under different sensory input conditions, revealed 17% speech production accuracy with only auditory input, 27% with added visual input, and 63% with added tactile input.

The Motor Speech Hierarchy

Figure 10.2 supports the following clinical profile: Stages 1 and 2: all functions achieved; Stage 3: poor stability and symmetry of jaw movement observed and overexcursion of the mandible with very poor grading and bilabial closure achieved with just the movement of mandible or jaw as opposed to lips; Stage 4: syllable and surface prompting needed to engage facial muscles for lip rounding and retraction; Stage 5: complex and surface prompting needed to achieve jaw-tongue separation, otherwise no independent lingual movement was seen; Stage 6: primary difficulty in the vertical plane of movement with breakdown in
combining more than one movement plane; and Stage 7: minimal prosodic disturbances observed because of timing issues with jaw control. Modality testing revealed that Jamie needed tactile information to successfully modify speech motor patterns (Figure 10.7).

**General Impressions**

Overall, Jamie had normal tone and well-balanced skeletal relationships for gross and fine motor development. However, unbalanced and underdeveloped speech subsystems were observed with poor motor control and overexcursion of the mandible. Poor independent use of labial-facial movements and minimal to no independent lingual productions were observed throughout his test responses.

**The Cognitive-Linguistic Domain**

**Standardized Test Results**

On the Differential Ability Scales (DAS) (Elliott 1990), a test of intellectual abilities, Jamie scored 93 (PR = 32) on General Conceptual Abilities, which includes oral subtests. His Special Non-oral Composite score was 109 (PR = 73). The 16-point difference between these two subtests was statistically significant (p < .05).

![VMPAC Scores: 3:0 Years](image)

**FIGURE 10.7** VMPAC scores at 3:0 years.
On the Vineland Social Maturity Scales (Doll 1947/1965), Jamie scored within the average range in all areas except communication. His standard score of 69 was ranked at the 2nd percentile for his age group. Motor skills were the strongest at the 88th percentile.

On the Preschool-Language Skills-3, PLS-3 (Zimmerman et al 1992), Jamie scored at the 3rd percentile rank. His age equivalency score corresponded to a 1-year delay in expressive language skills.

**General Observations**

At times Jamie appeared unorganized and immature and could become confused or hypersensitive with poor emotional modulation. Speech production was much improved with coordinated sensory input that included tactile input. He did participate in nonspeech events and routines at home and school to moderately support his overall learning and concept development. However, Jamie needed high structure to help him organize routines for learning.

**The Social-Emotional Domain**

Jamie indicated his wants and needs by using isolated vowel strings, eye gaze, pointing, and other gestures. He relied often on adult family members to anticipate his needs and required well-defined boundaries to control choice making.

**Behavior**

Jamie’s responses to the Burks Behavior Rating Scale (Burks 1977) revealed excessive withdrawal, poor anger control, and lack of social conformity. Jamie was very withdrawn and fearful with peers and adults who were not his caregivers. His mother was his main communicator and facilitator. Failure and fear of failure were judged to be mitigating factors. Jamie’s parents reported that he was “very aware” of his difficulty with speech production and that he has become less easily engaged in social interactions; he did not play with other children, and his temper tantrums had increased.

**SUMMARY IMPRESSIONS**

Given an overall evaluation of Jamie’s performance within PROMPT’s conceptual framework, Jamie’s main problems appeared to result from an undeveloped and unbalanced speech motor system that reinforced a strong attractor state; that is, the jaw overrode a normal developmental progression towards independent movement of other oral structures.

The major domains focused on for treatment were the physical-sensory domain (the speech-motor subsystems only) and secondarily, the social-emotional domain. The communication focus was targeted at social-interactive routines and early academic behaviors.
TREATMENT GOALS AND PROCEDURES

Treatment Goals and Schedule

Given the aforementioned information from Jamie’s assessment, the following motor speech treatment goals were identified for him:

1. Reduce jaw excursion.
2. Increase upper lip function for independent bilabial movement, rounding and retraction.
   a. Develop new motor schemas and motor-phoneme templates.
   b. Develop initial lexicon for use in routines and events.
4. Develop socially interactive routines that could be used with family and peers; namely, routines that require turn taking and use of phrases and sentences that embed the newly developed lexicon for speech production in structured events.

Jamie’s therapy consisted of 22 individual sessions of approximately 55 minutes each over 1 year. Approximately 8 sessions were spent on Phase 1 treatment and 7 sessions each were spent on Phases 2 and 3 before discharge.

Treatment Phases and Activities

Given the chosen social-interaction focus, all phases of treatment were directed towards Jamie’s need for understanding boundaries, developing competence, social interaction, emotional stability, and being able to use his speech to engage others. His strengths in overall physical-sensory systems and cognition meant that these domain areas could be used toward the development of social interactions and speech motor control. Sessions were developed to allow him to experience success in creating new motor schemas while engaging in activities he could use with his family and peers.

In treatment Phase 1, considerable time was spent in learning how to produce accurate target movements, which led to recognizable functional word forms. This included a brief warm-up of massed practice at Stages 3 and 4. These were targeted to control vertical and horizontal plane movements using different targeted motor-phonemes and syllables. Distributed practice included these targeted syllables in socially reinforcing games or activities, such as Mister Potato Head, Puppy Racers, simple concentration or matching games, or puzzles. A take-home book with the syllables/words used in each activity were specified and used by the family in such games or other appropriate situations. As well, all sessions were videotaped, and Jamie and his parents watched his session at least once during the interval between treatment sessions. Jamie’s parents reported that he loved to watch the videos and would regularly go over his “book” with his parents and older brother.

As Jamie progressed to Phase 2, motor-phoneme practice “warm-up’s” continued, but the emphasis was now placed on combining two planes of
ovement while increasing his comprehension and production of age-appropriate concepts and early grammatical forms. These forms were then used to code and produce language in more complex routines and activities. For example, expectations of the carrier phrases used and numbers of pairs matched were expanded as in the pair’s concentration game. Earlier productions, such as “I have bee,” were now expanded to “I have bee, (they) match.” Closing syllables, le increasing intelligibility, also provided more subsystems interaction ages 3, 4, and 5) and increased the available number of words that could be in various combinations.

Social interactions in routines and game playing, book reading, and early material (numbers and letters) were instituted in Phase 3. At this it, only specific word forms or motor-phonemes still needing refinement e targeted for “warm-up” practice. Later in this phase, Jamie would ask prompted “help” with certain words, or his parents would bring in words that had given him trouble within the context of phrases. If the expectations these productions were too high, usually the word would be placed within easier “phrase” form. For example, “I’m going skating tomorrow” (where was the “target”) was changed to “I go skate tomorrow.” When spe word forms were not the issue, grammatical complexity became the is. By this phase, Jamie understood routines, was able to select (from e or four) games he wanted to play, and could organize and complete s with less structure or “scaffolding.” At discharge, Jamie was able to monitor” and usually “self-correct” his own productions. He displayed good uational and self-regulating behavior, could not wait to share what was significant for him, and would initiate conversations and social-play with hiors and classmates.

POST-TREATMENT PROFILE OR OUTCOMES

ollow-up results from the VMPAC showed that Jamie’s speech production roved with PROMPT treatment. When dismissed, he performed at age-ropriate levels in all areas except focal oral motor control, which was at 70% he 5th percentile, cf. Figures 10.4 and 10.5). Still, this score was higher than reatment score at 32%. The scores also improved from 85% to 95% for al motor control; 15% to 78% for sequencing; 22% to 77% for connected ch and language control; and 57% to 85% for speech characteristics. Jamie’s ch production accuracy after PROMPT treatment was still the best (84% racy) when enhanced by tactile input. However, production was accurate > than half the time even when just an auditory model was given (55%) or a l model was given (63%) (Figure 10.8).

hen dismissed at 3:11 years of age, Jamie performed within normal s on formal and informal tests in receptive and expressive speech and uage.
VMPAC SCORES: 3:10 Years

When asked to evaluate his progress and describe how PROMPT therapy had helped Jamie, his parents wrote,

"Jamie speaks better than he ever did, before receiving PROMPT therapy. Before we could barely understand him, now we understand 90% of his communication and he is constantly improving. This has led to greater harmony in our family. Frankly, we don’t know what we would have done without it. Jamie now is less frustrated which has lead to better behavior. Before PROMPT therapy he would have temper tantrums that lasted on average about an hour each day. After PROMPT these tantrums have stopped and his behavior has improved remarkably. Jamie has also developed better socialization skills. Before PROMPT he was shy and withdrawn. After therapy he is much more outgoing. He is now a social butterfly with many friends. He has become much more independent."

FINAL REMARKS

Jamie’s case illustrates how PROMPT’s framework conceptualizes speech production within the context of multiple domains of function. It also stresses how motor speech subsystem development/rebalancing and touch can be used to enhance sensory input for achieving speech production accuracy and social interaction.
a child with PDD, the framework of PROMPT is used similarly. However, communication focus will directly alter the choice of words used and the comments in which the words may be used. Many children with PDD may have normal peripheral motor ability, but their sensory and integrative systems are disordered. In these children, the links between the sensory-motor and intuitive-linguistic areas are even more critical to establish. Ultimately helping to develop more normal oral language is the goal and ensuring that all native communication approaches are used to support social interaction communication with parents and caregivers are the goals. (See descriptions ongoing research on page 7.)

As clinicians and researchers, we owe it to our clients to explore all sensory domains and their interactions when seeking to develop speech, language, and cognition. Recognition of the dynamic interconnectedness among these domains, socially those concerned with motor, language, and social development should be underestimated. In short, it is time that we begin to develop methods of treatment for speech production disorders that merge the motor and language acts. Such an integration is required to achieve our highest and most valued sociability; namely, the ability to orally express ourselves and develop true human connectedness with others.

REFERENCES


