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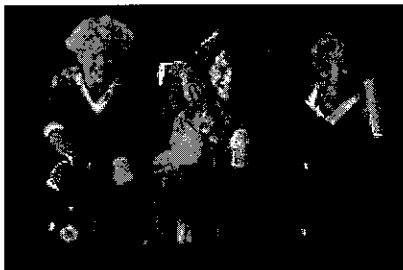
NDT to the Rescue

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NDT to the Rescue

Improving pediatric neurological disorders through the neurodevelopmental treatment approach

In the United States alone, 10,000 children are born yearly with cerebral palsy (CP) or other disorders of the central nervous system (CNS).¹ In addition, thousands of children experience acquired brain injury, secondary to disease or trauma.

Neurodevelopmental treatment (NDT) has proven effective in improving function and the use of impaired body segments and systems. Berta and

Karel Bobath's insights on the theory and application of NDT were instrumental when they began developing the technique in the 1940s and continue to be influential today.² NDT is a strategy used for managing people with motor impairments and resultant functional limitations, secondary to pathophysiology of the CNS. This approach is based on anatomical and kinesiological principles and incorporates the evolving scientific information on motor learning and motor control.³⁻⁵

Handling Helps Movement

The process of "handling" the patient using physical cueing is an integral part of the NDT approach. Handling involves applying external stimuli (touch, pressure) to patients as input to their CNS to elicit a motor response. It is utilized as a guide to define spatial, directional, and temporal parameters of the patient's body segments or to actually facilitate muscle activity to achieve the desired movement/response or the performance of an activity. Stiffness or restrictions to movement must be resolved before it is possible to facilitate efficient movement.

The clinician's level of expertise comes into play in the assessment of the patient's response to the input and in effectively grading the input, muscle demands, and complexities of the tasks performed by the patient to optimize success. As stated by Gordon: "The role of the therapist, therefore, should not be to stimulate or facilitate specific movement patterns but rather to select the tasks that are appropriate for the child to begin to attempt to solve and to structure the relevant conditions of the environment so that the child learns to solve motor problems in a variety of contexts."⁶

Keeping a patient's CNS appropriately engaged is also an essential part of the NDT approach, and is achieved not only through physical handling practices, but also through other means such as demonstration/modeling, adjustment to the environment, therapeutic activity selection, and psychological considerations, which ensure that there is a reason to respond and that what is happening is meaningful to the patient. The principles of learning from the error and gradual withdrawal of feedback from the clinician allow for true learning to occur within the patient's CNS, and helping the patient to achieve independence and enhanced quality of life. Thus, the overall goal of management within this NDT approach is for the patient to achieve restoration of function of the impaired segments and to then use these segments to return to or assume new roles in life.

The belief is that potential for recovery within the CNS is present.⁷⁻¹⁰ If appropriate use of the impaired segments is not encouraged, patients are being deprived of the opportunity for improvement or effective recovery and may, in fact, be subjected to the consequences of learned nonuse.¹¹

Grading is More than As, Bs, and Cs

Handling, however, continues to be an integral part of NDT, which relies on the therapist to grade the input given to the child in order to prevent artificially compressing degrees of freedom within the child's system. This freedom may appear as though the child actually has a higher level of control. During implementation of management strategies, grading is an important feature. The gradeable elements are: range requirements, muscle demands, components of the desired activity,

and therapist's input.

Adjustments in range are easily implemented to affect the total distance of excursion or of specific intervals within the range of movement. Usually, it is easier to gain control of a shorter distance versus a larger distance. When the child is working within a particular range, the degree of difficulty varies significantly. For example, it might be easier to work in the end range of an activity first, like in moving from sitting to standing.

The demands of muscle activity can be graded by the type of contraction, force intensity, speed, length of muscle tissue, coordination with other muscles, and open versus closed chain. The therapist is essential in assisting the child in developing motor control along these parameters. The sequencing and interplay of all these elements enhance motor learning and motor control development. For simplicity's sake, it is generally expected that control of an isometric contraction begins before control of an eccentric (lengthening) contraction, before control of a concentric (shortening) contraction. Also, closed chain precedes open chain and moving into gravity precedes moving out of gravity when considering developmental sequences for motor control.

When considering ways to grade activities besides range requirements and muscle demands, the therapist makes adjustments relative to specific component movements within the particular activity as they relate to the child's impairments. The therapist then determines the number of components to be attempted within the task and the complexities of "layering on" additional movements. For example, the child could work on a specific movement component and practice it in many other situations without being expected to complete the entire task. Eventually, however, the whole activity needs to be completed so guidance by the therapist may be necessary to preserve quality. Guidelines for selecting activities are:

- Activity has a high likelihood of producing the component movement that needs improvement, while avoiding substitution patterns;
- Activity is appropriate for the child's functional level, ie, if the child can only move a little actively into hip extension, design play activities that require small amounts of hip extension but do so in many different postures (perched, sitting, quadruped, standing);
- Ensure that the activity relates to the child's environment—make it meaningful and fun to keep the child engaged;
- After a degree of active control of the desired movement is accomplished, select activities that challenge improvements in qualities of movement, ie, speed, force intensity, coordination with the rest of the body, sustaining, reversal patterns; and
- To aid the carryover of skill acquisition, design activities or "stations" that the child can participate in away from therapy time, making sure that the station allows for relatively independent practice of the component movement in question.

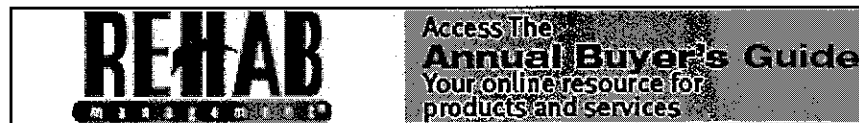
Practicing is vitally important for motor learning. Lastly, the therapist must grade the child's input. This is essential for the child to gain independence. The therapist is part of the environment and so the child's CNS is responding to the influences of the therapist. Examples of "grading off" are to move from proximal to more distal tactile cueing; decrease verbal instructions/feedback; and provide critiques of results versus performance, giving fewer visual cues.

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