Neuro-developmental Treatment of Adults with Hemiplegia

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History of NDT

- Developed by Berta Bobath
  - Physiotherapist
  - Gymnast
  - Assisted by her husband, Karel, a neurologist

- Main audiences
  - Adults with hemiplegia
  - Children with cerebral palsy

History of NDT

- Holistic Approach
- Quality and coordination of movement patterns
- Not simply individual muscle function and impairments

Main components:
- Normal movement patterns cannot be imposed upon abnormal ones
- Sensory-motor experiences

History of NDT

- **Historical Approach**
  - Potential for recovery vs. compensation
    - Bobath believed
      - That patients with hemiplegia had the potential for recovery
      - That recovery of function would occur if the patient placed demand on the involved side

History of NDT

Historical Approach

- Potential for recovery vs. compensation
- Problem-solving approach vs. protocol
  - Treatments must be individualized to fit the needs and impairments of the patient
  - Understanding the components of normal movement to compare with abnormal patterns of patients

History of NDT

- Historical Approach
  - Potential for recovery vs. compensation
  - Problem-solving approach vs. protocol
  - Key elements to NDT
    - Alignment – Cannot impose normal movement on mal-aligned joints
    - Handling – Inhibition, Facilitation, Key points
    - Placing – Reflex inhibiting postures (RIPs)
    - Practice – functional, sensory-motor experiences

History of NDT

**Historical Approach**
- Hierarchical
- Utilized developmental sequence
- Movement was expected to spontaneously carry over into function
- 4 key elements

**Current Approach**
- Systems
- Emphasis is no longer on specific sequence
- Task-specific practice
- Individualized treatment
- Improved evidence
- 4 refined key elements

Neuro-Developmental Treatment

Current Approach
- Potential for recovery vs. compensation
  - Compensation is the natural response to injury
  - Neuroplasticity – The brain’s ability to change and reorganize based on experiences
  - Recovery of function of the involved side is possible given neuroplasticity


Neuro-developmental Treatment

- **Nudo:**
  - Neuroplasticity during motor learning in squirrel monkeys
  - Mapped M1 for the finger/thumb, wrist/forearm, elbow/shoulder
  - Explored changes in the M1 representations pre- & post-training
  - Healthy and post-cortical injury
  - Conclusions:
    - Strength of synaptic connections – use vs. non-use
    - Spontaneous recovery (non-use) – M1 representation decreased
    - Post-injury trained (forced-use) – M1 representation remained and expanded
    - Over-use – time-dependent, may result in increased damage

History of NDT

Current Approach

- Potential for recovery vs. compensation
- Problem-solving approach vs. protocol
  - Grossly remained the same
  - Continue to adhere to individualized treatment based on movement analysis

Neuro-Developmental Treatment

- **Current Approach**
  - Potential for recovery vs. compensation
  - Problem-solving approach vs. protocol
  - Key elements to NDT
    - Alignment - Cannot impose normal movement on mal-aligned joints
    - Handling - Inhibition, Facilitation, Key points
    - Placing - Assisting patients in achieving the appropriate position through alignment and handling
    - Practice - team approach; functional, sensory-motor experiences

Principles of NDT

- Individualized Functional Outcomes
  - Know the patient
    - Life roles
    - Support system
    - Home environment
    - Patient’s goals for therapy
  - Know the patient’s impairments
    - Resulting from CVA
    - Co-morbidities
    - Functional Activity Abilities and Limitations (FAA & FAL)
  - Treat the whole person

Principles of NDT

- Individualized Functional Outcomes
- Motor Control
  - Systems approach
  - Take advantage of synergies

Principles of NDT

- Individualized Functional Outcomes
- Motor Control
- Challenge the Involved Side
  - Increase the demand on the involved side
  - Activity-dependent neuroplasticity
  - Logical progression of tasks

Principles of NDT

- Individualized Functional Outcomes
- Motor Control
- Challenge the Involved Side
- Increase Motor Learning
  - Performance vs. learning
  - Components of movement & entire movement

Principles of NDT

- Individualized Functional Outcomes
- Motor Control
- Challenge the Involved Side
- Increase Motor Learning
- Increase Carry-over & Retention
  - Practice
  - Teach according to individualized capacity and needs
- Interdisciplinary Approach
  - 24-hour management
  - Consistent practice

Principles of NDT

- **Movement Analysis**
  - Understand “normal” alignment & movement
  - Based on understanding of “normal”, able to assess “abnormal” alignment & movement
  - Determine missing components of alignment & movement
  - 4 core elements and 10 essential factors
    - Effect movement
    - Manipulated during interventions

Principles of NDT

■ **4 Core Elements**
  - Base of Support
  - Body segment alignment
  - Muscle activity
  - Weight shift

■ **10 Essential Factors**
  - 4 core elements
  - Gravity
  - Levers
  - Time
  - Distance
  - Speed
  - Environment

Neuro-Developmental Treatment

- Main Aspects of NDT treatment:
  - Starting Posture
  - Missing Components of Movement
  - Manual Cues
    - Facilitation
    - Inhibition
    - Stretch

Neuro-Developmental Treatment

- **Starting Posture**
  - Most efficient position from which to move
  - Improved muscle balance and alignment to achieve optimum length-tension relationship
  - Re-orient to midline
  - “Neutral” alignment of body segments
  - Sitting or Standing
  - Posture from which to compare normal and abnormal alignment and movement

Neuro-Developmental Treatment

- **Missing Components of Movement**
  - Assessment of alignment and movements in comparison to “normal”
  - Determine systematic reason for MCM (ROM, Neuro-muscular, etc)
  - Drive the treatment session to obtain more “normal” alignment or movement

Neuro-Developmental Treatment

- Manual Cues
  - “Key points” of control
  - Facilitate effective alignment/movement
  - Inhibit ineffective alignment/movement
  - Stretching of tight structures
  - 4 primary uses:
    - Establish the BOS
    - Align body segments
    - Activate the muscle activity
    - Assist with the weight shift

Neuro-Developmental  
Treatment

- **Facilitation**
  - Using manual cues to assess muscle activity
  - Determine client’s ability to initiate and sustain muscle activity for function
  - Assist with muscle activity to control a posture or for transition
  - Neuromuscular impairments

Neuro-Developmental Treatment

- **Inhibition**
  - Inhibit ineffective movement strategies
  - Maintain or control a posture which the client is unable to do on their own

- **Stretch**
  - Assess ROM
  - Techniques to increase available ROM
  - Musculoskeletal impairments

Neuro-Developmental Treatment

- Integrating NDT techniques
  - Bed mobility
  - Transfers
  - Gait
  - ADLs
  - IADLs

Conclusion

- Problem-solving Approach
- Movement Analysis
- Individualized, holistic treatments
- Promote functional recovery
- New technological interventions
- Increasing research