

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

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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

Velickovic, TD, Perat, MV. (2005) "Basic Principles of the Neurodevelopmental Treatment" *Medicina* Vol 42 (41): 112 - 120

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

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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

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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

Velickovic, TD, Perat, MV. (2005) "Basic Principles of the Neurodevelopmental Treatment" *Medicina* Vol 42 (41): 112 - 120

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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

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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

Nudo, RJ, (1998) "Role of Cortical Plasticity in Motor Recovery After Stroke" Neurology Report, Neurology Section, APTA, Vol. 22, No. 2

Fisher, BE, Sullivan, KJ. (2001) "Activity-Dependent Factors Affecting Post Stroke Functional Outcomes" Topics in Stroke Rehabilitation Vol. 8 (3): 31-44

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

Nudo, RJ, (1998) "Role of Cortical Plasticity in Motor Recovery After Stroke"
Neurology Report, Neurology Section, APTA, Vol. 22, No. 2

Neuro-Developmental Treatment

■ Fisher & Sullivan:

- Compensation vs. neuro-recovery
- Therapist vs. patient-focused practice
- Increased representation in M1 cortex (neuroplasticity)
- Current strategies:
 - Constraint-Induced therapy
 - Body-weight supported gait

Fisher, BE, Sullivan, KJ. (2001) "Activity-Dependent Factors Affecting Post Stroke Functional Outcomes" Topics in Stroke Rehabilitation Vol. 8 (3): 31-44

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

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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

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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

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Principles of NDT

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

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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

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Principles of NDT

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

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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

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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

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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

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Neuro-Developmental Treatment

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

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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

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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

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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

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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

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Conclusion

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