Introduction To Dynamic Neuromuscular Stabilization (DNS)

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Biography

- 2006: National University of Health Sciences (NUHS), earned D.C.
- 2006-present: **Integrative Chiropractic**, Owner
- 2007-2015: Triton College, Biology Department, Adjunct Faculty
- 2015-present: NUHS, Clinical Sciences Department, Adjunct Faculty
- 2007-present: DNS training; 2014: Certified Practitioner; 2015: Certified Pediatric Practitioner;
What IS DNS?

- A principled approach to Rehabilitation based on the neurophysiological development of the human locomotor system
  - Developmental Kinesiology
- Based primarily on the activation and integration of the intrinsic stabilization system of the spine and pelvis
Where did DNS come from?

- Professor Pavel Kolar, PaedDr.
- Director of the Rehabilitation Clinic, Charles University, Prague, Czech Republic
- Student of Janda, Lewit, and Vojta
- Developed the DNS approach
Developmental Kinesiology (DK)

- Principles that guide the development of spontaneous movement and stability in the first two years of life
  - There is a particular “order” and “timeline” that every infant generally follows over their first 16-18 months
  - Ex. Supine ➔ Sidelying ➔ Turning
- Governed by innate subcortical programming within the CNS using a genetically predetermined sequence
- While the child’s emotional state is vital to ongoing motor development, the spontaneous movement patterns observed are programmed in nature
The principles of DK provide us with the only objective basis for determining *ideal*, *natural* patterns of movement and stabilization:

- Allows the practitioner to rationally categorize motor patterns and postures
- With rational categorization, the practitioner can then properly and effectively define terms like “ideal”, “natural”, and “functional” which up until this point, have only had subjective or relative descriptions
- Allows the practitioner to determine which exercises/postures are better or worse depending on how far these motor patterns stray from the principle of DK
Purpose

Our goal is to teach our patients how to move and stabilize efficiently, so that they can transfer that effectiveness to more functional tasks (motor control)
Motor Control is a function of the CNS…essentially we are training brains

The most effective way to positively impact the CNS is to utilize the natural motor strategies of DK principles, which the brain and spinal cord easily recognize and understand.

Conversely, if we attempt to use a constructed motor strategy to train the brain, the CNS may not only be negatively impacted (abnormal muscle tone, alteration of joint ROM, pain) due to the unnatural quality of the movement, but it may be more difficult for the brain to recognize.
“Every developmental position is an exercise position”

...Pavel Kolář
The human body (CNS) contains an integrated stabilization system of muscle chains surrounding the spine and pelvis that subconsciously act in a feed-forward mechanism in order to provide a solid base of support for purposeful, efficient movement.

The functional stabilization provided by this system is essential for safe, phasic function of the head and extremities.
Quality of stabilization and phasic patterns are what is most important. If one piece of the chain is dysfunctional, the quality of the motor pattern is necessarily less efficient and effective...which can lead to joint overload, muscle overuse, and repetitive strain...creating a vicious cycle ending in decreased spinal stability.
Primacy of Respiration

- Primary stabilization of the spine, pelvis, and torso is established through *intra-abdominal pressure* created through coordinated muscular activity between the diaphragm, abdominal wall and pelvic floor musculature during breathing.
Primacy of Respiration

- As the diaphragm contracts, it moves inferiorly, or lowers, which pressurizes the abdomen.
- The pelvic floor and abdominal wall mm respond by activating against that pressure.
- Coordination of mm activity produces a controlled increase in intra-abdominal pressure that supplies stability to the spine, pelvis, and torso.
Diaphragm Function

- Respiration
- Stabilization
- Sphincter

Breathing and Stability are always connected and vital for function...this is established during the first 6 months of development.
DNS Rationale

- Use the ideal locomotor patterns of DK to assess movement and stabilization strategies
Utilize a basic developmental position to provide the patient with the best chance at actively evoking an ideal strategy of movement and stabilization

- External AND Internal cueing is used
- Focus on quality and respiration
DNS Treatment Strategy

- Integration of ideal patterns into daily activities, work, recreation, and sport
Ipsilateral: the “supporting” upper and lower extremities are found on the same side, and the “moving” upper and lower extremities are also found on the same side (e.g. rolling)

Contralateral: the “supporting” upper and lower extremities are found on opposite sides (e.g. crawling)

Fixed Point (Punctum Fixum): place where muscle pulls towards

Mobile Point (Punctum Mobile): insertional movement portion of the muscle
  - The fixed and mobile points of muscles can switch as the function switches

Joint Centration: position that has the greatest interosseous contact to all for optimal load transfer across the joint and kinetic chain
DNS Tests

- Diaphragm Test
  - With pt in seated position, Dr stands behind the pt and places a contact into the lateral intercostal spaces of the lower ribs
    - Assessment of position and movement during respiration
  - Ideal Activation
    - Lower rib cage expands laterally and symmetrically
    - Widening of the intercostal spaces
  - Non-Ideal Activation
    - Cranial movement of the rib cage
    - Insufficient widening of the cage and intercostal spaces
Diaphragm Test
DNS Tests

- Trunk and Head Flexion Test
  - With pt resting in supine, pt is instructed to “look down toward their feet”
  - Dr observes the general pattern (neck, clavicles, umbilicus, rib cage)

- Ideal Stereotype
  - Entire abdominal wall is activated
  - Stability of clavicle (No “lifting”)
  - Chest is maintained in caudal position

- Faulty Stereotype
  - Overactivity of RA
  - Cranially-directed movement of chest and clavicles
Trunk and Neck Flexion Test
DNS Exercise Position Principles

- DNS uses the postures and transitional patterns associated with normal development as a guide to basic, therapeutic exercise prescription.

- While a particular body region may be focused on, it is vital to understand that DNS utilizes “whole body” exercises...where attention is paid to all aspects of the movement pattern.

- If you cannot breathe well in the position, you cannot perform the exercise.
Prone 3 Months

- The first true support of the C/S, upper T/S and Shoulder Girdle occurs at approximately 3 months old when the prone child raises his head and neck (against gravity), via facilitation through the upper extremities, in order to see more of the world around him/her.
3 months

PRONE
Primary Prone Position

- Posture:
  - Prone
  - Face down (Head and Neck elongated)
  - Arms flexed above shoulders, with elbows in-line with ears, and hands in-line with shoulder joints
  - L/S in relative neutral...NO hyperextension

- Support
  - B/L medial epicondyles of elbows
  - Pubic Symphysis

- Activity
  - Raise head straight up towards ceiling without extending C/S
  - Raising begins as low as T4
Primary Prone Position

- Activity (cont.)
  - After ideal positioning is attained, the Doctor stands at the side of the patient facing cephalad
  - Doctor places both hands around the patient’s waist, with slight pressure pushing in to their lateral abdominal wall
  - Doctor instructs patient to brace out, effectively causing a slight abdominal wall mm contraction that the Doctor can feel
    - “I have pushed in, can you use your belly muscles to push my hands back out”
    - REMEMBER, we are looking for a slight (10% of max contraction) abdominal wall mm contraction...NOT a filling or “ballooning” of the belly with air
  - Once proper brace is established, pt is then instructed to raise the head
  - While the head is raised, pt is instructed to pay attention to maintaining abdominal brace and normal breathing into belly...should feel relatively effortless to maintain head position against gravity
Primary Prone Position

- Subtleties and Clinical Experience
  - Monitor for overactivation of Pecs (palpate)
  - The spine should *elongate*, not accentuate, the T/S kyphosis
  - You should observe NO skin folds or “crease” in the back of the neck
  - Correct for L/S hyperextension and paraspinal hyperactivity
    - Re-positioning and bracing
  - Patient ought to be consciously aware of breath and abdominal wall activation
  - Head ought to feel relatively light and mobile
Corrections/Instructions

- Place a flat object (towel, pillow, etc) underneath the patient's abdomen/pubis to relieve L/S hyperextension
- Use varying levels of shoulder flexion and abduction
- Instruct patient to "pull" themselves forward through their elbows
  - Place hands around the patient’s waist and attempt to pull them backward while they resist
- Instruct patient to rotate their heads left and right
  - Pure rotation with NO chin jutting
Stabilization of the L/S and Pelvis in the sagittal plane is completed at 4.5 months old when the infant, lying supine, is able to lift their pelvis off the floor to touch their knees.

This is accomplished due to facilitation of core musculature including the diaphragm and abdominal wall musculature...development of controlled belly breathing.
4 months
SUPINE
Supine 4.5 Months

- **Initial Posture**
  - Supine
  - C/S in neutral with arms resting at sides
  - Shoulders wide
  - Hips and knees flexed to 90°, with legs resting on surface (chair, ball, etc)
Supine 4.5 Months

- Support
  - T/L Junction
  - B/L Scapular Spine

- Activity
  - Raise legs off of surface (>90° at knee)
  - Hips remain flexed at 90° (or less) with slight abduction and external rotation
  - Feet in neutral (NO plantarflexion)
  - Breath into abdomen
Activity (cont.)

- After ideal positioning is attained and pt has been educated on proper support, Dr stands at the head of the table facing caudal.

- Dr informs pt that they will be placing their hands on the pt’s lower ribs, and during normal breathing, Dr will actively push and “lower” the pt’s ribcage during exhalation to the more ideal “expiratory” position…that “new” position will be maintained by the Dr.

- Dr will allow the patient to breathe in this new posture…educating the pt about how they now “feel” contact between their T/L junction and L/S with the ground, how it is now easier to “feel” their breath into their lower (below the umbilicus) abdominal wall, and how this position applies a natural elongation and traction to the L/S.
Supine 4.5 Months

Activity (cont.)

- Dr informs pt that they will be removing their hand contact on the pt’s ribcage, and pt must utilize their abdominal wall mm (via bracing) to maintain this new, “expiratory” position of the thoracic cage.

- Dr slowly removes his hands while pt initiates brace and maintains ideal position while breathing “low” into their abdomen.

- Pt is instructed to breath into all aspects of their abdominal wall (lower quadrants, laterally, etc).

- Pt is instructed to maintain positioning and controlled belly breathing, then raise one of their lower extremities off the surface (exercise ball).
  - Maintenance of ideal positioning and breath during activity is VITAL.

- Pt is instructed to raise both lower extremities off the surface.
Primary Supine Position

- **Subtleties and Clinical Experience**
  - Educate pt regarding support points so that they know where they ought to feel the most contact with the ground
  - Maintain C/S in elongated position (no extension or chin jutting)
    - Use towel underneath the occiput if necessary
  - Shoulders are “wide”, NOT retracted…we NEVER instruct pt’s to “squeeze shoulders down and back”
  - Make sure that hips remain slightly abducted and externally rotated…we do NOT want them perfectly straight (or internally rotated)
  - You can “play with” or alter the amount of hip flexion so that patients can feel T/L junction support and core mm facilitation more easily
A Note on Breathing...

- 3-Dimensional Breathing
  - A controlled breath that primarily begins in the abdomen, via facilitation of the diaphragm, and extends into the thoracic cage
    - Expansion should NOT only occur in the abdomen, but also the thoracic cage
    - Allows for natural mobility of the thoracic cage (decreases stiffness and rigidity)
  - Expansion of the abdominal wall and thoracic cage should occur in all directions and in all quadrants
    - Front to back
    - Side to side
  - A very mild bracing of the abdominal wall musculature during inhalation and expansion helps to maintain the necessary intra-abdominal pressure that is vital for ideal stabilization and control of the L/S, Pelvis, and Thoracic Cage
Final Takeaways

- DNS is NOT just a technique, but a principled approach to rehabilitation based on the tenets of Developmental Kinesiology.

- In addition to what was described here, DNS also offers their own approach to manual therapy and body awareness training.

- The DNS approach is useful for all ages...infants to geriatrics.
Further Information

- DNS Textbook: *Clinical Rehabilitation*, Pavel Kolor
- DNS Website: www.rehabps.com
- Textbooks on Developmental Kinesiology
  - *Infant Motor Development*, Jan Piek
  - *Motor Skills Acquisition In The First Year: An Illustrated Guide To Normal Development*, Lois Bly

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