EFFECT OF DYNAMIC CORE INTERVENTION ON POSTURE AND FUNCTION IN A CHILD WITH CEREBRAL PALSY: A CASE REPORT

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Background

Core Stability: the ability to control the position and motion of the trunk over the pelvis to allow optimum production of force and motion of the terminal segment[1]

- Inner core muscles: respiratory diaphragm (RD), transversus abdominis (TA), pelvic floor (PF), deep fibres of multifidus (DM). These muscles have been shown to activate prior to movement, creating anticipatory lumbar and pelvic stability [2-4]
- Outer core muscles: internal oblique (IO), external oblique (EO), rectus abdominis (RA), erector spinae (ES), gluteal muscles (GM), adductors (ADD) and latissimus dorsi (LATS)[4,5]
- Coordinated effort of inner and outer core components seems to be required to provide "central stability for distal mobility"[4]
- Core function research in **adults**:

Reduced capacity of core muscles to participate in proximal stabilization may contribute to low back pain[6,7] and knee injuries [8]

- Core function research with **children:**

Altered timing - postural muscle activity, as measured by EMG, found to be related to upper extremity goal-directed movement in 32 children with developmental coordination disorder (DCD) 8 - 10 years old[9]

Altered activity - EMG showed later onset and decreased frequency of activity in postural muscles during gross motor activities in 9 boys with DCD[10]

Intervention - group exercise program of combined traditional static core stability and fitness exercise for 3 children with DCD 9 - 11 years old produced improvement in variety of outcomes[11]

- To date no core intervention study conducted with children with CP
- Dynamic Core intervention was developed:

As an alternate core methodology for children with motor, sensory and cognitive challenges who cannot participate in traditional core exercise

To facilitate the relationship between the diaphragm and pelvic floor through the use of breath[2] in precise alignment [12] as the access point of the inner core in children

To promote the recruitment order of inner core components prior to outer core components as reported in the adult literature

Purpose

To describe effect of Dynamic Core intervention on posture and function in a child with CP

Client

- 12-year old boy with right spastic hemiparesis
- Attending school in both regular grade 6 and special needs classrooms
- Decreased attention span
- Difficulties with abstract concept development and information processing speed
- Mild visual accuity difficulties corrected with glasses

Evaluation

- Upper chest breathing pattern, breath holding noted on transitional movements and challenging tasks
- Sitting: moderate posterior tilt of pelvis, lumbar and thoracic flexion, forward head posture and elevated eye gaze, sitting tolerance of 10 minutes
- Sit-to-stand: with exertion, requiring upper extremity support
- Standing: anterior pelvic tilt, lumbar extension, thoracic flexion, forward head posture, R posterior trunk rotation and pelvic retraction, increased weightbearing on L side
- Static standing: approx. 3 seconds, then take a step due to lack of stabilty
- Gait: decreased R stance phase, frequent falls
- Recreation: adapted bicycle, skating, hockey, swimming

Intervention

Frequency: Two blocks of 8-week intervention, 3 weeks apart, including a home program

Adjunct to treatment: Bilateral serial casting during first block of treatment resulted in no significant change in range of motion

Dynamic Core Approach

Supine:

- Training of lateral breathing pattern
- Linking inner core activation through diaphragm recruitment ("blow before you go") with outer core muscle activation: Posterior Oblique postural synergist (POS) & Anterior Oblique postural synergist (AOS)[5]

Sitting:

- Training of lateral breathing pattern
- Introduction of wedge to promote neutral alignment
- Continued linking of inner core activation with POS and AOS
- POS and AOS exercises with ball between knees to facilitate ADD overflow to PF
- POS and AOS with hips at 80, 60 and 30 degrees of flexion

Standing:

- Training of lateral breathing pattern
- Awareness of rib cage over pelvis alignment
- "Blow before you go" prior to all transitional movements
- POS and AOS in standing

Sit-to-stand:

- Maintenance of neutral alignment of rib cage and pelvis
- POS in partial sit-to-stand transition paired with "blow before you go"

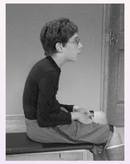
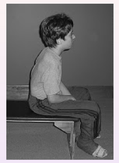
Gait:

- Maintenance of rib cage over pelvis during gait: "blow before you go" before each swing phase of gait and pushing UEs against therapist
- Awareness of neutral rib cage over pelvis in stride standing

Goals

1. Sitting posture: sit in neutral rib cage and pelvic alignment for 20 minutes with wedge
2. Sit-to-stand: transition without use of UEs
3. Standing posture: improved rib cage and pelvic alignment
4. Standing balance: stand still for approximately 60 seconds
5. Gait: decreased incidence of falls when playing

Outcomes

Discussion

- First study to implement Dynamic Core intervention in a child with CP
- Order of recruitment, inner to outer core, reported in adult literature was found to be successful in a child with spastic hemiparesis
- Utilizing breath in precise alignment to activate inner core components and then linking them to outer core components supported improved alignment and functional balance
- Intervention focused on core stability successfully achieved client/family-centered functional goals
- Limitations: outcomes are based on clinical observations
- Objective outcome measures of core stability in children remain to be developed
- Dynamic Core intervention warrants further research with children of varied age groups and diagnoses

Conclusion

Dynamic Core intervention improved posture and functional balance in a 12-year old child with moderate spastic hemiparesis

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