Teaching Movement for Communication

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CPEC Philosophy

• All children can learn
• Learning needs to be active and children with CP, no matter how severe the disability, can and should be active
• Cerebral palsy and like disabilities are primarily disorders of movement
• Multiplicity of skills in all activity – holistic learning
• Look at the long term view of a young child with cerebral palsy and that it is possible that children can learn to develop function into adulthood
• Skills learned are for life - not just now
• Belief in the child as an individual who can contribute
• Open expectations
Expressive communication requires movement
Communication is complex

- Sensory
- Motor

- Cognitive
- Pragmatic
  - Social emotional
  - Functional uses
  - Conversation skills
- Language
  - Semantics (word meanings)
  - Syntax (grammar)

- Understanding & Expression

All these skills are integrated together for communication
Movements for speech

• **Airflow** - Muscles of respiration

• **Voice** - Larynx (vocal cords)

• **Resonance** - Soft palate

• **Articulation** - Jaw, tongue, lips/cheeks, palate
Clear, connected speech requires sufficient:

- Speed, range, accuracy, strength, grading, coordination and rhythm of movement of the muscles for respiration, vocalisation, intonation and articulation.

**Single sound**

- **Syllable**
- **Word**
- **Sentence**

- Fine movements from a stable base
The mouth is connected to the rest of the body

• Anatomical relationships

• Posture & movement
  – Key issues for participation and learning

Problem at the lips,

look at the hips

and the feet, trunk, shoulders, arms, hands, neck, head, jaw....
Sensory motor challenges

• Movement challenges
  – Producing body movements, facial expressions, gesture, speech
  – Timing and sequencing movements to “demonstrate intentionality”

• Sensory processing challenges
  – May lead to “different” behaviors, e.g. sensory seeking, repetitive behaviors, reduced eye-hand coordination
  – Challenges with motor planning (praxis)

• Vision challenges
  – Reduced use of eye-gaze
  – Affecting cues to take a turn, “missing” the visual cues or slower take-up

• Auditory processing challenges
Different, not just delayed, development

- Early communication / gestural movements may be absent, inconsistent or difficult to observe as intentional

- Vocalization and speech sound production limited by significant oral sensory-motor challenges

- Variability of movement based on position, fatigue, emotional state, health, sensory input, etc

- Atypical movements may be misinterpreted
Children with CCN have different, not just delayed, development

- Difficulty **spontaneously developing** and using typical gestural and spoken communication
- We have to actively intervene to provide access to modes of communication they may be able to learn in order to determine potential
- Need to be taught / learn different movements for communication
Spontaneous development of healthy movements is unlikely

- Never seen those movements used to communicate

- Movements require practice to learn

- Need structured opportunities to learn
  - motor control
  - to generalize / problem-solve how to use these skills to communicate with others in a variety of functional
    - Positions
    - Activities
    - Settings
Developing movements for communication

- Understand the individual’s movement patterns
- Provide meaningful feedback to possibly communicative, spontaneous movements (behaviours)
- Develop underlying capabilities for posture and motor control
- Model communication behaviors / AAC modes the child may be able to learn during genuine interactions
- Teach specific movements for communication
- Accommodate for current sensory, postural and movement challenges
- Capitalize on opportunities for the child to communicate
AAC movements

- Facial expression
- Whole body movements
- Actions in environment (mobility)
- Pointing, eye-pointing
- Sign / gesture
- Access to aided system
  - non-electronic, electronic
The cerebral palsy entities

Current diagnoses at CPEC 2018:
- Hypoxic Ischaemic Event
- Biotin and thiamine-responsive basal ganglia disease
- Microencephaly
- Primary Dystonia
- Alpha Mannosidosis
- Propionic Acidemia
- Polymicrogyria
- Congenital Cytomegalovirus (CMV)
- encephalopathy
- CP secondary to Posterior Quadrantic Dysplasia
- Periventricular Leukomalacia (PVL)
- Acquired Brain Injury
- Leukodystrophy
- Pelizaeus Merzbacher Disease
...and like disabilities – the syndromes

Current syndromes at CPEC 2018:
- Rett Syndrome
- Cri du Chat syndrome
- Aicardi-Goutieres Syndrome
- Pitt-Hopkins Syndrome
- Bainbridge- Roper Syndrome
- Prader-Willi Syndrome
- Joubert's Syndrome
Motor challenges

• Cerebral palsy – brain injury or abnormality resulting in posture, movement and participation challenges
• Type and severity of movement challenges related to the location and extent of the brain injury or abnormality
• GMFCS – Gross Motor Function Classification System 1-5
• MACS – Manual Ability Classification System 1-5
• For students who have more significant impairment i.e. MACS 4 – 5, when the person makes a voluntary movement, can be misleading/confusing/very different from what the child intended, and can lead to assumptions about cognition
Students with cerebral palsy

Frequently use atypical motor movements to function:

• May lean forward with whole body to reach forward
• May use the same movement pattern for a whole range of functions
• Different yes and no responses
• Facial expression can be affected
• May use a smile as an affirmative response which is a challenge
Key Movement Issues for students with cerebral palsy

• KMIs are movement skills that develop spontaneously in typical development
• Underlie ALL functional movement
Stability

• Quality, sustainable movement comes from a stable base
• Need a stable base from which to move
• If not stable, compromises all areas of development and learning movement for
  • Mobility
  • Hand and fine motor skills
  • Communication
  • Daily life skills
Key motor issues that affect stability and function

- Set patterns of movement including reflexes
- Associated movements in the rest of the body when attempting to move – lack of selective movement
- Low tone throughout trunk
- One side of the body more affected than the other - asymmetry
- Unsustained and unaligned weightbearing
- Challenges with weightshift
- Fatigue
- Sensory processing challenges
  - Less stable, weaker core from which to move
  - Affects head control and head movements
  - Arm and hand movements
  - Fine motor – index finger for pointing
Long term implications of using limiting patterns
Set Patterns of Movement

- flexor (bent) patterns
- extensor (straight) patterns
- reflex activity
  - ATNR
  - STNR
  - Grasp
How do set patterns of movement affect communication?

- Set patterns of movement affect the movements available for all communication.

- May be confusing
  - Where are they intending to move?

- Only have reflexes, misinterpreted as cognitive impairment
  - “pre-intentional reflexive”
Associated reactions

When the person initiates a voluntary movement eg. to speak or reach out, involuntary movements can be observed in the:

- Trunk
- Legs
- Arms
- Neck
- Face
- Mouth, tongue

(Set patterns of movements, mirroring)
How do associated reactions affect movements for communication?

• Movement produced can be very different to what the child intended
• Misleading movements where there is extra associated movements or no easily observed or recognizable movement – leads to assumptions about cognition and the ability to learn to communicate
• Difficulty isolating one or two movements that child can use to communicate
• Intelligibility is significantly affected
• With fatigue when whole body is “switched on” and lack of success in attempts to communicate, child can shut down
What is asymmetry?

- One side of the body is nearly always affected more than the other side resulting in asymmetry

- Asymmetrical Tonic Neck Reflex (ATNR)
  - Overuse of less affected parts of the body
  - Hip dislocation
  - Scoliosis
  - Surgery
How does asymmetry affect movements for communication?

• ATNR and/or increased tone on one side of the body:
  • obligatory head turning to one side affects teaching head movements for Yes/No and switching
  • Compromises child’s ability to stabilise themselves with one arm and hand and use the other for gesture/direct access
  • impacts signing which requires bilateral arm and hand use
Weightbearing

Weightbearing is through many parts of the body

• Head through spine to hips
• Hips to knees to feet
• Shoulders through elbows, wrists and hands

Key to effective weight-bearing: ALIGNMENT

Activity: sit while not weightbearing through feet, lift arms off surface
Why is weightbearing important?

- Builds strength especially around joints
- Elongates muscles which are in shortened positions
- For the upper limbs, weightbearing through straight arms and open hands prepares the hands for fine motor skills
- Lower limbs: healthy development of the hip joints, promotes feet flat for effective standing
How does lack of weightbearing affect movements for communication?

• Less stable, weaker base/core from which to move
  – affects head control and head movements
  – arm and hand movements
• Impacts development of fine motor skills – index finger for pointing/direct access
Weightshift

• The ability to shift body weight and maintain or hold the weightshift in that position is essential to enable a person to maintain posture and move eg: take a step, use a hand tool

• Weightshift to each side, forward, back, diagonally, around a joint

• Components of weight-shift: Initiate, grade and maintain or hold

Activity: writing while weightbearing through writing hand
Challenges with weightshift

• If absent, child cannot move limbs effectively to step, use one hand in isolation
• If cannot hold or maintain weightshift, as movement is initiated with one arm or leg, the body weight moves back onto the moving limb and impairs function
Key motor issues: weightshift

• Challenges achieving and maintaining weightshift through the arms and hands affects the use of the arm and hand to target
• Weightshift is essential for **long term** direct access to:
  • a communication book and/or
  • speech generating device
  • Hand switches and foot switches to access technology for play and communication
Key issue: Sensory processing

• Students with cerebral palsy can also have sensory processing challenges
• Poor feedback through tactile, proprioceptive and vestibular systems
• Affects student’s ability to plan and execute movements required for functional skills and gestural language – motor planning
Sensory processing impact on motor movements

• Movement is different. The cues we typically look for aren’t there

• Interpreting movement of children with physical disabilities and sensory processing challenges can be difficult

• As all communication (gesture, light tech, high tech) relies on motor movements, children with sensory processing challenges will have different communication/learning pathways
Challenges to communication

Planning, organising and coordinating movements may be inconsistent or difficult to observe as intentional. Such as:

• Facial expression
• Visual avoidance (esp. auditory processing difficulties)
• Reaction to body contact (hugs, etc)
• Reach to get – reach to point
  – texture of objects, sensory seeking interferes
• Co-ordination of looking and reaching (pointing)
• Actions on the environment - motor planning, sensory seeking
• Gestural communication
• Speech – afferent (kinesthetic) dyspraxia / apraxia

• Early communication / gestural movements may be absent, inconsistent or difficult to observe as intentional.
Challenges to communication

• Vocalisation and speech sound production is often limited by significant oral sensory-motor challenges.

• Interpretation of the child’s communication is further complicated as they appear to have more movement available to them than they can effectively use for function.

• Partners distracted by sensory seeking behaviors
  – difficulty discriminating when child is actually communicating
An introduction to some strategies to address the key issues for graded arm and /or hand movements

• Stable positions that address the key movement issues from which to move – use of specialised equipment

• Daily routines where stable positions, active transitions and opportunities to move are embedded

• Teaching arm and hand movements to target/point

• Teaching head movements to scan
Graded Movements

Motor Planning

Practice

Stability

Experience

Weight Shift

Fatigue

Weight Bearing

Symmetry

Strength

Disassociation

Set Patterns of Movement

Muscle Tone

Gravity

Sensory Processing

Long term implications of using limiting patterns
Key features to consider when selecting equipment

- Safe and practical
- Enables person to be active
- Assists in addressing Key motor issues for participation
- Addresses integrity of body structure
- Facilitates social interaction
- Assists with independence
- Facilitates access to the daily routine, play, kinder and school activities, work activities and recreation
Equipment **should** enable a way to...

- It is not an end in itself
  - participate
  - engage with others and the environment
  - do things that children want to do

... so the person needs to make the connection, to learn
Introducing equipment

- What is the purpose of the equipment from the child’s perspective?
  - How does it help me do things I want to do

- Helping parents and children understand the enabling purpose of equipment
  - Not just stuff I have to do
  - Not just something else to fit into the day
  - Not something I have to make my child do
  - Not restraint
  - Looks different – look more different without it!
  - Expectations (implied messages)

- Have to help the child learn to use it
  - Unable to use previous limiting patterns
  - Planned process to learn how to use it
Seating

• Stable
• Knees bent at 90’
• Hips at 90’ or less
• Thighs supported
• Symmetrical:
  • Trunk upright and symmetrical (weight bearing evenly on both hips)
  • Head, neck and spine in straight anatomical alignment
• Feet flat and supported- never dangling
• Critical point of control – the hips.
   Hip supports at 45’ angle through joint and NOT over top of thighs or from back of seat as these will allow child to slide forward.
<table>
<thead>
<tr>
<th>Part</th>
<th>Support Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hips</td>
<td>non-slip mat, lateral hip supports, hip strap sitting astride</td>
</tr>
<tr>
<td>Feet</td>
<td>footplates, footblock, non-slip mat, ankle weights, foot guides</td>
</tr>
<tr>
<td>Chest</td>
<td>cut-out table, side supports</td>
</tr>
<tr>
<td>Shoulders</td>
<td>shoulder supports</td>
</tr>
<tr>
<td>Arms and hands</td>
<td>stabilizing bars - horizontal/upright</td>
</tr>
<tr>
<td>Head</td>
<td>lateral head supports, neck (occipital) support</td>
</tr>
</tbody>
</table>
Seating
Table/tray

- Provides more stability
- Table height is crucial
- Cutout provides more stability for forearms
- Slanted clip board can provide a stable work surface as well as stabilising paper, books, worksheets
Other equipment to provide stability and symmetry

• Arm wraps/lycra arm sleeves
• Dynamic lycra postural splinting

Needs to be supported by quality positioning in well selected equipment for functional purpose
Direct access: target with one hand

• The key is a stable, upright position which addresses the key movement issues for participation: that is, the student is:
  - symmetrical
  - weightbearing in alignment through hips (upright position) and feet, forearms resting on the table
  - able to weightshift to one arm and hand

• Consider the function of the shoulder and elbow
The shoulder

- Directs and positions the arm in space – forward, to the side, across the body, behind, above, in front...
- **Reaches with accuracy**
- Can be strong and muscles contract around the joint to stabilise...
- Weight bear and strengthens in crawling, pull up to stand, push and pull
- Stabilises the arm so that the hand can target and manipulate
The elbow

- Lengthens or reduces the length of the arm

- Positions the hand close to or away from the body – in space or on a surface e.g. communication book
The forearm and wrist

• Orients the hand to the object/target

• Stabilises the hand
In combination, the shoulder, arm, wrist and hand...

• Reach accurately to point or target
The shoulder is a key in communication which requires sign or direct access.

Shoulder strength and control is a key to:

• Any gesture away from the body e.g. Pointing, waving, many keyword signs
• Direct access to communication book, speech generating devices
Direct access/indirect access? – that is the question
Key hands-on strategies

• Weight-bearing through straight arms and open hands

• Weight-bearing through flat feet

• Weight-shifting in all positions
Key hands-on strategies

• Active reach in all directions

• Active reach forward from shoulder, straight elbow, with open/closed hand, index finger point

• A range of targets

• Isolating the index finger to point
Facilitating the arm to reach out

Variable pressure and guiding the extensor surface of the arm

Facilitating reach and elbow extension
Facilitating finger point

• Deep pressure to finger
• Finger splint
• Coloured bandaid on pointer finger
• Note that sensory input needs to be to the isolated finger, not to the back of the hand or the other fingers, i.e. don’t hold the hand closed
• May stabilise the wrist and support other fingers to maintain position from under the hand for some children with spasticity / athetosis

(no hands on moving limb when communicating!!)
Sensory input to the isolated finger
May stabilise the wrist and support other fingers to maintain position from under the hand for some children with spasticity / athetosis.
The decision: direct access or indirect access??
Manual Ability Classification System (MACS): consult the child’s occupational therapist

What do you need to know to use MACS?

The child’s ability to handle objects in important daily activities, for example during play and leisure, eating and dressing.

In which situation is the child independent and to what extent do they need support and adaptation?

I. Handles objects easily and successfully. At most, limitations in the ease of performing manual tasks requiring speed and accuracy. However, any limitations in manual abilities do not restrict independence in daily activities.

II. Handles most objects but with somewhat reduced quality and/or speed of achievement. Certain activities may be avoided or be achieved with some difficulty; alternative ways of performance might be used but manual abilities do not usually restrict independence in daily activities.

III. Handles objects with difficulty; needs help to prepare and/or modify activities. The performance is slow and achieved with limited success regarding quality and quantity. Activities are performed independently if they have been set up or adapted.

IV. Handles a limited selection of easily managed objects in adapted situations. Performs parts of activities with effort and with limited success. Requires continuous support and assistance and/or adapted equipment, for even partial achievement of the activity.

V. Does not handle objects and has severely limited ability to perform even simple actions. Requires total assistance.

Distinctions between Levels I and II

Children in Level I may have limitations in handling very small, heavy or fragile objects which demand detailed fine motor control, or efficient coordination between hands. Limitations may also involve performance in new and unfamiliar situations. Children in Level II perform almost the same activities as children in Level I but the quality of performance is decreased, or the performance is slower. Functional differences between hands can limit effectiveness of performance. Children in Level II commonly try to simplify handling of objects, for example by using a surface for support instead of handling objects with both hands.

Distinctions between Levels II and III

Children in Level II handle most objects, although slowly or with reduced quality of performance. Children in Level III commonly need help to prepare the activity and/or require adjustments to be made to the environment since their ability to reach or handle objects is limited. They cannot perform certain activities and their degree of independence is related to the supportiveness of the environmental context.

Distinctions between Levels III and IV

Children in Level III can perform selected activities if the situation is prearranged and if they get supervision and plenty of time. Children in Level IV need continuous help during the activity and can at best participate meaningfully in only parts of an activity.

Distinctions between Levels IV and V

Children in Level IV perform part of an activity, however, they need help continuously. Children in Level V might at best participate with a simple movement in special situations, e.g. by pushing a button or occasionally hold undemanding objects.
MACS 1-3

- **MACS 1:** Handles objects easily and successfully: at most, limitations in the ease of performing manual tasks requiring speed and accuracy, able to target

- **MACS 2:** Handles most objects but with somewhat reduced quality and/or speed of achievement. Can usually target within a 2cm square area but may not use isolated index finger to target.

- **MACS 3:** Handles objects with difficulty; needs help to prepare and/or modify activities. Cannot perform certain activities and the degree of independence is related to the supportiveness of the environment context. Targetting is inaccurate and will use whole hand or fist. Requires larger, more spaced out targets eg. 4cm targets with gaps between
MACS 4 and 5

MACS 4: Handles a limited selection of easily managed objects in adapted situations: The child may have practised and learnt how to target with a large arm movement, open or closed whole hand. Child may require alternative way of responding that is not using their hands

- May use head movements for Yes and No
- Eyegaze
- Switching using head movements for electronic device

MACS 5: Does not handle objects and has severely limited ability to perform even simple actions: Child will require alternative way of responding that is not using their hands

- May use head movements for Yes and No to scan through communication book
- May use alternative Accept/reject eg. eye movements
- Eyegaze
- Switching using head movements for electronic device
Key Movement Issues
Partner-assisted scanning using head/nod shake
Facilitations for head movements

• Stable, symmetrical start position
  – (equipment, hands on as required)
• Sensory preparation
  – E.g. massage/tapping to the head and shoulders to feel head in space
• Visual target?
• Hands on facilitations
  • Neck movements from a stable base
  • Position and stabilise the shoulders
  • To facilitate head down/chin tuck for child who extends back, apply firm pressure to the sternum
• Interpersonal facilitations
Opportunities to practice head movements outside of communicative contexts

- Important to practice movements when not trying to answer a question
  - Can use specific facilitations and provide specific feedback as it is agreed what movement is being attempted

- Younger children: songs, rhymes
- Older individuals can often just agree to practice
Case studies

• Lily
• Owen