Understanding Motor Planning Deficits in Young Children with Autism Spectrum Disorder

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What is motor planning?

• Motor actions are planned in advance of the intended goal.
  • Gripping a spoon and avoiding an awkward hand position
  • Climbing in and out of a car seat
  • Putting on a jacket
For Example

- Audience participation
- Watch us
- Break into pairs & try it!
- Full group reflection
Typical motor learning & planning

• The first time we learn something new it takes conscious thought. With practice, we integrate the sensory and motor information needed for success. The movement becomes automatic.

• Examples of complex actions:
  - Learning to ski
  - Step aerobics
  - Driving a car
  - Climbing stairs (uneven steps)
  - Writing
What’s typical?

- Inner drive to move, explore, try new things.
- Master each challenge and feel successful.
- Success gives confidence to try increasingly more difficult motor challenges.
• The more a child practices a motor skill, the better it becomes.

• Motor planning develops by solving *challenges* with the body: climbing into a car seat, going down a slide, walking up stairs.

• Success with motor planning challenges leads to gaining more skills. Climbing a jungle gym progresses to climbing a tree.

• When skills do not develop naturally, a child may avoid movement activities.
Children with Autism Spectrum Disorder

• Children with ASD have been found to have deficits and delays in:
  • Gross and Fine motor skills
  • Adaptive or daily living skills – eating, dressing, bathing
  • Balance and coordination
  • Postural control
  • Motor control – force, direction, timing of movement
  • Motor Imitation
  • Motor Planning
Motor Planning Deficits in Children with ASD

• Has trouble figuring out how to use a spoon
  • Can’t get the spoon to the mouth without spilling
  • Holds object so tightly that it is difficult to use
  • Holds object so loosely that it is difficulty to use

• Has trouble learning to dress himself
  • Learning how to don a jacket has to be the same each time

• Has trouble climbing in and out of the car seat
  • Difficulty seating self on the seat – turning / over shooting
  • After repeated practice can seat self
Motor Planning Deficits
Forti et al 2011

• Preschoolers with ASD with typical cognition compared to age matched peers – placement FM task
  • Deficits in velocity changes
  • Deficits in moving directly to target (spatial control)
Motor Planning deficits
Ecker and Parham 2010

• Shows poor coordination and appears to be clumsy
• Has trouble grading movement – either using too much force or too little force to complete an action
• Tends to play the same activities over and over rather than shift to new activities
• Has trouble coming up with new ideas during play
Motor Planning Deficits
Ecker and Parham 2010

• Has trouble figuring out how to carry multiple objects at the same time
• Seems confused about how to put away materials/toys in their correct places – and when learned – will do it the same way every time
• Becomes confused about the sequence of actions
• Fails to complete tasks with multiple steps
• Has difficulty imitating demonstrated actions, such as movement to songs or games with motions
• https://www.youtube.com/watch?v=SH0VlYNluHw
• Sarinana, J. Photography and the Feelings of Others: From Mirroring Emotions to the Theory of Mind
Mirror Neuron

• A **mirror neuron** is a neuron that fires both when an animal acts and when the animal observes the same action performed by another. (Wikipedia)

• This system is thought to be compromised in children with ASD as measured with EEG, fMRI.

• Other long connection systems throughout the brain have been implicated in ASD as well including trans-cerebellar pathways and those through the corpus callosum
The areas lit up in white in the picture above indicate the location of mirror neurons. It is anchored in the Superior Temporal Sulcus (STS), Inferior Parietal Lobule (IPL) and Premotor Area (PA).
Nova Science NOW: 1 Mirror Neurons

https://www.youtube.com/watch?v=Xmx1qPyo8Ks
https://youtu.be/H6Tabh2Z5P1
Classroom Supports for Children with ASD

https://www.youtube.com/watch?v=SH0VIYNlHuHw
Impact Continued...
What do you see in the Classroom?

• Inconsistency
• See skills spontaneously but not on command
• Trial and error approach
• Difficulty imitating
• Needs extra/excessive practice to gain skills
• Has to *think* about how to move
• Have to look to see how they’re moving
• May talk themselves through task
What do you see in the Classroom?

- Too much or too little force
- Trips or falls when walking or running – long after peers have become more stable
- Frequently bump into objects and people accidentally
- Have difficulty learning to go up and down stairs, and may be frightened
- Difficulty printing or writing
- Poor articulation
- Difficulty eating and forming speech sounds
How does it feel?

Imagine if...

- You could see obstacles in your way, but you could not make your body move to avoid them.

- You felt like you were sitting on a block of ice, could no longer sense where you were sitting, and fell off of your chair repeatedly.

- You tried to drink a cup of water from a paper cup, only you couldn't tell how hard to squeeze it to hold onto it. You squeezed it too hard and the water spilled all over you. The next time you didn't squeeze it hard enough and it fell right through your hands and onto the floor.
What do you see in the Classroom?

• Crave the familiar and stick to routines
• Low self esteem
• Shut down or avoidance
• Verbal strategies to avoid or distract
Trouble can show up at any or all stages of praxis:

• Coming up with an idea of what to do (repetitive play, restricted play)
• Planning and organizing what the body needs to do
• How to sequence and execute movements
• Remembering results of past experiences
• Impacts all areas of development
• Motor planning becomes a conscious act, not automatic, everything is frustrating!
Motor Planning and Learning

• Ever hear a parent say: My child has selective hearing? Or he does things when he wants to? She is just being stubborn—I have seen her do it before?

• Children diagnosed with ASD may seem to ignore directions given to them, but they are most likely not doing the requested activity because it is QUITE DIFFICULT for them. They have trouble getting the message from their brains to their bodies to perform the requested activity.
Motor Planning and Learning

• Having the cognitive skills vs. being able to demonstrate it
• For example, doing a math problem in class
• Getting out your pen and paper
• Finding the problem on the board
• Attending to the teacher’s voice
• Locating where to write your answer on the paper
• Remembering all the numbers
• Working through the problem to get the answer
How to support Learning

• To teach motor planning the child may need 1:1 attention
• Teaching a child with these difficulties may require a lot of patience
• Teaching social skills may include motor awareness.
• Consider how gymnastics, karate, or swimming can give a child practice learning new motor activities, but can also improve his ability to organize, complete academic activities, and even socialize with other children.
Learning Through Play

Think about the skills you need to play cars with a peer....

• Orchestrate your body to sit down
• Ability to establish eye contact
• Ability to understand the social exchange
• Imitate gross motor movements
• Appropriately manipulate toys
School based Play and Recess activities

• For school aged children social communication can often be practiced during school yard activities. These activities usually require proficient motor skills to be successful (Berkley, Zittel, et al., 2001)

• Motor skill deficits are common in school ages children with ASD and may affect opportunities to practice social communication.
Being SOCIAL THROUGH PLAY

• So if a child cannot keep up the other kids due to motor planning deficits; moving through the crowds of kids and play equipment at recess... they may experience:
  • Difficulties with self-esteem
  • Demonstrate behavioral issues
  • Increased difficulties with socialization
  • Increased isolation and repetitive behaviors
Motor Planning and social interactions

To gain another attention you need to:
• Establish eye contact
• Follow simple directions
• Spontaneously request
To take turns.....
You need the same skills
Integrating motor skills and socialization

• So if a favorable environment is provided ASD difficulties such as peer relationships can be improved

• So teaching functional motor skills to children with ASD→optimal environment →practice social skills during physical play →Increased social success

• More research is needed in this area to develop programs that support both
A child who goes to school then comes home.....

- Possibly is frustrated from school
- Then again it is time to string together steps to get through your evening routine
- How many steps to brush your teeth???
- Go to the bathroom → get out your toothbrush → turn on the water → turn off the water → grab the toothpaste → squeeze it on → brush → spit → clean up (9 steps)
- And the night time routine is just beginning and who is there the whole way.....PARENTS
Effects on Parent child relationship

https://www.youtube.com/watch?v=3g5YbibjJ7Q
Developmental Perspective

• Small differences in early motor development are one of the essential factors that affect early social development of toddlers with ASD. (Bhat, et al. 2011)

• Motor skills and social impairment are still interrelated in older children with ASD.
Increasing understanding and support

One Mother’s Story:

• Mother was an amateur triathlete and business executive and had been inpatient with her daughter since birth.

• She believed her daughter could do more or better “if she just put her mind to it.”

• Her perspective and approach to challenges shifted as she began to understand her daughter’s abilities

• She began to understand that her daughter’s struggles were beyond her daughter’s control and her daughter deserved help. The mother’s annoyance shifted to supporting daughter’s efforts and nurturing her self-esteem.

• (Miller, Sensational Kids, 2006)

• Calling for support in the home
Impacts of motor planning on oral motor development and communication

https://www.youtube.com/watch?v=BuZMQiuu7nc
Oral Planning in ASD

- Poor oral-facial imitation
  - Children with ASD have significantly reduced oral-facial imitation. Rogers et al. (2003) said that “lack of social cooperation did not account for their poor performance” (p. 763).
Oral Planning in ASD

- Reduced oral movement and complex syllable production
- Increased oral scanning/groping
- Reduced ability to isolate oral movement from other movements

- Try These Three Times Fast:
  - “Toy boat”
  - “People pledging plenty of pennies”
  - “Pad kid poured curd, pulled cod”
Motor Planning Impact on Language

• Manual forms of communication (e.g., signs, gestures, exchange systems, etc.) may be more difficult

https://www.youtube.com/watch?v=izNjpkI3dJE
Motor Planning Impacts on Language

- Assessment of receptive language (e.g., pointing to pictures, showing what is known) may be impacted

https://www.youtube.com/watch?v=oA5bkoY2H7o
Motor Planning Building Language

• Verbal imitation deficits in ASD can impact language development

https://www.youtube.com/watch?v=vQ64R0KKssc
Where does Sensory fit in?

• To move efficiently and effortlessly, a child must be able to register, interpret and organize sensory input from his body. Problems can lead to motor planning difficulties.

• Motor planning is dependent upon unconscious body sensations.

• If a child does not receive accurate information from his senses, the result is abnormal motor output with abnormal feedback.
Need to look at what’s going on “inside the computer.” How is the child experiencing movement and gravity (input)? Effective processing is required for gaining higher level skills (motor planning).
Sensory Foundation
What do we see in children with ASD?

• Difficulty registering and/or processing sensory information. Impaired *multisensory integration*.

• They do not learn new motor skills in the same way as typically developing children.

• Often *need support* and additional practice when learning a new skill.
Activities to Work on Improving Motor Planning Skills

Activity Ideas

https://www.youtube.com/watch?v=JSbD9vwVJoQ
General treatment strategies

- Hand-over-hand assistance (or hand-under-hand)
- Forward and Backward Chaining
- Break down multi-step tasks
- Use pictures or video to help sequence through a multi-step task
- Slow down
- Use simple language
- Wait time
General treatment strategies

• Visual cues – shapes taped to floor, lines to walk
• Let other children go first and model
• Practice in context – practice in empty classroom, playground
• Generalize to new playground with same equipment
• Use music and rhythm
General treatment strategies

• Give specific feedback (beyond, “Good job!”)
• Repetition and extra opportunities to practice
• Talk through the steps and have child tell you what’s next (depending on language skills)
• Check off list (pictures)
• Motivation and meaning!
Accommodations

• Cut out table and chair
• Supportive seating
• Allow frequent position changes – stand, kneel, lie on tummy
• Keep classroom arrangement consistent
Back and forth folding, shape placement, threading pipe cleaner through holes. Craft assembly challenges a child’s ability to develop strategies for organizing as they relate parts to the whole.
Choose shapes, *make a plan.*
Arrange shapes & compare to model.
How to I maintain order?
• Try it out first!
• Beginning, middle, end rituals
• Consistent routine
• Spot markers
• Timer, flip lights or use music cues
• Have a related activity for those who finish early
Build it together to improve planning. Try barefoot, inside, outside.
Scarecrow Dress-up Group
Bibliography


Bibliography


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Bibliography


Websites

- http://idoinautismland.com/
- http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=7402644&fileId=S0140525X00081504
- http://www.joyfulbirthbaby.com/yoga-poster-for-kids/
- http://www.kidsyogastories.com/kids-yoga-poses/
- http://www.namastekid.com/learn/kids-yoga-poses/
- http://theinspiredtreehouse.com
- http://www.sensory-processing-disorder.com
- http://www.SPDFoundation.net
- http://yourtherapysource.com