Practical PT for Confident Kids:

Beyond the Basics for Balance, Strength, and Stability

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UNLV PHYSICAL THERAPY CARE-lab WHERE SCIENCE MEETS PRACTICE

Objectives for today:

- **UNIQUE PHYSIOLOGY:** Understand the unique physical, sensory, learning, and motor characteristics of people with Ds that impact movement and gross motor development
- BALANCE: Specifically discuss the sensory systems and muscle groups that coordinate together to improve balance
- **RESEARCH:** Introduce current information related to balance systems and their impact on children with disabilities including Ds
- **REAL-LIFE EXAMPLES:** Provide real-life examples that exemplify positive changes in balance and stability following specific sensory-motor exercises and activities
- **HOME EXERCISES:** Learn and practice some activities that you and your child can do to improve balance and coordination…starting today!

Your Take-Aways

1

Learn the body systems (physiology) that are related to balance

2

Learn what the research says about what works and why

3

Learn real exercises and small changes you can make today to create big change for your child's future!

Why Is Physical Therapy Important Infant, Toddler or Child with Ds?

Unique Physiology

- Flexible joints
- Flexible ligaments
- Lower resting muscle tone
- Flat feet
- Visual learners
- Processing time
- Inner ear structural changes
- Unique physiology – let's talk about it

Vision

- **Functional maturity**: 1 year old
- **HEAD POSTURE** impacts vision and visual experience
  - Torticollis
  - Head tilt
- **VISUAL EXPERIENCES** drive motor movements and gross **MOTOR DEVELOPMENT**
- Visual system gives info to the brain related to **BALANCE**

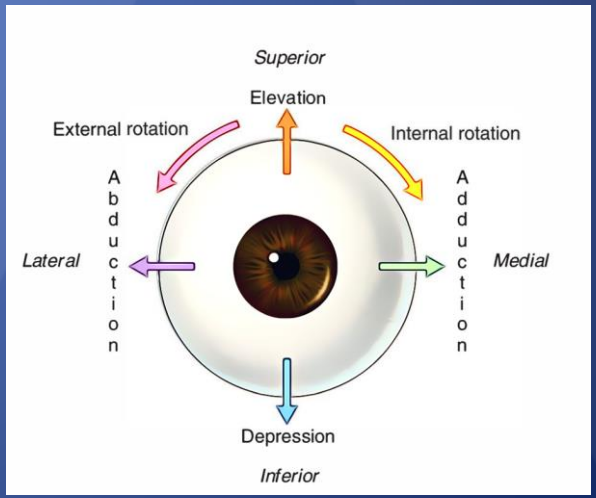
Vision

Each eye has 6 DIFFERENT MUSCLES

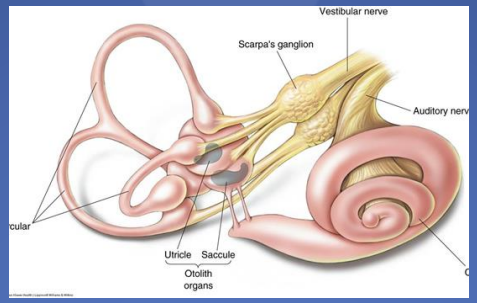
- All eye muscles have to work together to create clear image
- Double vision
- Depth perception

VISUAL CHANGES can impact BALANCE!

- **Visual acuity** (glasses)
- Nystagmus (extra eye movements)
- **Strabismus** (eye surgery or patching)
- Difficulty with visual tracking (wandering or lazy eye)



Vestibular system



- The vestibular system is **INSIDE BOTH EARS**
- **S**ends information to the brain about:
  - Head position
  - Head movement direction (side-to-side, forward/backward, spinning)
  - Head movement speed
- **Functional maturity**: 9 years old

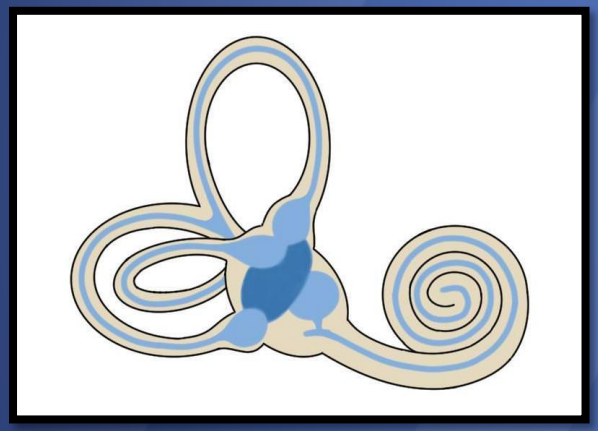
Vestibular system

- The vestibular system sends balance info to the brain through the **SAME NERVE THAT CONTROLS HEARING**
  - The vestibulocochlear nerve
- **HEARING IMPAIRMENT** (hearing aids) affects the vestibular system and **CAN NEGATIVELY IMPACT BALANCE** and decrease balance reactions
- The vestibular system works together with the visual system
- **VISION IMPAIRMENT** (glasses) and **HEARING IMPAIRMENT** at the same time **CAN AFFECT BALANCE, STABILITY, AND DIZZINESS** with movement

Proprioception

- Proprioception is essential for **BODY AWARENESS**
- Low muscle tone, ligamentous laxity (very common with diagnosis of Ds) can decrease proprioception signals and **DECREASE BALANCE AND STABILITY**

Common Sensory Integration Impairments



- Visual
  - 50-75% of people with Ds have visual changes
  - Increased incidence of nystagmus and strabismus
- Hearing/Vestibular
  - >50% of people with Ds have hearing impairment
  - Impact to cranial nerve VIII (vestibulocochlear) makes concurrent involvement with vestibular function likely
  - Documented differences of inner ear anatomy/shape may impact vestibular function
- Proprioception
  - 100% of people with Ds have ligamentous laxity, which decreases feedback from proprioceptive sensors in joints and muscles

Primitive Reflexes

- Unconscious movements
- Designed to lay the foundation for fluid movement and motor milestone achievement
- Genetically encoded and often non-integrated for children with Ds
- Some common patterns we often see:
  - STNR
  - Babinski
  - Protective extension
- We can integrate them with specific exercises - **at any age**!!

Two Types of Balance Reactions

Anticipatory

Reactive

Two Types of Balance Reactions

Anticipatory

- Postural muscles
- Motor plan to ”get ready” for an action
- More of long-duration muscle endurance
- Goal of symmetry
- Takes extra seconds of wait time for our kids with Ds
- Verbal cues like “hands ready,” “tummy tight,” “two hands”, etc help to facilitate

Reactive

- Head, body, arm, or leg movements
- Learned from the ”top down”
- In response to a change in head or body position
- Goal of a quick reaction to bring the body back to balance
- Designed for safety
- Practice, practice, practice!!

Strength and Control – in 3 Planes of Motion

- Side to Side (right and left)
- Forward and Backward
- Twisting (rotation)

Balance is LEARNED from the head down to the toes

- Starts with head righting
- Then body righting
- Shoulders
- Core
- Hip stability
- Knees
- Ankles and feet

Balance muscles

- Neck muscles
  - Control the head
- Core muscles
  - Control the body
- Gluteus maximus muscles
  - Assist with forward and backward balance
- Gluteus medius muscles
  - Keep the body in balance when standing on one foot
- Knee stabilizers
  - Eccentric quadriceps control
- Ankle muscles
  - React to changes in surface

Balance and stability relies on the FEET!!

Start wearing SUPPORTIVE SHOES today

- Saucony baby ride
- Saucony cohesion, velocer, excursion
- Brooks adrenaline – after big kid size 3.0!

Ask your pediatrician, physical therapist or orthotist about INSERTS

For a very flat foot, we recommend:

- Suresteps SMO
- DAFO chipmunk
- Kidsoles – Bouncy and Sturdy (light support)
- Kidsoles - NEON (full support or sports impact)

Research shows that...

- People with Ds have affected visual processing time (decreased reaction speed)
- People with Ds have a different shape of the inner ear
  - Enlarged vestibular aqueducts: 50%
  - Hearing loss is common
- People with hearing loss have impacted vestibular function
- People with Ds have a different VOR response
  - Indicating that eyes and ears do not always naturally coordinate together
- Therapy that includes vestibular stimulation improves balance in children with Ds
- Strengthening and balance exercises improve motor outcomes for children with Ds

Received: 16 May 2022 | Revised: 25 November 2022 | Accepted: 29 November 2022

DOI: 10.1111/jar.13068

ORIGINAL ARTICLE

JARID bild WILEY

The effect of a telehealth exercise intervention on balance in adults with Down syndrome

Kristina Guerrero[1] | Alexandria Umagat[1] | Mark Barton[1] | Andrew Martinez[1] | Kai-Yu Ho[1] | Sarah Mann[2] | Thessa Hilgenkamp[1]

In a recent study, Mann Method PT and UNLV found that...

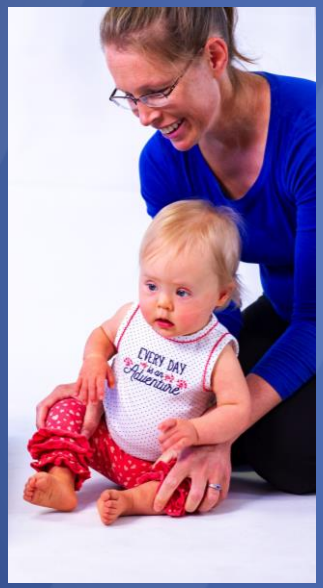
Balance **IMPROVES** following
regular
consistent
practice of MMPT exercises targeting
hip muscle strength
and **visual-vestibular coordination**
for adults with Ds
even via Telehealth!

Methods: Eighteen low-active participants with Down syndrome completed a 12-week telehealth exercise program based on the Mann Method. Balance testing took place before and after the intervention, which included: TUG, MCTSIB, FICSIT-4, and FRT. This study was registered as a clinical trial on ClinicalTrials.gov, identifier: NCT04647851.

Results: Significant improvement was seen in the TUG ($p = .043$), FICSIT-4 ($p = .019$) and FRT ($p = .019$). All participants achieved maximum scores on the MCTSIB in pre- and post-testing.

Conclusions: Balance in low-active adults with Down syndrome significantly improved following the telehealth exercise program, which we attribute to the tailored exercises that address visual/vestibular deficits and hip muscle weakness.

Mann Method™ PT Principles



- ✧Foundational Exercises
- ✧Hip Strengthening Exercises
- ✧Visual-Vestibular Coordination
- ✧Primitive Reflex Integration
- ✧Mobility skills

Getting started is as easy as 1-2-3!!

- Based on the research
- Based on the practice
- Based on the Mann Method™ PT Principles
  - Visual-vestibular coordination
  - Improved proprioception
  - Increased muscle strength
  - Primitive reflex integration

Francesca

Peter

Example Visual Chart

Mann Method
PT and Fitness, PLLC

MMPT™ 2021 Home Program Recommendations

	INFANT	TODDLER	KID	
Penguin waddles			 	Sing and move!! Support child's body or hands. Body weight shifts – NOT JUST leaning the top half of the body. Tummy time, sitting, or standing!
Rotational Reaches			 	Laying, sit, or stand. Practice turning toward the right and the left. Alternate side to side. Head turns, eyes find a target, upper body rotates, lower body stays still. "LOOK AND REACH"
Over-Unders			 	Slow and controlled Feet stay still while upper body moves Protect the back of the head and neck for infants and young children This is a BIG MOVEMENT, so go slow and controlled!

Time for awesome. Let's get moving!!

Side-to-side Tilts (AKA ”Penguin Waddles”)

- Weight shifting from side to side
- Eyes looking straight ahead
- Stack shoulder, hip, knee, and foot in vertical line
- Unweighted foot lifts SLIGHTLY off the ground
- Look for head and body adjusting to stay upright as body shifts
- Place two polydots on the floor side by side for visual cue for where to place feet
- Challenge: 3 sec HOLD on one foot

Tips, Tricks, and Progressions

- 9-12” diameter Polydots for foot placement
  - Available for purchase online
- WHOLE body should move onto one foot balance (NOT JUST TIPPING UPPER BODY side to side)
- Progressions:
  1. Hold the child’s body and move together
  2. Hold both hands
  3. Eventual goal: independent weight shifts
- Challenge: add 3 second HOLD on one foot (tilt, tilt, HOLD!)

Penguin Waddles

1. Rock side to side during tummy time with baby
2. Tip your baby or toddler side to side in sitting
3. Hold your child's hands in standing
4. Progress to waddles all by yourself!!

Sing and move!!

Rotational Reaches

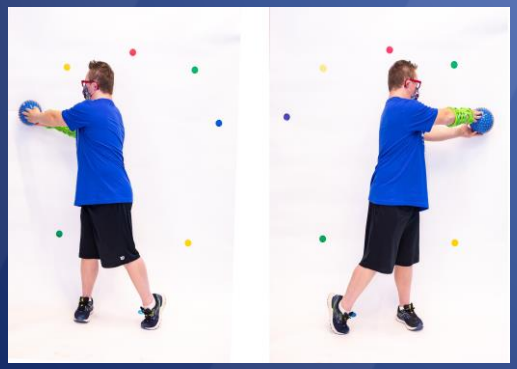
- Laying, sit, or stand
- Practice turning toward right and left
- Alternate side to side
- Head turns, eyes find a target, upper body rotates, lower body stays still
- **“LOOK AND REACH”**

Rotational Ball Passes

1. Sit back to back with a partner
2. Standing back to back with a partner
   -Hold the ball with BOTH HANDS and pass the ball in a circle
3. Stand with your back to the wall with colorful targets
4. Add a mini basketball hoop- reach to one side to get the ball and then 180 degrees turn and shoot!

**Head turns, eyes find a target, upper body rotates, lower body stays still

“LOOK AND REACH”



Tips, Tricks, and Progressions

- No partner: sit or stand with back to wall and tap wall targets with a ball
- **Look** at a visual target each time
  - A sticker/decal on the wall
  - Your partner's eyes
  - This will help with **visual-vestibular coordination**
- Go slow and in control
- Top half of body rotates on top of bottom half – feet should NOT move
- Should make you feel a **little dizzy,** but not dizzy enough to fall down or feel sick
- Dizzy: If you get dizzy, fold your hands together and push down gently on the top of your head and blow out strongly. If very dizzy, sit down.

Progressions:

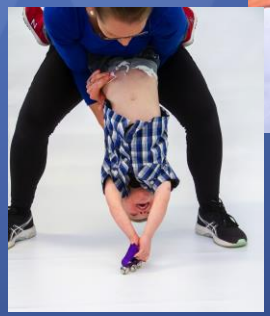
1. Sitting, facing same direction
2. Sitting, back to back
3. Standing, facing same direction
4. Standing, back to back

Over-Unders

- Eyes look up and head tips back gently
- Eyes look under, with BENT KNEES
- Feet stay still while upper body moves
- Slow and controlled
- Head in midline and reaching with BOTH hands
- Protect the back of the head and neck for infants and young children
- This is a BIG MOVEMENT, so ease into it!!

Over – Unders Variations

1. Reach overhead for toy with BOTH hands (sitting or standing)
2. Drive a rolling toy or item between child's legs
3. Looking upside down under legs (all by herself)
4. Upside down peekaboo or reach to grab an item off the floor (adult holding child belly to belly)
5. Back to back ball passes with a sibling or friend!



Over-Under Ball Passes (ADVANCED)

- Stand back to back with a partner
- A little apart to prevent “booty bump”
- Two part movement
  - Look and reach overhead
  - Look and reach under legs
- “LOOK AND PASS”
- Pass with two hands
- Keep your balance
  - Feet steady while upper body moves

Tips, Tricks, and Progressions

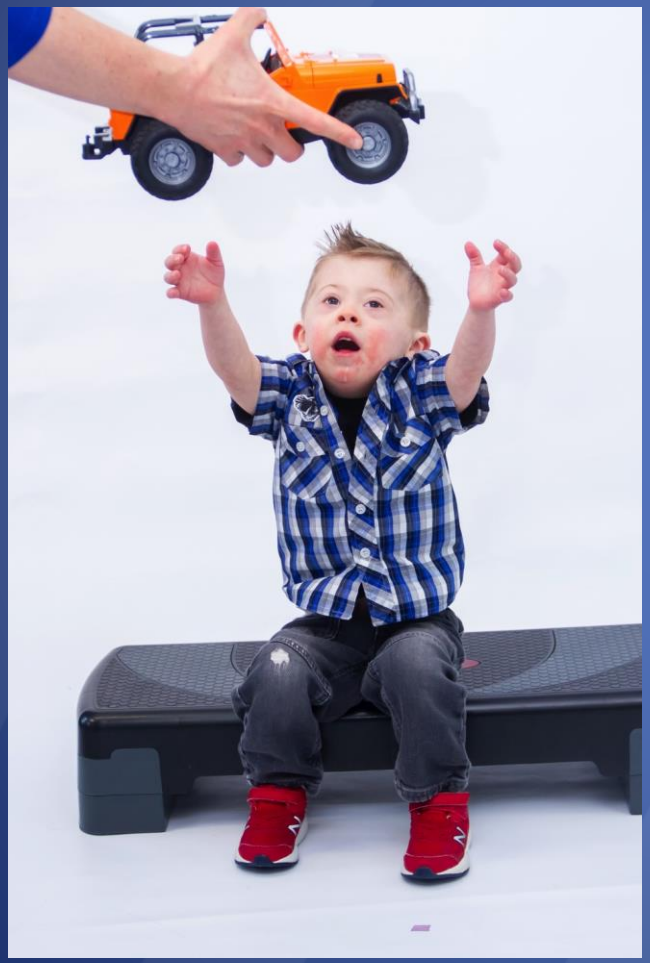
- Start by passing the ball way under or way over so the individual doesn't have to reach down as far or look up as far when learning movement
- Use spots as targets on wall (overhead and knee level) if standing with back against a wall
- **Be careful and start slow!**
  - This activity is very stimulating for the vestibular system and can cause loss of balance if advanced too quickly
- Should make you feel a **little dizzy**, but not dizzy enough to fall down or feel sick
- Dizzy: If you get dizzy, fold your hands together and push down gently on the top of your head and blow out strongly. If very dizzy, sit down.

Progressions:

Standing facing same direction

1. Standing with back against a wall
2. Standing back to back with a partner

Stand Up and Reach



- Seated on bench, step, or cube chair
- Feet on ground, knees bent
- Looking up at toy overhead
- Stand up and reach up at the same time

Tips, Tricks, and Progressions

- Sit on a firm surface that allows the individual to sit with feet firmly on the ground
- Practice standing up from the surface first, so that the individual consistently starts by **leaning forward** and uses legs to do the work of standing up
- Offer hand support at first if needed
- Gradually blend the stand up + reach movements together
- Hold the item so that it is just out of reach AND encourages the person to **look up** as they stand up
- Say, “stand up and reach”
- Use a favorite toy, a scarf, a ball, bubbles, etc.
- Reach with two hands together
- Progress to “stand up and catch” a ball!

Community Resources

Community programs for individuals with Down syndrome:

Mann Method Physical Therapy and Fitness PLLC

- www.mannmethodpt.com

NDSC – Advocacy, website, newsletter

Global Down Syndrome Foundation

www.globaldownsyndrome.org

- Office 303.468.6673 *cjones@globaldownsyndrome.org*

GiGi's Playhouse

- **Joing a GiGiFIT class near you!**
- https://gigisplayhouse.org/locations/
  - Gigi's At HOME
  - https://gigisplayhouse.org/gigisathome/

Your local DSA

- **Rocky Mountain Down Syndrome Association (RMDSA)**

Young Athletes

- https://resources.specialolympics.org/sports-essentials/young-athletes

Special Olympics

- https://resources.specialolympics.org/locale=en

Research opportunities (adults)

- CARE Lab at UNLV - https://unlvptlabs.com/care-lab/
- Contact Thessa Hilgenkamp: thessa.hilgenkamp@unlv.edu

QUESTIONS:

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