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Postural Orthostatic Tachycardia Syndrome:

Symptom Management and Physical Therapy Treatment in Pediatric Population

Emily Santos, PT, DPT

Christy Cary, MSPT

Children's Hospital Colorado
Here, it's different.™

No Conflicts

No Disclosures

OBJECTIVES

1. The participant will be able to explain what Postural Orthostatic Tachycardia Syndrome (POTS) is and how it is diagnosed.
2. The participant will be able to identify appropriate physical therapy treatment interventions for patients that have been diagnosed with POTS.
3. The participant will be able to identify other diagnoses commonly seen in patients with POTS and possible referrals that may by indicated for patients with POTS.

What is Postural Orthostatic Tachycardia Syndrome (POTS)?

- A syndrome where one has an excessive increase in heart rate with standing and chronic symptoms of orthostatic intolerance and no orthostatic hypotension.
- Considered a type of autonomic dysfunction (dysfunction of the autonomic nervous system) (Kizilbash et al., 2014)
- Dysfunction of the autonomic nervous system = wide variety of symptoms
- A type of dysautonomia (Armstrong et al., 2017)
- “Most common form of orthostatic intolerance in young people." (Roberston, 1999)

History of POTS

- POTS was first described by Schondorf and Low in 1993 (Schondorf and Low, 1993)
- First report of POTS in the pediatric population 1999 (Stewart, 1999)
- Youngest reported patient diagnosed with POTS, 6 years old (Boris, 2018)
- Previous disorders with similar characteristics have been described include:
  - 1940: The orthostatic tachycardia (Medow, 2011)
  - Mitral valve prolapse, orthostatic intolerance, neurocirculatory asthenia (Raj, 2006)

POTS Diagnosis: Consensus Statements Define POTS:

1. Heart rate increase of 40 beats/minute or more (or heart rate over 120 bpm) within 10 minutes of upright posture in 12-19 years, with no orthostatic hypotension.

* Orthostatic hypotension is defined as > 20 mm Hg drop in systolic blood pressure.

* 20 years and older = 30 beats/minute increase in heart rate

*Tilt table is gold standard (head up tilt HUT) (Fedorowski, 2019)

*Active stand test alternative: supine to standing in clinic (Plash, et al. 2013 & Bryarly, et al. 2019)

Freeman et al., 2011 & Sheldon et al., 2015

POTS Diagnosis Continued

2. Orthostatic Symptoms: symptoms that are exacerbated with upright position, better when recumbent

May include: chest discomfort, light headedness, exercise intolerance, mental fog, headache, nausea, fatigue, sleep complaints, etc.

3. Chronic symptoms: 6 months (Bryarly et al., 2019)

- Some use 3 months (Boris 2018 and Grubb and Karabin 2008)

4. All other conditions have been ruled out (thyroid, anemia, etc.)

Freeman et al., 2011; Sheldon et al., 2015; Fedorowski 2019

POTS Diagnosis Continued

Other formal autonomic function tests may help determine subtype of POTS and rule out CNS:

- Heart rate variability/cardiac response with paced deep breathing
- Heart rate and blood pressure changes with Valsalva maneuver
- Quantitative sudomotor axon reflex test (QSART)
- Thermoregulatory sweat tests

Bryarly et al., 2019

Cause of POTS

- Do not know
- Heterogenous & multifactorial
- Commonly seen after:
  - A virus or infection 41%
  - Surgery 12%
  - Pregnancy 9%
  - Vaccination 6%
  - Accident 6%
  - Puberty 5%
  - Post concussion 4%
  - Emotional stress or trauma 3%

Shaw et al., 2019

POTS in Pediatrics

Commonly seen after:

- A virus or infection 25%
- Post concussion 11%
- Trauma (fracture or surgery) 3%

57% have joint hypermobility

Boris and Bernadzikowski, 2018

Evolving Case Study:

John is a 13 year old male. John is a 7th grader who enjoys hanging out with friends and playing basketball. For one week now, John has been feeling fatigued, with body aches and nausea. The flu has been going around his school recently.

Where do you currently recommend that he follow up with these symptoms?

POTS Symptoms:

Multiple symptoms from multiple systems

<u>Most Common Complaints at Initial Presentation of Symptoms:</u>

- Dizziness
- Weakness
- Rapid heartbeat and palpitation on standing
- Headache
- Fatigue
- Abdominal pain
- Syncope

Fedorowski, 2019

POTS Symptoms Continued

- Multiple symptoms (> 24 different symptoms have been reported)

- Top 6 initial complaints in pediatrics:
  - dizziness 31%,
  - headaches 20%,
  - fatigue 12%,
  - abdominal pain 7%,
  - syncope 5%,
  - nausea 5%

Boris, 2017

POTS Symptoms continued:

Pediatric Symptoms Reported:

- Sleep abnormality: 98%
- Chronic pain other than headache: 84%
- Gastrointestinal: 79%
- Raynaud symptoms: 74%
- Fatigue: 61%
- Headaches: 46%
- Muscle pain: 56%
- Joint pain: 41%
- Vasovagal syncope: 32%

Ojha et al., 2011

POTS Symptoms Continued:

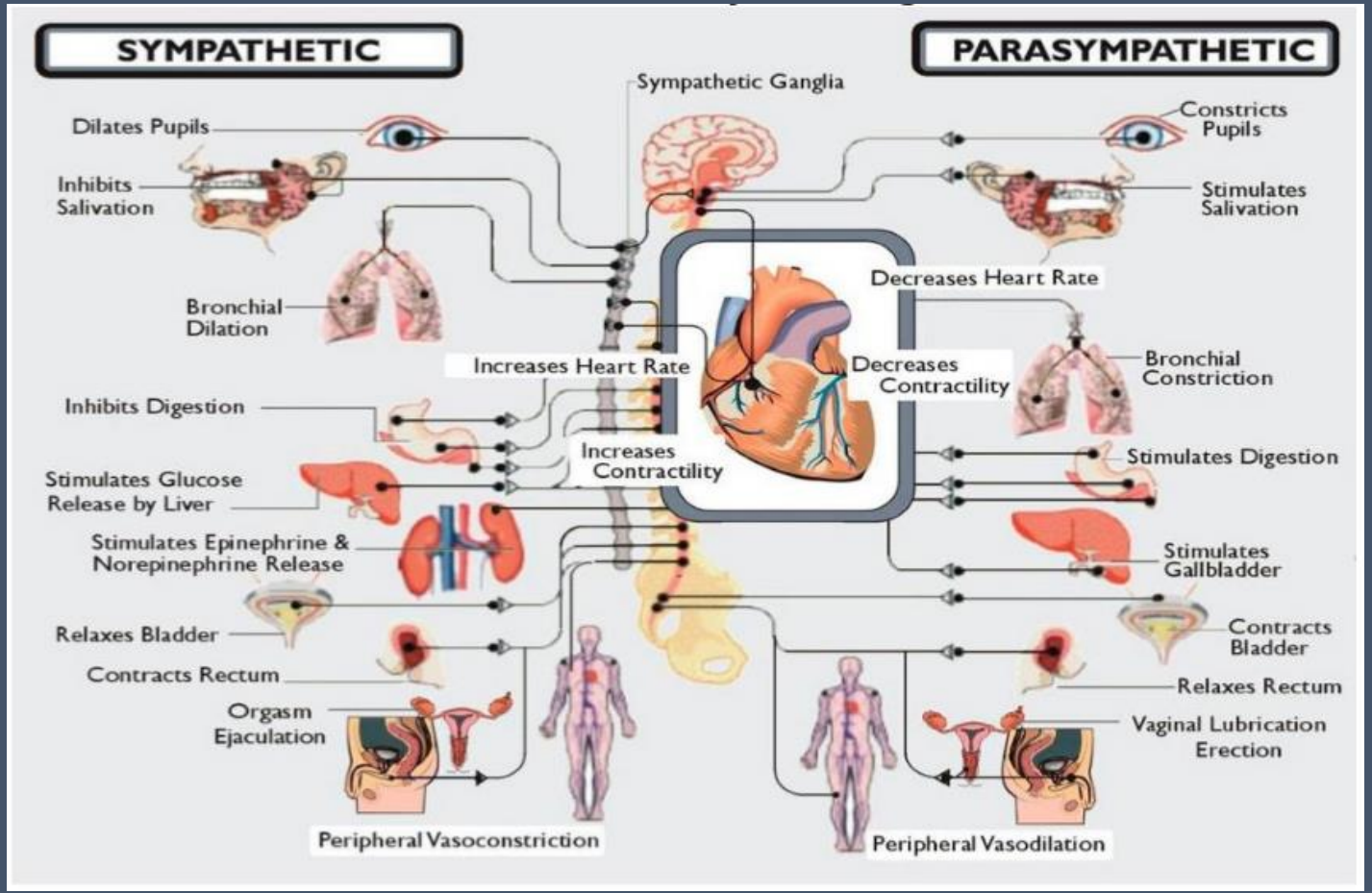
Pediatric population:

- 66% reported > 10 symptoms
- 50% reported >14 symptoms
- 30% reported > 26 symptoms

Boris and Bernadzikowski, 2018

- Symptoms can vary from mild to severe
- 25% are disabled and unable to perform regular school or work activities (Grubb and Karabin 2008)

Autonomic Nervous System Relate to Symptoms



Vinik, 2012

Case Study Continued:

2 Months later:

•John has continued to feel nauseous and fatigued. He has noticed that his heart is "racing" more so when he is standing with associated dizziness. He has started to miss at least 1 day of school a week. He continues to report dizziness, with headaches and abdominal pain as well. He has trouble falling asleep and is waking up at approximately 10 am most days now, with late school attendance a couple days a week.

•Now what are your recommendations for follow-up?

Case Study Continued:

John saw cardiology and had a normal EKG and echocardiogram. He received no activity restrictions.

Proposed Subtypes of POTS by Pathophysiology

1. Hypovolemic: volume depletion or dysregulation, have low plasma and blood volumes

2. Neuropathic: partial autonomic neuropathy, peripheral sympathetic denervation of legs may cause reduced vasoconstriction & venous pooling in the legs

3. Hyperadrenergic: disproportionate sympathetic activity, have elevated standing plasma norepinephrine levels reflecting exaggerated sympathetic response driving tachycardia

Bryarly et al., 2019; Zhao and Tran, 2019

Proposed Subtypes of POTS Continued:

- All leading to a final common pathway of excessive heart rate with orthostatic intolerance in standing.
- No consensus on subtypes
- Can have more than one subtype
- Other subtypes may include:
    - Mast Cell Activation Disorder
    - Autoimmune (viral and/or genetic) examples: Rheumatoid arthritis, lupus, Sjorgen's Syndrome

Bryarly et al., 2019 and Zhao et al., 2019

Who are the patients with POTS?

- Affects between 500,000 and 3,000,000 people in the US (Robertson, 1999 and Garland, 2015),
- 80-94% female (Boris, 2018 and Shaw et al., 2019)
- 93% Caucasian (Shaw et al., 2019)
- Most between ages of 12-50 years old with mean age of symptom onset 21± 12 years with median age 17 years old (Shaw et al., 2019)
- Most common age of onset 14 years old (modal) (Shaw et al., 2019)
- 47% developed first symptoms after the age of 18 (Shaw et al., 2019)

Patient experiences getting a diagnosis of POTS:

- 75% reported being misdiagnosed prior to getting POTS diagnosis
- Average time from presentation to healthcare provider to diagnosis of POTS is 24 months
- Mean number of physicians seen prior to diagnosis: 7

Shaw et al., 2019

Pediatric Implications

- Difficulty attending school (miss school days, become home schooled, drop out, delayed enrollment into higher education)
- Difficulty participating in sports
- Difficulty socializing with peers
- Difficulty performing ADL's

Boris, 2018

Case Study continued:

4 months later:

John is still presenting with abdominal pain, headaches, fatigue, and dizziness. He is now missing up to 2-3 days of school a week secondary to his above symptoms. He is unable to play basketball with his team and is not hanging out with his friends as often anymore. He sleeps every afternoon when he arrives home from school. He is referred to gastrointestinal clinic.

Case Study continued:

He is prescribed Prilosec and Zofran and was educated in the importance of a balanced diet. He is scheduled for an upper endoscopy, abdominal x-ray, CT scan, and ultrasound. CT scan shows intestinal inflammation. All other tests were normal.

6 months later:

John is referred to rheumatology secondary to his history of generalized joint pain and chronic gastrointestinal symptoms. He was found to have a normal complete blood count (CBC), erythrocyte sedimentation rate (ESR) and c-reactive protein test (CRP) with no significant weight loss or fevers.

Overall Treatments for Patients with POTS

- Requires a multidisciplinary approach
- Identify and treat comorbid conditions (i.e.: celiac, headaches, hypermobile EDS etc.)
- Treat symptoms (chronic pain, etc.)
- Exercise
- Counseling
- Nonpharmacological treatments
- Pharmacological treatments: treat symptoms that are most disabling

Bryarly et al., 2019

Overall Treatment Goals for Patients with POTS

Give patients validation, education, plan, encouragement, & optimism!

Help patients to increase activity and function and improve quality of life by:

- Educate in managing symptoms
- Educate in lifestyle modifications
- Exercise plan
- Reduce medications as symptoms improve
- Focus on function

Kizilbash et al., 2014

Nonpharmacological Treatments:

1. Volume Expansion
2. Venous pooling
3. School/work accommodations
4. Lifestyle changes
5. Cardiovascular Conditioning & Strengthening
6. Counseling

* 52% of those reporting symptom improvement contributed it to nonpharmacological treatments (Shaw et al., 2019)

Volume Expansion

Patients with POTS can have reduced plasma and blood volume (Fu and Levine, 2018)

- **Increasing salt**

- Salty snacks/supplements, (improvements in 2 weeks) (Boris, 2018)

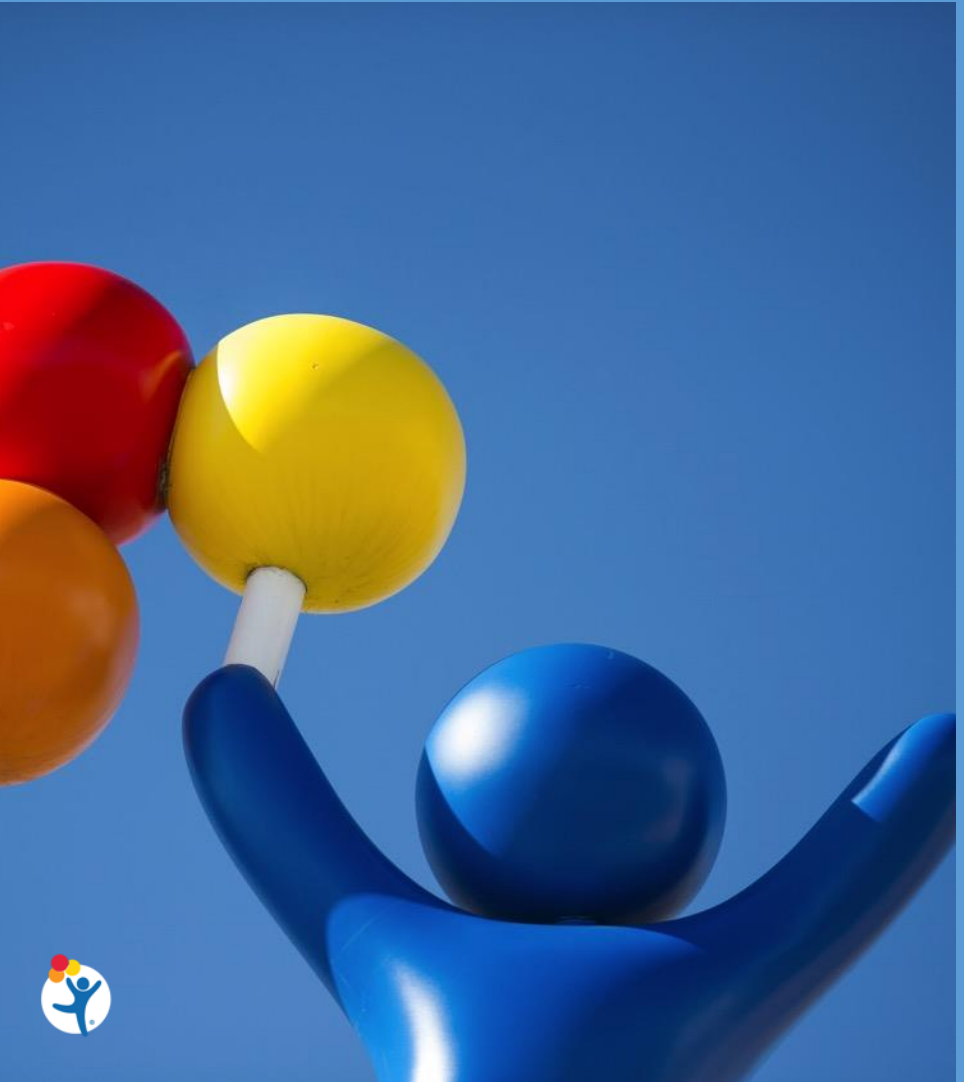
-Salt tablets are controversial, as have been documented to add water into the gastrointestinal system and can lead to nausea and dehydration (Fu and Levine, 2018)

Volume Expansion Continued

- **Increasing Water**
- 60-80 oz water or more, (improvements in 2 weeks) (Boris, 2018)
- Drink a glass of water before getting out of bed.

Volume Expansion Continued

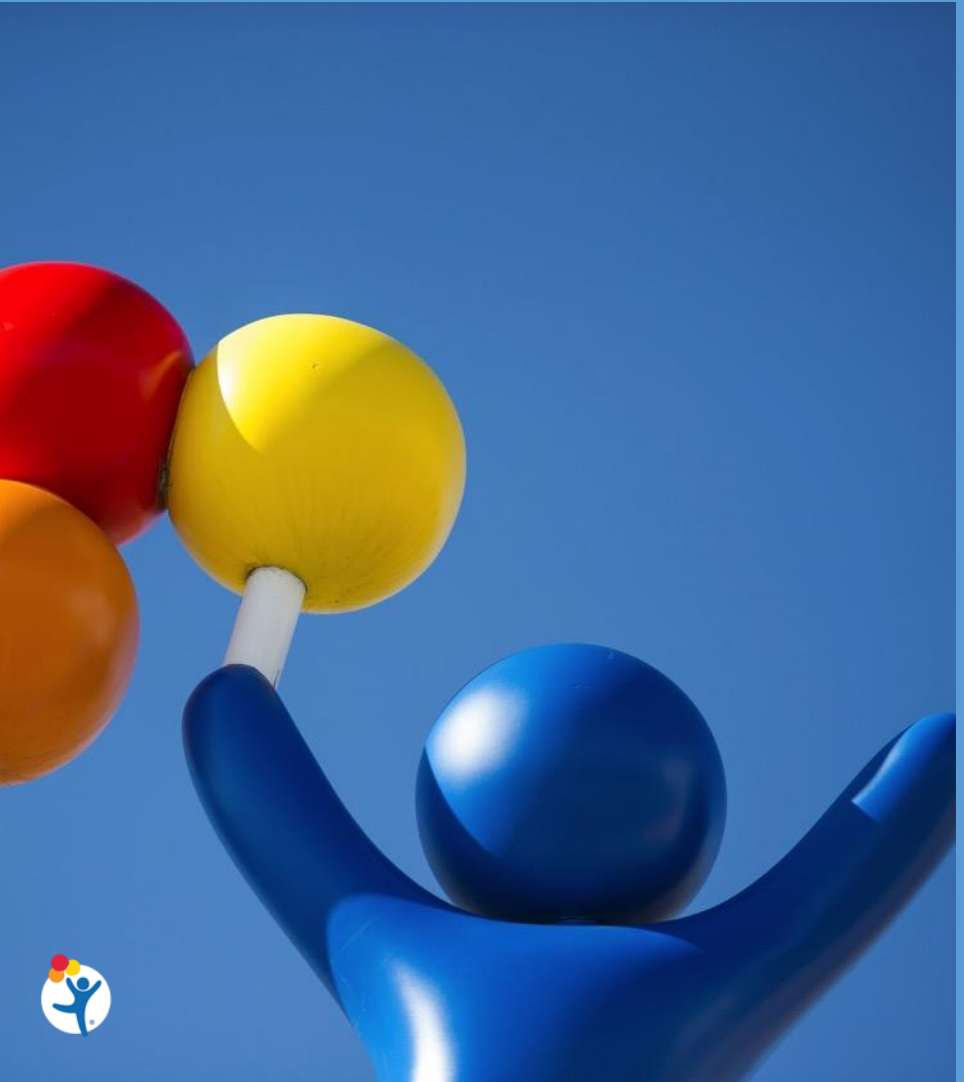
- Sleeping in head elevated position
- Elevate head of bed 4-6 inches
- Entire body at angle with sleeping (Fu, and Levine, 2018)
- With 12 patients, head elevated positioning appeared to improve in 80% of patients and completely normalized orthostatic tolerance in over 40% after three months (Cooper and Hainsworth, 2008)



Venous Pooling

Patients with POTS demonstrated increase in venous pooling in lower extremities during upright posture. Possibly due to decrease in vascular tone and vasomotor control. (Fu and Levine, 2018; Stewart and Weldon, 2001)

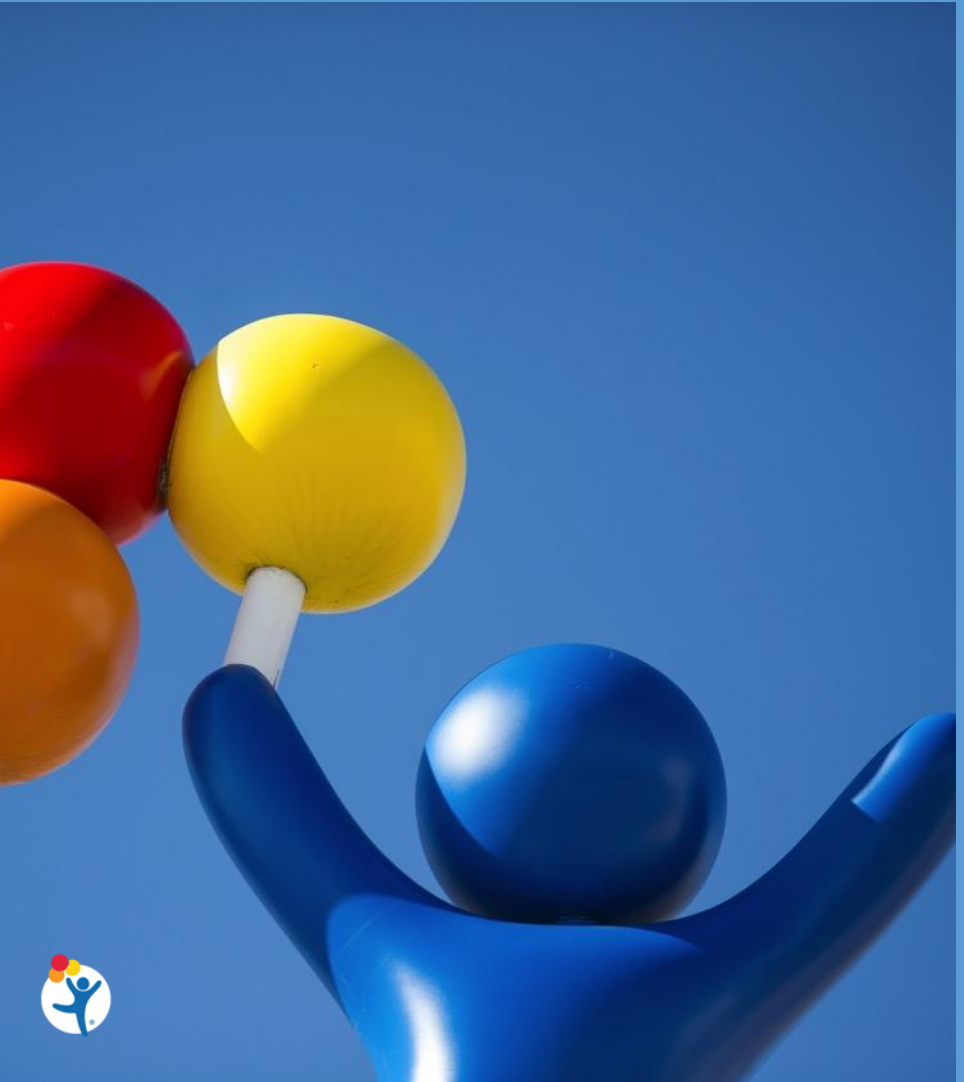
- Lower extremity pumping exercise to do prior to sitting up from supine: ankle pumps, heel slides, straight leg raise, abdominal draw in.
- Logroll for transitions supine to sitting.
- Lower extremity pumping exercises to do in sitting prior to standing up: ankle pumps, long arc quadriceps, marching, abdominal draw in.



Venous Pooling Continued

Compression garments:

- Thigh-high or waist-high garments work best
- Garments best used when applied and taken off in supine position (Cutsforth-Gregory and Sandroni, 2019)
- Per presentation by Dr. J.R. Boris: 20-30 mmHg, have also seen 30-40 mmHg recommendations in literature (Boris, 2018)
- Consider abdominal binders for mesenteric pooling (Bryarly et al., 2019)



Venous Pooling continued

Physical Counter Maneuvers to help decrease acute symptoms of syncope:

- Squeeze ball
- Leg crossing
- Muscle pumping
- Squatting
- Coughing

All work to decrease venous pooling

Fu and Levine, 2018
Cutsforth-Gregory and Sandroni, 2019

School Accommodations

Some IEP/504 Considerations

- 2 sets of books
- Elevator key
- Extra time between classes/for tests and for homework
- Walk with friend
- Water bottle/salty snacks
- Self limit/place to chill – library, empty class
- No PE or allow to use Levine protocol in place of formal PE class
- Later start time for school or early end time

Boris, 2018

Lifestyle Changes

- Pace yourself*
- Good sleep hygiene*
- Avoid triggers*
- Avoid extreme heat, use cooling bandanas, etc.
- Avoid prolonged standing
- Avoid caffeine
- Avoid dehydration

Bryarly et al., 2019

Lifestyle Changes Continued:

- Regular schedule
- Exercise consistently
- Spend time in sunlight and wear sunscreen
- Avoid napping, avoid laying down during day
- Avoid prolonged fasting, eat small frequent meals
- Avoid large meals with high fat and complex carbohydrates (eat low glycemic and high fiber meals)
- Avoid straining with bowel and bladder functions

Bryarly et al., 2019

Physiology of Cardiac System in POTS

27 patients diagnosed with POTS versus controls: Blood and plasma volume 20% lower than controls (Fu et al., 2010)

Left ventricular mass 16% smaller than controls (Grinch Syndrome) (Fu et al., 2010)

Leads to reduction in stroke volume and increase in heart rate secondary to baroreflex (Fu and Levine, 2018; Fu et al., 2010)

Found that three months of exercise increased cardiac size by 12%, cardiac mass by 8%, and blood volume by 6% with patients with diagnosis of POTS (Fu et al., 2018)

Cardiovascular Conditioning: Dallas/Levine Protocol

- Originally used for deconditioned astronauts
- Study was done with 251 adults with POTS, 53% in research environment and 71% in registry no longer met POTS heart rate criteria
- Persistent results for those who continued to follow-up 6-12 months later
- Based on premise of starting recumbent exercise because they are not tolerating upright position so recommend training everyone in recumbent position initially

George et al., 2016
Fu and Levine, 2018

Cardiovascular Conditioning: Dallas/Levine Protocol

The Heart Rate Zones below are for OFF beta blockers ONLY.

Remaining on a Beta Blocker? Follow the expected RPE only.

Training Zone	Heart Rate (bpm)	Expected RPE
Intervals		19-20
Race Pace		
Maximal Steady State, MSS		16-19
Base Pace		13-15
Recovery		6-12

Bryarly et al., 2019

Dallas/Levine Protocol Continued:

- Original study was months 1-3, after the study they added pre months 1 and 2 for those that were more deconditioned.
- 3 Choices on where to start on protocol:

  - Pre month 1 (easiest month if really deconditioned)

  - Pre month 2 (2nd easiest, if deconditioned and not ready for month 1 but pre month 1 too easy)

  - Month 1: most start here

Individuals will most likely feel worse initially prior to feeling better

Bryarly et al., 2019 (appendix)

Dallas/Levine Protocol Continued:

- Resistance training
  - Lower extremities
  - Core
  - Lower extremity muscles pump blood back to rest of body, which helps with venous return
- Resistance training: recommended 2 sets of 10 repetitions
- When able to do more than 10 repetitions, can increase weight for next session

Fu and Levine, 2018

Dallas/Levine Protocol:
Pre-Months and Month 1

- Mode: Recumbent bike, swimming, or rowing **if** that is their sport

- Recumbent strength exercises-helps avoid increase in symptoms

Fu and Levine, 2018

Dallas/Levine Protocol: Month 1

POTS Exercise Training Program

Month 1

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2 **Training Mode 1** 5 min Warm-Up 30 min Base Pace 5 min Cool-down	3 **Weight Training**	4 **Training Mode 1** 5 min Warm-Up 30 min Base Pace 5 min Cool-down	5 **Weight Training**	6 **Training Mode 1** 5 min Warm-Up 30 min Base Pace 5 min Cool-down	7
8	9 **Training Mode 1** 5 min Warm-Up 30 min Base Pace 5 min Cool-down	5 **Weight Training**	11 **Training Mode 1** 5 min Warm-Up 30 min Base Pace 5 min Cool-down	12 **Weight Training**	13 **Training Mode 1** 5 min Warm-Up 20 min **MSS** 5 min Cool-down	14 **Training Mode 1** 40 min Recovery
15	16 **Training Mode 1** 5 min Warm-Up 30 min Base Pace 5 min Cool-down	17 **Weight Training**	18 **Training Mode 1** 5 min Warm-Up 30 min Base Pace 5 min Cool-down	19 **Weight Training**	20 **Training Mode 1** 5 min Warm-Up 30 min Base Pace 5 min Cool-down	21
22	23 **Training Mode 1** 5 min Warm-Up 30 min Base Pace 5 min Cool-down	24 **Weight Training**	25 **Training Mode 1** 5 min Warm-Up 25 min **MSS** 5 min Cool-down	26 **Training Mode 1** 40 min Recovery	27 **Weight Training**	28 **Training Mode 1** 5 min Warm-Up 30 min Base Pace 5 min Cool-down

Training Mode 1 = Any of: Recumbent Biking, Swimming, Rowing (Concept II preferred)
Weight Training can be done on same days as Cardio workouts if necessary.

Bryarly et al., 2019

Dallas/Levine Protocol: Month 2

- Month 2: Semi upright

- Upright stationary bike or trainer

- Important to progress to semi- upright strengthening

- Usually improvements first in functional abilities prior to individual feeling better.

Fu and Levine, 2018

Dallas/Levine Protocol: Month 3

- Month 3: Upright
- Mode: Walking, treadmill, elliptical, stair climber, etc. Remember to progress to upright strengthening too
- Protocol originally ended at month 3 as by the end one should hopefully be functioning upright with less symptoms (Fu Q. and Levine B. 2018)
- Added months 4-6 for those that wanted to do more than just daily activities
- Can be used for maintenance once complete month 3

Bryarly et al., 2019 (appendix)

Dallas/Levine Protocol: Month 4-6

Months 4-6: For those that want to do more, especially to return to sports

Recommend to have a month that they use for maintenance if they are not in a regular sport full time.

Bryarly et al., 2019 (appendix)

Modified Dallas - Protocol from Children's Hospital of Philadelphia (CHOP)

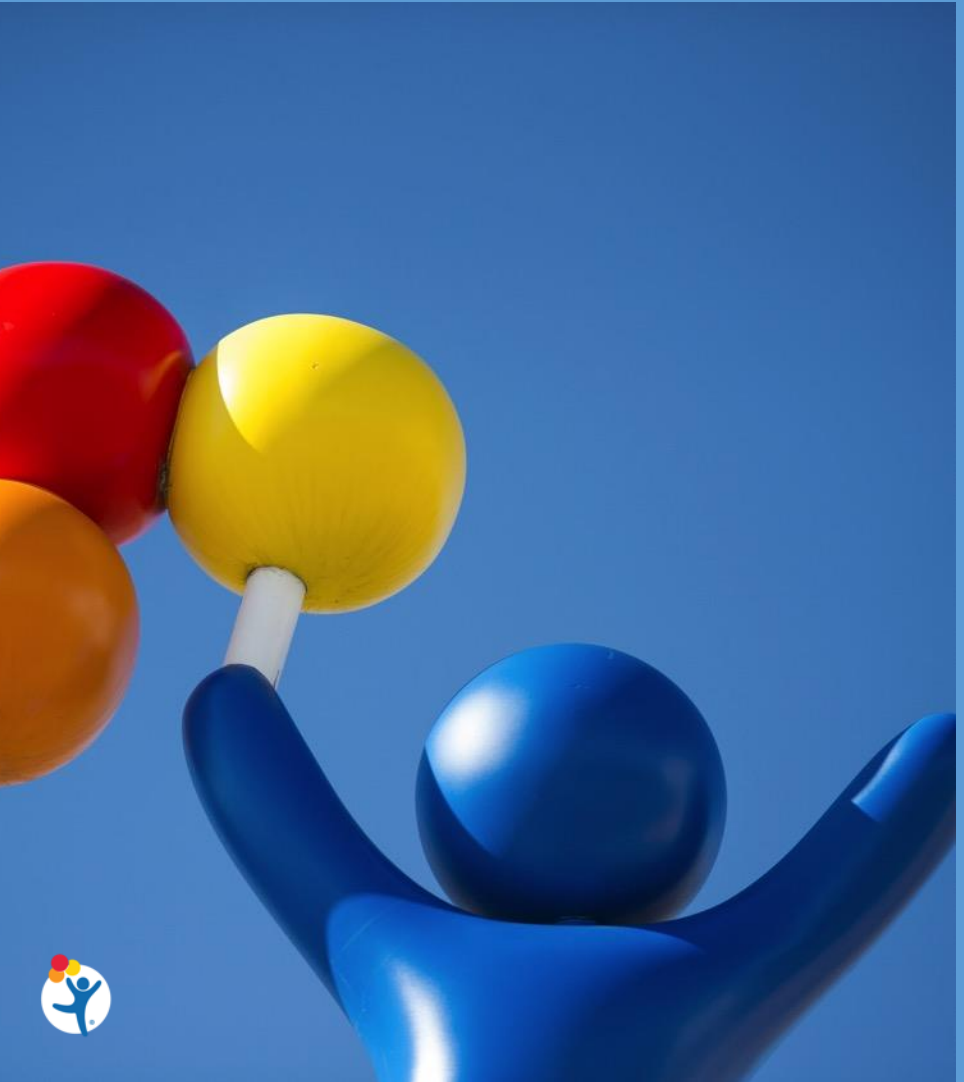
- Modified original protocol to make it more user-friendly
- Have their own intro letter explaining the protocol
- Differences:

-8 month versus 6 month protocol (No pre-months)

-Use RPE scale 0-10 versus 6-20

-Added specific exercises to their protocol including stretching/strengthening

http://www.dysautonomiainternational.org/pdf/CHOP_Modified_Dallas_POTS_Exercise_Program.pdf



Physical Therapy Outcome Measures

Focus on function, not symptoms

1. Functional Disability Index (Walker FDI) parent and child report (Lai et al., 2009)

2. 36 Item Short Form Health Survey (SF-36)

- Validated self report tool (Ware and Sherbourne, 1992)
- Considered measure of quality of life and SF-36 used in patients with POTS (Bhatia et al., 2016; Fu, et al., 2011; Benrud-Larson et al., 2002)

3. RAND 36: similar to SF-36, measure of quality of life (Bagai et al., 2011)

Others: Patient Specific Functional Scale and Peds QL (Armstrong et al., 2017)

Pharmacological Treatments

- No FDA approved drugs to treat patients with POTS
- Treating symptoms
- 29% of those reporting symptom improvement contributed it to pharmacological treatments (Shaw et al., 2019)
- Dr. Boris noted over 25 different medications that they use to treat variety symptoms. His moto is “if it's bad enough to cause disabling symptoms that prevent you from doing ADL’s, then consider treating it.”
- Saline infusions used sometimes for persistent dizziness that does not respond to oral meds. (Boris, 2018)

Pharmacological Treatments Continued

- Alpha-1-adrenergic agonist (ie: Midodrine for low BP)
- Corticosteroid (ie: Fludocortisone to increase blood volume)
- Beta Blocker (ie: Propanolol to decrease tachycardia); If on beta blocker cannot accurately use heart rate for the Levine protocol: use rate perceived exertion
- Cholinergic agonist (ie: Pyridostigmine to increase venous return and decrease tachycardia)

Others for symptoms of headaches, nausea, brain fog, etc.

Raj, 2006; Bryarly et al., 2019

Prognosis for Patients with POTS

- Not a pediatric or teenage syndrome, do not "outgrow it"

- 2-10 years after pediatric diagnosis (mailed questionnaire 34% response rate):
  - 85% overall report some or more improvements
    - 19% report recovery or complete resolution of symptoms*
    - 51% report persistent but improved symptoms
    - 16% report intermittent symptoms
  - 3.5% report worsening. (Bhatia et al., 2016)

- after 3 months cardio training, 10/19 patients (53%) no longer met POTS criteria AND all patients reported improved quality of life (on SF-36) after training (Fu et al., 2010)

Prognosis for Patients with POTS Continued:

- Of the 41% that completed months 1-3 of Levine, 71% no longer met POTS criteria (George et al., 2016)
- Outcome measure: "markedly increased under all categories in virtually all patients" on SF-36 after completing months 1-3 of Levine (George et al., 2016)
- Bruce et al., 2016 report “Improvement in Functioning and Psychological Distress in Adolescents with Postural Orthostatic Tachycardia Syndrome Following Interdisciplinary Treatment” – 3 week multidisciplinary rehab program, showed significant decrease in psychological stress and functional impairment

Case study continued:

8 months later:

John returned to PCP, who reviewed his symptoms and did diagnose him with Postural Orthostatic Tachycardia Syndrome. He was educated in salt and water importance. A sleeping regimen was emphasized. He was sent to physical therapy and started the Levine protocol.

Other Referrals to Consider:

- Gastroenterology
- Pelvic Floor Physical Therapy (Incontinence, constipation, gastroparesis, etc.)
- Headaches - Neurology
- Rheumatology
- Genetics if suspect EDS
- Psychology
- Allergy/immunology
- Sleep specialist

Possible Comorbidities

The Face of POTS: Survey of 3276 patients diagnosed with POTS reported: 83% had at least one additional medical condition

- Migraine headaches: 40%
- Irritable bowel syndrome: 30%
- Ehlers-Danlos Syndrome (hypermobile type): 25%
- Chronic Fatigue Syndrome: 21%
- Fibromyalgia: 20%
- Asthma: 20%
- Raynaud's phenomena: 16%
- Iron deficiency anemia: 16%
- Autoimmune disease: 16%
- Gastroparesis: 14%
- Vasovagal syncope: 13%
- Inappropriate sinus tachycardia 11%
- Mast cell activation disorder 9%

Shaw et al., 2019

Possible Comorbidities Continued

Ehler's Danlos Syndrome (EDS):

39 patients with POTS with prevalence of 18% in patients meeting hypermobile EDS criteria (compared to 0.02 in general population) (Wallman et al., 2014)

Proposed theory that connective tissue impairment in Ehlers Danlos Syndrome leads to abnormalities in vascular abilities including lower extremity blood pooling and decreased venous return (Bryarly et al., 2019)

Continued evidence required for substantiation of this hypothesis

Possible Comorbidities Continued

- Hypermobile EDS (hEDS) = 22.4%
- Hypermobility Spectrum Disorder (HSD) = 34.9%
- **5% autoimmune or inflammatory disorders:** Diabetes, lupus, RA, Sjorgen's Syndrome, etc. (Vinik and Erbas, 2013)

Boris and Bernadzikowski, 2018

Possible Comorbidities Continued

Eosinophilic gastrointestinal disorders (EGID):

Study with 7 patients with EGID and POTS diagnoses: Onset of autonomic symptoms around onset of gastrointestinal disorder in 3 of the subjects

3 additional subjects with autonomic symptoms with acute gastrointestinal flare

History of autonomic dysfunction is 5-10x higher in EGID population- with unclear mechanism

Huang and Dellon, 2019

Possible Comorbidities Continued

Mast Cell Activation Syndrome:

MCADs intermittent symptoms caused by mast cell mediator release, including increased levels of serum tryptase (most frequently used)

Can also use urinary histamine levels

Presentation variable but can include urticaria, angioedema, flushing, vomiting, reflux, shortness of breath, nasal congestion

Bonamichi-Santos et al., 2018

Possible Comorbidities Continued

Some healthcare providers noticed use of histamine antagonists benefit to manage hyperadrenergic type POTS (with MCA co-morbidity) symptom (flushing) as well (Shibao et al., 2005)

2015, Cheung and Vadas presented study at American Academy of Asthma, Allergy, and Immunology: Screening Questionnaire:

Patients already diagnosed with POTS and EDS 66% of them reported symptoms of MCAS as well (Cheung and Vadas 2015 as referenced by Bonamichi-Santos et al., 2018.)

Case Study continued:

9 months later:

John is now able to go to school for most days consistently. He is performing the Levine protocol and attending physical therapy on outpatient basis every month for the last three months. He is doing morning exercises to assist with dizziness upon getting out of bed. He has started attending a psychology appointment consistently to address his frustration with overall symptoms as well as to assist with lifestyle changes.

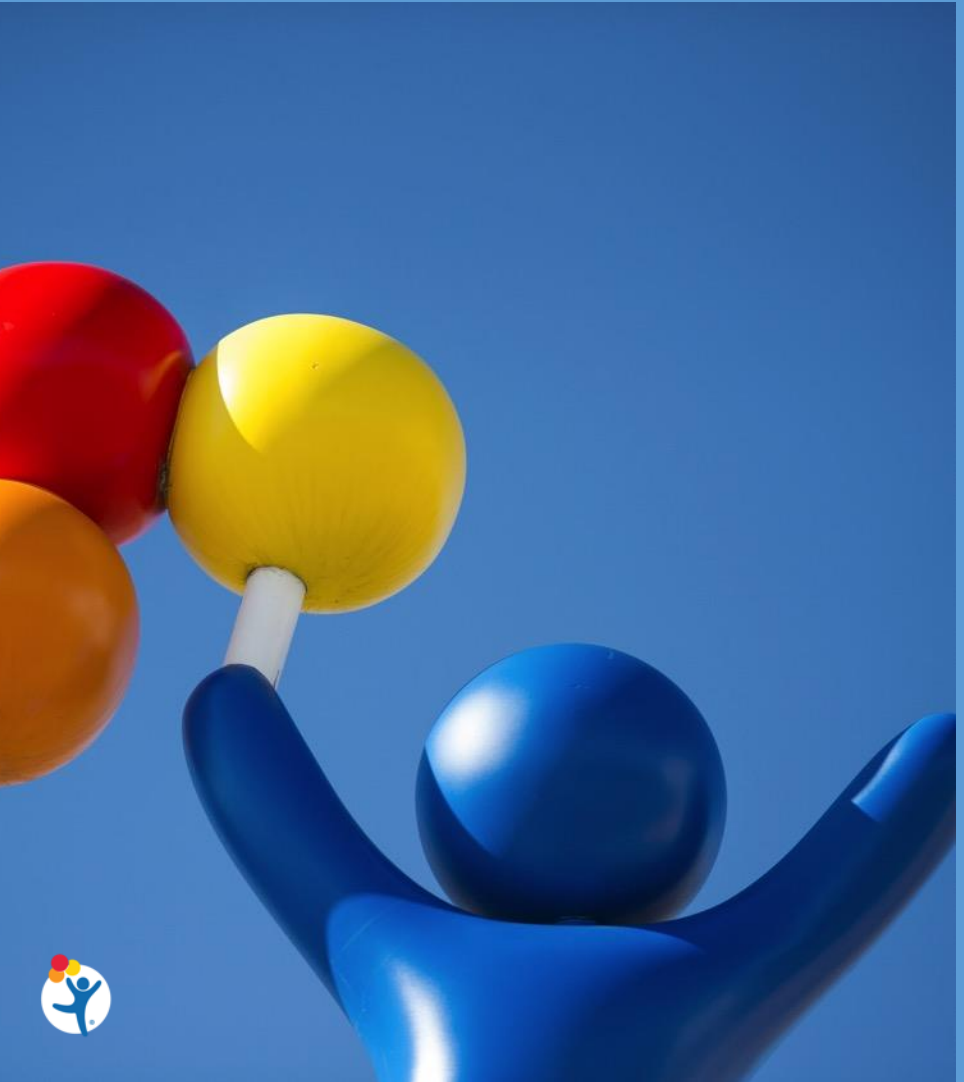
POTS Summary

- A heterogenous syndrome with a variety of types that presents with a wide variety of symptoms that result in abnormal increased heart rate in standing with orthostatic intolerance.
- Best treated with multifaceted treatments and a multidisciplinary approach to treatment. Treatments focus on decreasing symptoms and improving function.
- Usually gets better but takes time.

Dysautonomia International video, “What Is POTS?”

http://dysautonomiainternational.org/page.php?ID=30


Questions?



Contact Information

Emily Santos, DPT

Email: emily.santos@childrenscolorado.org

Phone: 720-777-7422

Christy Cary, MSPT

Email: christy.cary@childrenscolorado.org

Phone: 720-478-2331

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Session Assessment Questions

1. What is a preferred cardio exercise to begin pediatric patients with POTS on?
    a. Running on treadmill
    b. Walking on treadmill
    c. Riding an upright bike
    d. Riding a recumbent bike
    e. Whatever they like to do.

2. What other comorbidities are patients with POTS also known to have? (circle all that apply)
    a. Diabetes
    b. Mast Cell Activation Syndrome
    c. Migraine Headaches
    d. Hypermobile EDS
    e. All of the above

Session Assessment Questions Continued

3. What referrals may be indicated for a patient with POTS? (circle all that apply)
    a. Gastroenterology
    b. Psychology
    c. Genetics
    d. Podiatry
    e. None of the above

Session Assessment Question Answers

1. What is a preferred cardio exercise to begin pediatric patients with POTS on?
Answer: d. Riding a recumbent bike

2. What other comorbidities are patients with POTS also known to have? (circle all that apply)
Answer: e. All of the above

3. What referrals may be indicated for a patient with POTS? (circle all that apply)
Answer: a. Gastroenterology
b. Psychology
c. Genetics

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