

Dear Doctor and/or collaborating health care provider,

Thank you for your interest in the unique exercise training program we've developed for patients with Postural Orthostatic Tachycardia Syndrome. We originally used this training program in a NIH funded research project with POTS patients. Several publications that you may be interested in have been generated from that original research (listed at end of information letter). We subsequently enrolled over 250 patients in a registry under the care of their own doctors, over the past 3 years in order to try to track the usefulness of the program in the community. This POTS Registry Study is now closed to new enrollees, though we are still collecting follow-up data from patients to determine the outcome. However, we receive requests for the training program daily, so Dr. Levine is willing to share the program with inquiring doctors or their designated health care providers to implement with their own patients. We plan to make this information public on our website after our Registry Study data has been published.

Please understand that we are not available to assist you in implementing this program with your patients. It's not that we don't want to be helpful – it's just that the requests for the program are overwhelming, and we simply do not have the time or manpower to respond individually to all requests for assistance.

Here is all the training information you need to get your patient started. Please review it thoroughly. Attached with this letter you will find the following:

1. an introduction letter detailing the program
2. a method employed to calculate heart rate training zones (every patient must have their own heart rate training zones calculated individually by you)
3. the global training guidelines sheet with a place for you to enter the heart rate zones you calculated specifically for your patient
4. 7 months of training calendars
 - a. Months 1-3 are the typical program. These months were used in our previously published research. The vast majority of patients begin with Month 1.
 - b. We included Pre Month 1 and Pre Month 2 which we use only in a small percentage of the most deconditioned and debilitated patients.
 - c. We included Months 4-6 for you as well. Many patients like having this additional training that continues to challenge them beyond the traditional 3 months of training. Progression to this level of training is very individual.
5. an example of a workout log sheet for cardio training

Please guide and monitor the gradual increase in daily water and salt intake for your patient as they can tolerate, as well as advise them whether they should raise the head of their bed 4-6 inches (another general recommendation that is made for POTS patients). We do not recommend the use of salt tablets as they can move water into the GI system and out of circulation. Instead, we recommend that a patient learns how much sodium they are getting in their regular diet and then supplement it with table salt. 1 tsp of granulated iodized table salt has approximately 2300 mg sodium. One effective strategy is for patients to measure out the required additional amount of salt per day into a small bag and then disperse it over their food throughout the day. We have found that making changes in water and salt to the diet should be done gradually (over weeks) and together (i.e. water and salt increasing or decreasing together). We think it is also important for you to encourage your patient to be upright during the day when they are awake. Reclining or laying down for hours at a time only works against all the hard work they will be putting in at the gym.

We recommend making regular appointments with your patient to track their progress and monitor their response to increases in water and salt and to the training. Some patients need monthly appointments, others every 3 months. We require our patients to bring in their exercise

log sheets at each visit. Routine orthostatic testing (supine for at least 5 minutes; then standing with measurements at 1, 3, 5, and 10 minutes) can be a valuable tool in assessing progress with these patients at office visits.

If you choose to have your patient remain on a beta blocker while doing the training, they will not be able to follow the heart rate zones you calculate. However they still need to monitor their training intensity and for this purpose we suggest that they use the Rating of Perceived Exertion (RPE) – listed next to the heart rate zones on the Training Guidelines sheet. Most doctors choose to wean patients off medications they may have been prescribed for POTS before starting the training, or during the training as patients get stronger. Please understand that the original published research was done with patients off all medications prescribed for POTS. The POTS Registry has been conducted with the vast majority of the patients in the same unmedicated state.

Using exercise as a therapy becomes a life-long choice for the patient that decides this is helpful for them and should be considered part of personal hygiene. We find it helpful to have the patient think of the written program as a prescription from their doctor and to follow it as such. The first month can (and often does) generate increased fatigue. However we have found that most patients will see improvements somewhere in their lives within 3 months. Sticking with it in the face of this early fatigue is essential. You need to determine whether the patient can follow this program on their own at a fitness center or whether they need to be in a physical therapy or cardiac rehab program with more oversight and direction.

We sincerely hope this is helpful for your patient to assist them on the path to better health. If they adopt regular exercise training as a therapy for POTS, they will of course reap the benefits in many other aspects of their health across their lifespan.

Sincerely,

POTS Registry Team

Braden Everding, M.S.

Kimberly Carter, APRN, FNP-

C Dr. Yasir Saleem, M.D.

Dr. Stephen George, M.D.

Institute for Exercise and Environmental

Medicine 7232 Greenville Avenue, Suite 435

Dallas, TX 75231

Ph: 214-345-4617

THRIEMPOTSRegistry@TexasHealth.org

Dr. Benjamin D. Levine, M.D., F.A.C.C., F.A.C.S.M.

Director, Institute for Exercise and Environmental Medicine

S. Finley Ewing Jr. Chair for Wellness at Presbyterian Hospital of Dallas

Harry S. Moss Heart Chair for Cardiovascular Research

Professor of Medicine and Cardiology

Distinguished Professorship of Exercise Science

University of Texas Southwestern Medical Center at Dallas

Your doctor or healthcare provider has decided that you may benefit from a unique exercise training program that Dr. Benjamin Levine and his team have designed, researched, and prescribe for patients primarily suffering from Postural Orthostatic Tachycardia Syndrome (POTS). Trying this program is a decision that you need to be 100% committed to for yourself and your health. **This letter will outline the details of following this program. It should be thoroughly read by the healthcare provider and patient, and used in conjunction with the Monthly Training Calendars and Training Guidelines Heart Rate Zones calculated by the healthcare provider.** This program includes using the following techniques to remedy the physiologic conditions that may be causing your suffering from this syndrome: increased water and salt intake, raising the head of your bed, performing cardiovascular aerobic exercise 3-5 days a week, and strength training 2 days a week. You will need access to a wide variety of gym equipment, and therefore it is recommended that you join an exercise facility. Many patients follow this program without help, or have a friend, family member, personal trainer or physical therapist oversee your progress. We believe it is imperative for POTS patients to begin with cardio and strength training exercise in a more horizontal position and progress over many weeks to upright activity (each patient does this at their own rate, but we give a specific outline in the Monthly Training Calendars).

Water and Sodium Intake

Many studies have found that POTS patients have reduced circulating blood volume and this can cause an increased upright heart rate. Therefore, it is recommended that POTS patients increase their water and sodium intake. This can be a big adjustment, but it is one of the easiest ways to help you feel better—at least until you become “trained”. (It is well established that chronic exercise training alone will increase circulating blood volume, but until you are “trained” you can increase your blood volume via this method and the next one). Your doctor needs to monitor this for you directly to ensure it is safe for you. In general, it is recommended that POTS patients consume up to 3 liters of water a day and between 7,000 -10,000 mg sodium a day. A slow, progressive increase in daily sodium intake in/on your food and snacks is recommended so as to not upset your gastrointestinal system. Spread the water and sodium intake out throughout your day, and consume them together.

TIPS:

- 1 tsp granulated iodized table salt = approx. 2300 mg sodium
- Sometimes it is helpful to determine how much more sodium you need from table salt per day, measure it out in the morning, put it into a Ziploc bag to put on your food throughout the day.
- Purchase a 1 liter water bottle and carry it with you everywhere. It will help remind you to drink water, and help you keep track of exactly how much you are drinking each day.
- Start drinking your water first thing in the morning even before you get out of bed.
- When you become chronically exercise trained (and maintain exercise), you likely won't need these high levels of water and sodium daily.

Elevate the Head of the Bed

Raising the head of your bed off the ground 4-6 inches is another simple method to increase circulating blood volume. Your doctor needs to monitor these first two things for you, keeping track of your blood pressure, and adjusting your use of these methods as necessary.

TIPS:

- Large phone books, blocks of wood, or bed risers (like you can purchase at stores like Bed, Bath, and Beyond) placed under the feet at the top of your bed work best for placing your entire body at a slight angle while you sleep.
- It is not the same thing to sleep on a few extra pillows under your head!!

Be Upright While Awake

Getting upright during the waking hours of the day is **very important**. Oftentimes, this syndrome has people feeling so badly that it just feels better to lie down, or have your upper body reclined or your feet elevated for most of the day. It is highly recommend that you work toward only lying down or reclining if you are actually sleeping to take a nap, or sleeping at night. Keep in mind that it is like taking one step forward to do the exercise for the day, but two steps backward if you lay down or recline for the remainder of the day.

TIPS:

- When you are awake, as you can tolerate, you need to work toward having your feet lowered to the ground and your torso upright when you are sitting to do things like work, doing your studies, eating, watching t.v., working on the computer, etc.
- Do this incrementally as you can tolerate (i.e. for longer periods of time across several weeks)
- Take a drink of water, get up and walk around at least once per hour.

The Structure of the Training Calendars

Months 1-3 are the original, researched training program. We created Pre Month 1 and Pre Month 2 for those who needed to begin with less intensity. Months 4-6 are an extension of the original program and are an option for long term maintenance training. Your healthcare provider may choose to have you begin with Pre Month 1, Pre Month 2, or Month 1 of training. This is up to them based upon your condition. Training during these first months should only utilize the following horizontal modes: recumbent biking, rowing (Concept II preferred), and/or swimming laps or kicking laps with a kickboard. Month 2 is when people can usually begin to use the upright bike, and Month 3 or 4 is when people can generally incorporate the more upright modes (elliptical and treadmill walking).

Think about the calendars as a week by week guide. You need to complete all the training for that week within each week. You may shift training sessions on the calendar a day or so before or after it is scheduled. However, it is important that all sessions for that week then are shifted so the order they are performed is maintained as prescribed (and you complete all workouts for that week within a week). One requirement is that after 'Maximal Steady State' workouts you must always complete a 'Recovery' workout the next day. A 'Recovery' workout can actually be doing anything active as long as your heart rate stays below the zone prescribed. Recovery workouts can be done by slowly cycling at a low level on the recumbent bike, using a kickboard to leisurely kick laps in the pool, taking a walk outdoors, playing in the yard with your kids, anything active that gets you moving continuously for the prescribed amount of time.

There are a few other points to keep in mind. If for some reason you miss a period of workouts (illness, injury, etc.) it is best to back up in the calendar and repeat cardio workouts. For example, if you miss several cardio workouts, back up and repeat a full week. If you miss a week, back up and at least repeat 1½ -2 weeks. If you've stopped for more than 2 weeks, you may want to consider beginning all over again. The program gets progressively more difficult, and when you take time off you lose some of your hard-earned conditioning, therefore it is important to back up and repeat some workouts. You may also need to return to training with the first more horizontal modes of training (i.e. recumbent bike, swimming, rowing only) before moving forward in the program again.

TIPS:

- Use what you have access to and can tolerate training on, but starting with one horizontal mode of training is key
- Rowing with the Concept II is preferred because it mimics open water rowing best. Open water rowers have the largest, strongest hearts out of all competitive athletes. Rowing is great to strengthen your heart muscle!
- Keep the workouts spread out throughout the week. This is more beneficial than bunching them up and then taking several days off from exercising.
- Try not to take more than 2 days off from exercising. This is KEY!!
- If you cannot complete all the sessions for that week, you need to repeat that entire week again before moving forward.

The Basics of the Strength Training

The weight training sessions prescribed should take you ~25 minutes to complete. All weight training should be done on seated equipment, and we do not recommend the use of free weights until you have gotten stronger. If you are unfamiliar with weight training, please get a personal trainer to help you utilize proper form and technique on each machine. It is easiest if you get a notebook to separately log your weight training accurately. The strengthening exercises are mainly for the lower body and core and this is

intentional. Lower body muscles act as pumps when they contract (as you are walking about in daily life) to return blood to your heart. Increased leg muscle mass means more blood returned with each step you take.

TIPS:

- Strength training can make you sore in the beginning (especially 2 days after the workout).
- Some people find that they can only get to the gym 3-4 days a week. It is alright to do your weight training at the end of your cardio workouts instead of on separate days if you prefer.
- Take at least a day off between strength training workouts. You need to allow your muscles at least that day to recover and build muscle.

Recommended Strength Training Exercises

We give the general recommendation to perform 2 sets of 10 repetitions of the following: seated leg press, leg curl, leg extension, calf raise, chest press, and seated row. You should do as many repetitions as you can on the second set. When you can do more than 10 on the second set, then you need to increase the weight you are lifting for your next session. We also ask that you perform exercises for your core such as: abdominal crunches, back extensions, side planks or anything Pilates based that you can do on the floor (2 sets, 10-20 repetitions as you are able). This is the minimum strength training exercises that are recommend as you are getting started. After the first month, if you would like to add new weight training exercises, consult your trainer/therapist, but do so slowly and knowing that working new muscle groups might make you sore again.

TIPS:

- If you don't have access to any seated strength training equipment: doing something is better than doing nothing for strength training. Discuss this with your healthcare provider and set up your own plan. You can look online for home strength training exercises to strengthen legs, core and upper body. These will usually utilize a floor mat, resistance bands, or a physioball, and again anything Pilates based that can be done on the floor is great.

The Basics of the Horizontal to Upright Cardio Training

In the beginning, for this program you need to use equipment that keep you seated or horizontal: the recumbent bike, a rowing ergometer (such as the Concept II rower), and swimming (or kicking with just a kickboard) because they will not exacerbate any symptoms you have by being in the upright position. Use these modes until you feel you are ready to try moving on to the upright bike (incorporate this for a few weeks), the elliptical (incorporate this for a few weeks—no arm motion at first) and then some treadmill walking (no incline at first). Lastly, you can increase speed and grade on the treadmill as is necessary to keep your heart rate in the correct heart rate zone for your workouts. You may not be able to add an incline on the treadmill until after you have completed Month 3 of training. It may be hard to imagine walking on the treadmill for exercise right now, but most POTS patients that have done this program have been able to utilize a treadmill for walking workouts by the end of Month 3 or 4.

The rower is one of the best pieces of cardio equipment you can use to strengthen your heart. Please do not be afraid of it! Ask someone at your gym to teach you how to use it, and we recommend continuing to use the rower for occasional workouts throughout your training (and for the rest of your life!).

The 10 minute warm up and cool down can be done on any piece of equipment and should not be skipped. At the end of your warm up you should have your heart rate approaching the appropriate heart rate range for your prescribed workout, so you can simply begin your workout time then. For the cool down, simply remove all resistance from the piece of equipment you are using and slow down. In the beginning, your heart rate will take a long time to recover (and may not fully recover until after you leave the gym), but as you become more trained, it will lower more quickly during your cool down. We would recommend a bit of stretching during or after your 10 minute cool down is complete.

TIPS:

- Go to the following site for rowing technique: <http://www.concept2.com/us/training/technique.asp>
- If you never have access to a Concept II rower you still can use this program with success.

- If you have unbearable symptoms when first trying a more upright mode, then simply return to the more horizontal mode. You should then try something more upright again in a few weeks.
- If you want to use two different pieces of equipment (for example, 15 minutes on the upright bike and then 15 minutes on the rower) that is fine, just be sure you complete an entire 30 minutes with your heart rate in the appropriate training zone before cooling down.

Monitoring your Heart Rate

We recommend you purchase a heart rate monitor set (a watch with a chest strap) to monitor your heart rate during cardio exercise training so you can exercise in the proper heart rate zones. These can be found online or at a large sporting goods store. You do not need to purchase an expensive model. Each cardio workout is prescribed to be within a specific heart rate range (see Training Guidelines sheet from your healthcare provider), and it is important that you complete the workout in that heart rate range.

Your resting heart rate can be reduced by training, and sometimes it's unchanged and just your heart rate response to upright posture is lower. You should occasionally keep track of your morning, resting HR as you are becoming more trained to determine if it is lower so that your healthcare provider or trainer can adjust your workout training zones as necessary.

TIPS:

- Some monitors work even while swimming in the pool (for regular swimmers, cheapest models: Polar FT4 or RS100 best when used with the T31 hard chest strap).
- If you ever question what the monitor is reading (equipment can go bad or need new batteries), simply feel your pulse at your neck or wrist and count the beats for 15 seconds and multiply by 4 (heart beats per minute).

Long Term Maintenance Cardio Training

Moving on to Months 4-6 of training is very individual. Some people choose to just maintain the level of training laid out in Month 3 forever. For long-term maintenance beyond the program: use whatever modes you enjoy most, continuing to more upright activities, and still using the rower 1-2 times/week if you like it. Jogging and stair stepping should be saved for after you are able to complete workouts on the elliptical or fast walking at an incline completely symptom free, and you never have to do either of these activities if you never want to. But you may surprise yourself, we've had individuals take up running that never thought they would!

High intensity interval training like that which begins in calendar Month 4 has been shown to provide significant benefits to the cardiovascular response to exercise for healthy individuals and several patient populations. Anecdotally, we have found it to be beneficial to POTS patients that respond well to training when they are ready for it. An example of 3 x 1 minute intervals: a 10 minute warm up to get your HR up to Base Pace zone. Then for 1 minute go "all out", hard and fast, increasing the resistance and speed on the mode you are using...trying to get your HR up to your interval heart rate zone. Then for the next minute, you simply remove all resistance, slow down and actively recover. Get a drink, but keep moving on the piece of equipment. It doesn't matter what your HR gets down to. Then you repeat this "all out" 1 min interval followed by a 1 min active recovery, and repeat a third time (i.e. 3 x 1 min intervals). Then do a 10 min cool down and a 20 minute Recovery workout. At first, the upright bike, rower, or elliptical are safest vs. the treadmill for interval training.

You can still do a 5 min. warm up and cool down on base pace and MSS workout days—and we would recommend this. In Month 4 and beyond, there are not recovery work outs necessarily exactly following MSS work outs. You can add any strength training you want, and try other things like yoga, aerobics classes, returning to competitive sports as you feel able (we still would not recommend any exercise in the heat however). Consider yourself on the path to wellness and do what you feel you can do! We often hear that symptoms continue to diminish with long-term training. Each patient progresses through the program to upright exercise at a different pace. And you need never do any jogging in your life if you do not wish.

Visits with your Doctor or Healthcare Provider

This is up to the two of you, but we say please be proactive about seeing your doctor as needed during and especially after the training program is completed. Some patients need monthly appointments, and others every 3 months, and then every 6 months – 1 year. It is important to take your training logs to your health care provider that is monitoring you, so you can discuss the training together.

TIPS:

- Routine orthostatic 10 minute stand testing can be a valuable tool in assessing progress at office visits. Also, this provides an opportunity to adjust heart rate training zones if your healthcare provider developed your zones.

Medication use while following this Training Program

Please consult your healthcare provider on this issue. It is important for us to point out that our original published research using this training program was done with patients off all medications prescribed for POTS. Our World-Wide POTS Registry Study has been conducted with the vast majority of the patients in an unmedicated state as well. Ideally, it is best to hold all of your medication for POTS that affects your heart rate and blood pressure while training, but this is up to your healthcare provider. Your healthcare provider can only prescribe heart rate training zones that are determined while off beta blockers. If you choose to continue a beta blocker while following the training you will not be able to follow the heart rate zones. You will need to gauge each workout based on a Rating of Perceived Exertion (a subjective measure of how hard you feel like you're exercising), which are listed next to the heart rate zones on the Training Guidelines sheet. Most healthcare providers choose to wean patients off medications they may have been prescribed before starting the training or during the training.

TIPS:

- If staying on a beta blocker and only following RPE for intensity of cardio workouts:
 - Recovery workouts should feel light and easy.
 - Base Pace workouts should feel moderate and you should sweat and be breathing harder, but you should be able to talk to someone next to you.
 - MSS workouts are tough, and again you'll definitely sweat and be breathing hard, but maybe not be able to carry on a conversation during these workouts.

What to Expect Getting Started

This program is not an easy fix to having POTS, and if exercise made everyone feel better in a matter of weeks, everyone would be doing it. The real results that you may see will come after several committed months of training. It is our experience in training POTS patients that the first month may be very difficult, and you may very well feel increased fatigue during this month. This is not surprising, so do not give up! You are challenging your system to do things it CAN do, but is not USED TO doing. The second month may still be tough. The hope is that you'll feel less fatigue, begin to sleep better, and suffer from less POTS symptoms in your daily life than you did before beginning the training. This is the goal!!!

TIPS:

- Check in with your healthcare provider anytime you feel you need to as they know you and your condition very well.
- Your commitment and mental toughness are keys.
- When you begin with a new mode of training, it is not uncommon to feel increased fatigue. Listen to your body. Push forward when you can, or repeat a week if you feel you need to.
- If you are anything like the individuals we've met with POTS, you no doubt do not feel good a majority of the time, and have tried several other things to make your condition better. Here is the question your doctor has posed to you: Why not give this program your utmost effort for 3 full months (or 5 months if you're beginning with the Pre Months) before deciding if it helps you or not? Remember the benefits of training occur after months of training and not just days or weeks.
- Write down a list of things you want to resume in your life, tape it to your bathroom mirror, and read it every day. Read it especially on the days you do not feel like going to the gym—Allow it to help motivate you to get your quality of life back.
- Get a workout buddy if you need one! They can't follow your HR zones, but they can work out with you!

- Ensure your family is on board with supporting you in this journey. Help them understand you may feel more tired in the beginning, but the hope will be to feel better in the long run.

Exercise as Your Lifelong Therapy

If you feel that exercise is helpful for you in any way, maintaining exercise will then be important for you to sustain the benefits and continue to see further improvements in your health and quality of life.

Furthermore, you will experience the benefits of regular exercise in many other areas of your life and health as well. Many patients successfully resume caring for their children, full-time work, full-time school, or enter college when previously they thought these things might be impossible. We sincerely hope that this is the case for you as well. Keep in mind that according to the American College of Sports Medicine (ACSM) every healthy adult should perform 30-60 minutes of exercise more days than not. Most of our patients adopt exercise as part of their daily personal hygiene program. Some patients feel that daily exercise is needed to avoid developing symptoms.

If you have an illness, setback, or quit exercise and realize you felt better while training, this is actually a good sign! Do not be discouraged. You have a good response to exercise and know it makes you feel better! Just start again. You likely need to begin with horizontal modes of training, but now know how to progress yourself to upright modes as you can tolerate.

Patients Sharing This Program with Other POTS Patients

We do ask that you do not share this program beyond your own personal use. We feel strongly that each patient undergoing an exercise program needs to be monitored by their healthcare provider regularly. Any healthcare provider around the world can contact Dr. Levine's team in Dallas for this information to use at their discretion with their own patients. If you have any specific questions about your condition or use of the program, they need to be directed to the healthcare provider that has given you this program for your treatment.

YOU CAN DO IT!!

This Information Provided by:

Dr. Benjamin Levine and Team

Kimberly Carter, APRN, FNP-C

Institute for Exercise and Environmental
Medicine 7232 Greenville Avenue, Suite 435
Dallas, TX 75231

Ph: 214-345-4619

www.ieemphd.org

THRIEMPOTSTRegistry@TexasHealth.org

Our Recent Publications Related to POTS

- Shibata S, Fu Q, Bivens TB, Hastings JL, Wang W, Levine BD. Short-term exercise training improves cardiovascular response to exercise in the Postural Orthostatic Tachycardia Syndrome. *Journal of Physiology* 590.15, 3495-3505, 2012.

- Fu Q, VanGundy TB, Shibata S, Auchus RJ, Williams GH, Levine BD. Exercise training versus propranolol in the treatment of the postural orthostatic tachycardia syndrome. *Hypertension* 58(2); 167-75, 2011.

- Galbreath MM, Shibata S, VanGundy TB, Okazaki K, Fu Q, Levine BD. Effects of exercise training on arterial-cardiac baroreflex function in POTS. *Clinical Autonomic Research* 21(2):73-80, 2011.

- Fu Q, VanGundy TB, Galbreath MM, Shibata S, Jain M, Hastings JL, Bhella PS, Levine BD. Cardiac origins of the Postural Orthostatic Tachycardia Syndrome. *Journal of the American College of Cardiology* 55(25): 2858-2868, 2010.

- Fu Q, VanGundy TB, Shibata S, Auchus RJ, Williams GH, Levine BD. Menstrual cycle affects renal-adrenal and hemodynamic responses during prolonged standing in the postural orthostatic tachycardia syndrome. *Hypertension* 56(1): 82-90, 2010.

POTS Global Training Guidelines for Cardio

1. Your healthcare provider will calculate heart rate training zones specific FOR YOU, and enter them below. Use these zones in collaboration with the POTS Monthly Workout Calendars and the "Instructions for POTS Training" that should be provided by your healthcare provider.
2. Specific workout heart rate zones are individually prescribed by your healthcare provider based on your age and the fact you've been diagnosed with POTS. The heart rate at the "maximal steady state" or MSS is set at approximately 75% of your heart rate reserve. The workout zones are structured around the MSS value. The workout zones are defined as follows:

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		16-18
Base Pace		13-15
Recovery		6-12

3. If these heart rate zones feel too easy or too difficult, please discuss with your healthcare provider (keep in mind in the beginning most of the workouts may feel tough). Medications can affect your ability to achieve these zones. As you become "trained," your zones may need adjusting.
4. If you use the example Training Log to track your cardio workouts, here are some helpful definitions:

Training Zone – example: Recovery, Base Pace, MSS or Intervals

Mode – Recumbent bike, Upright bike, rower, elliptical, swim, walk, etc.

Rating of Perceived Exertion (RPE):

Subjective rating of the entire cardio workout on a scale of 6 to 20:

6 is very, very easy

11 is fairly easy

13 is somewhat hard

15 is hard

17 is very hard

19 is very, very hard

Sleep – How much sleep you got the night BEFORE.

Weather – examples: warm, humid, windy, cold (or indoor workout)

Note: Exercise in the heat is not recommended for patients with POTS.

For Healthcare Provider to Calculate Heart Rate Zones for POTS Training Program

You'll Need:

1. Individual's Age
2. 10 minute Stand Test Heart Rates, additional resting HRs from home if you feel their lying, resting HR in the office is elevated.
3. If they've recently performed a max exercise test, and you know your max HR and other data, it can be helpful as well.

Method:

1. Determine approximate maximal Heart Rate
 - a. Take $220 - \text{age} = \text{Max HR}$
2. Determine the Heart Rate Reserve (HRR)
 - a. $\text{Max HR} - \text{Supine Resting HR (from stand test or morning resting HR's averaged)} = \text{HRR}$
3. Take $\text{HRR} \times 0.75 = 75\% \text{ of HRR}$
4. Determine mid Maximal Steady State (MSS) heart rate
 - a. Add 75% of HRR + Supine Resting HR = Mid MSS heart rate
5. Determine the MSS training zone
 - a. 5 beats above and below the mid MSS HR
6. Determine the Base Pace training zone
 - a. the 20 beat range below the MSS zone
7. Determine Recovery zone
 - a. < the lowest Base Pace HR
8. Determine the Race Pace training zone
 - a. 10 to 15 beat zone that is > highest MSS HR (but top end not higher than 95% of Max HR)
9. Determine the Interval training zone
 - a. > highest Race Pace but not higher than Max HR (i.e. > approx 95% of Max HR)

Example:

17 year old POTS patient. Lying, resting HR = 95, Might be high, but home resting morning HR's similar. 1 min standing HR = 120, 3 min standing HR = 127, 5 min standing HR = 130, 10 min standing HR = 137. Take $220 - 17 = 203$ (max HR). $203 - 95 = 108$ (HRR). $108 \times 0.75 = 81$ (75% of HRR). $81 + 95 = 176$ (mid MSS heart rate). So, MSS training zone is 171-181. And the low end of that $171 - 20 = 151$. So, Base Pace zone is 151-170. Recovery zone is then anything lower than 151. Zones above the MSS: Race pace zone is determined by finding $0.95 \times \text{max of } 203 = 193$. So, Race pace is 182 – 193 and indeed this is an 11 beat zone (this is good, Race pace needs to be around 10-15 beats usually). And you've already found the interval zone, anything above 193.

- If the patient's office supine resting HR after 10 minutes of quiet rest is elevated, ask them to obtain a resting HR while at home first thing in the morning for a few days. Average this HR for supine HR.
- If the patient has recently done a maximal exercise test, and you believe they were able to achieve a max effort, use this as their max heart rate instead of taking 220-age.
- The original 3 Month POTS Training Program only utilizes MSS, Base Pace, and Recovery Heart Rate Zones. At month 4 we recommend starting to include Interval Training, so we give them all 5 heart rate zones in the beginning.
- Very severe patients may need zones adjusted up 5-8 beats (it doesn't take much exercise to elicit a very high heart rate from them, even when not in the upright posture).
- This is a guide that works very well for 95% of patients. If a patient is rating workouts incredibly high or low, minor adjustments may need to be made. We've usually only adjusted zones by 5-8 beats up or down as necessary. Again, this is not common, but needs to be kept in mind.
- If you think a patient's supine resting heart rate has dramatically changed, you need to recalculate zones based on their new lying, resting heart rate.

with
canner™

Scanned with
 CamScanner™

22125000

24

Pre-Month 1

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
1	2 Training Mode 1 5-10 min Warm Up 3 min Base Pace 2 min recovery 3 min Base Pace 5-10 min Cool Dwn	3 Weight Training	4 Training Mode 1 5-10 min Warm Up 3 min Base Pace 2 min recovery 3 min Base Pace 5-10 min Cool Dwn	5 Weight Training	6 Training Mode 1 5-10 min Warm Up 3 min Base Pace 2 min recovery 3 min Base Pace 5-10 min Cool Dwn	7
8	9 Training Mode 1 5-10 min Warm Up 4 min Base Pace 3 min recovery 4 min Base Pace 5-10 min Cool Dwn	10 Weight Training	11 Training Mode 1 5-10 min Warm Up 4 min Base Pace 3 min recovery 4 min Base Pace 5-10 min Cool Dwn	12 Weight Training	13 Training Mode 1 5-10 min Warm Up 5 min Base Pace 3 min recovery 5 min Base Pace 5-10 min Cool Dwn	14
15	16 Training Mode 1 5-10 min Warm Up 5 min Base Pace 3 min recovery 5 min Base Pace 5-10 min Cool Dwn	17 Weight Training	18 Training Mode 1 5-10 min Warm Up 6 min Base Pace 3 min recovery 6 min Base Pace 5-10 min Cool Dwn	19 Weight Training	20 Training Mode 1 5-10 min Warm Up 6 min Base Pace 3 min recovery 6 min Base Pace 5-10 min Cool Dwn	21
22	23 Training Mode 1 5-10 min Warm Up 6 min Base Pace 3 min recovery 5 min Base Pace 5-10 min Cool Dwn	24 Weight Training	25 Training Mode 1 5-10 min Warm Up 7 min Base Pace 3 min recovery 5 min Base Pace 5-10 min Cool Dwn	26 Weight Training	27 Training Mode 1 5-10 min Warm Up 7 min Base Pace 3 min recovery 5 min Base Pace 5-10 min Cool Dwn	28

Training Mode 1 = any of: supine cycling, recumbent bike, swimming laps, swimming laps with a kick board, rowing (Concept II preferred) Recovery = slow down, reduce resistance, get a drink, but don't stop moving

--Warm Ups and Cool Downs are done starting very slowly with little (or no) resistance and leading up to and out of your Base Pace HR zone.

--Physical therapist can begin with **supine cycling** only if a patient is beginning program as wheel-chair bound/bedridden.

--Weight Training can be done on same days as cardio workouts if necessary.

Pre-Month 2

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
1	2 Training Mode 1 10 min Warm Up 5 min Base Pace 2 min recovery 5 min Base Pace 2 min recovery 5 min Base Pace 10 min Cool Down	3 Weight Training	4 Training Mode 1 10 min Warm Up 5 min Base Pace 2 min recovery 5 min Base Pace 2 min recovery 5 min Base Pace 10 min Cool Down	5 Weight Training	6 Training Mode 1 10 min Warm Up 5 min Base Pace 2 min recovery 5 min Base Pace 2 min recovery 5 min Base Pace 10 min Cool Down	7
8	9 Training Mode 1 10 min Warm Up 6 min Base Pace 2 min recovery 6 min Base Pace 2 min recovery 6 min Base Pace 10 min Cool Down	10 Weight Training	11 Training Mode 1 10 min Warm Up 7 min Base Pace 2 min recovery 7 min Base Pace 2 min recovery 7 min Base Pace 10 min Cool Down	12 Weight Training	13 Training Mode 1 10 min Warm Up 8 min Base Pace 2 min recovery 8 min Base Pace 2 min recovery 8 min Base Pace 10 min Cool Down	14
15	16 Training Mode 1 10 min Warm Up 10 min Base Pace 3 min recovery 10 min Base Pace 10 min Cool Down	17 Weight Training	18 Training Mode 1 10 min Warm Up 11 min Base Pace 3 min recovery 11 min Base Pace 10 min Cool Down	19 Weight Training	20 Training Mode 1 10 min Warm Up 12 min Base Pace 3 min recovery 12 min Base Pace 10 min Cool Down	21
22	23 Training Mode 1 10 min Warm Up 13 min Base Pace 4 min recovery 13 min Base Pace 10 min Cool Down	24 Weight Training	25 Training Mode 1 10 min Warm Up 14 min Base Pace 5 min recovery 14 min Base Pace 10 min Cool Down	26 Weight Training	27 Training Mode 1 10 min Warm Up 15 min Base Pace 5 min recovery 15 min Base Pace 10 min Cool Down	28
29	30 Training Mode 1 10 min Warm Up 20 min Base Pace 10 min Cool Down	31 Weight Training	32 Training Mode 1 10 min Warm Up 24 min Base Pace 10 min Cool Down	33 Weight Training	34 Training Mode 1 10 min Warm Up 27 min Base Pace 10 min Cool Down	35

Training Mode 1 = any of: supine cycling, recumbent bike, swimming laps, swimming laps with a kick board, rowing (Concept II preferred) Recovery = slow down, reduce resistance, get a drink, but don't stop moving

—Warm Ups and Cool Downs are done very slowly with little resistance and leading up to and out of your Base Pace HR zone. —Weight Training can be done on same days as cardio workouts if necessary.

Month 1

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
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.

Month 2

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
1	2 Training Mode 1 5 min Warm-Up 30 min Base Pace 5 min Cool-down	3 Weight Training	4 Training Mode 2 5 min Warm-Up 20 min Base Pace 5 min Cool-down	5 Weight Training	6 Training Mode 2 5 min Warm-Up 20 min Base Pace 5 min Cool-down	7
8 Training Mode 1-2 5 min Warm-Up 30 min Base Pace 5 min Cool-down	9 Weight Training	5 Training Mode 2 5 min Warm-Up 30 min Base Pace 5 min Cool-down	11 Weight Training	12 Training Mode 1-2 5 min Warm-Up 25 min MSS 5 min Cool-down	13 Training Mode 1 40 min Recovery	14
15 Training Mode 1-2 5 min Warm-Up 40 min Base Pace 5 min Cool-down	16 Weight Training	17	18 Training Mode 1-2 5 min Warm-Up 30 min MSS 5 min Cool-down	19 Training Mode 1 40 min Recovery	20 Weight Training	21 Training Mode 1-2 5 min Warm-Up 35 min Base Pace 5 min Cool-down
22	23 Weight Training	24 Training Mode 1-2 5 min Warm-Up 35 min MSS 5 min Cool-down	25 Training Mode 1 40 min Recovery	26 Training Mode 2-3 5 min Warm-Up 30 min Base Pace 5 min Cool-down	27 Weight Training	28 Training Mode 1-2 5 min Warm-Up 40 min Base Pace 5 min Cool-down

Training Mode 1 = Any of: Recumbent Biking, Swimming, Rowing (Concept II preferred)

Training Mode 1-2 = Either Upright bike or Rowing

Training Mode 2 = Upright Bike

Training Mode 2-3 = Any of: Upright Bike, Treadmill walking (flat grade), Elliptical (stationary arms)

Weight Training can be done on same days as Cardio workouts if necessary.

Month 3

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1 Training Mode 2-3 5 min Warm-Up 35 min Base Pace 5 min Cool-down	2 Weight Training	3 Training Mode 2-3 5 min Warm-Up 35 min Base Pace 5 min Cool-down	4 Weight Training	5 Training Mode 2-3 5 min Warm-Up 35 min Base Pace 5 min Cool-down	6 Training Mode 2-3 5 min Warm-Up 35 min Base Pace 5 min Cool-down	7
8 Training Mode 2-3 5 min Warm-Up 40 min Base Pace 5 min Cool-down	9 Weight Training	10 Training Mode 2-3 5 min Warm-Up 30 min MSS 5 min Cool-down	11 Weight Training	12 Training Mode 2-3 40 min Recovery Weight Training	13 Training Mode 2-3 5 min Warm-Up 35 min Base Pace 5 min Cool-down	14
15 Training Mode 2-3 5 min Warm-Up 60 min Base Pace 5 min Cool-down	16 Weight Training	17 Training Mode 2-3 5 min Warm-Up 30 min Base Pace 5 min Cool-down	18 Weight Training	19 Training Mode 2-3 5 min Warm-Up 35 min MSS 5 min Cool-down	20 Training Mode 2-3 25 min Recovery Weight Training	21 Training Mode 2-3 5 min Warm-Up 50 min Base Pace 5 min Cool-down
22 Training Mode 3	23 Weight Training	24 Training Mode 2-3 5 min Warm-Up 45 min Base Pace 5 min Cool-down	25 Training Mode 3	26 Training Mode 3 5 min Warm-Up 40 min MSS 5 min Cool-down	27 Training Mode 2-3 25 min Recovery Weight Training	28

Training Mode 2-3 = Any of: Rowing, Upright Bike, Treadmill Walking, Elliptical – MIX IT UP when ready to the more upright modes! Training Mode 3 = If you're ready: Treadmill Walking or Elliptical. (If not, stick with Rowing and Upright Bike.)
Weight Training can be done on same days as Cardio workouts if necessary.

Month 4

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
1 45 min Base Pace	2 Weight Training	3 40 min Base Pace	4 60 min Base Pace	5 Weight Training	6 45 min Base Pace	7
8 Weight Training	9 30 min Base Pace	5 5 min Warm-Up 3x1 min Intervals 5 min Cool-down 20 min Recovery	11 45 min Base Pace	12 Weight Training	13 5 min Warm-Up 30 min MSS 5 min Cool-down	14
15 Weight Training	16 35 min Base Pace	17 5 min Warm-Up 35 min MSS 5 min Cool-down	18 Weight Training	19 5 min Warm-Up 4x1 min Intervals 5 min Cool-down 20 min Recovery	20 40 min Base Pace	21 25 min Recovery
22 60 min Base Pace	23 Weight Training	24 5 min Warm-Up 5x1 min Intervals 5 min Cool-down 20 min Recovery	25 45 min Base Pace	26 Weight Training	27 30 min Base Pace	28 5 min Warm-Up 30 min MSS 5 min Cool-down

Training Modes are not listed because individuals should continue to progress to upright modes as they can tolerate. We recommend beginning Interval training on the rower, upright bike or elliptical.
Weight Training can be done on same days as Cardio workouts if necessary.

Month 5

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
1	2	3	4	5	6	7
	60 min Base Pace	Weight Training	45 min Base Pace	45 min Base Pace	Weight Training	60 min Base Pace
8	9	5	11	12	13	14
Weight Training	5 min Warm-Up 5x2 min Intervals 5 min Cool-down 20 min Recovery	45 min Base Pace	40 min Base Pace	Weight Training	5 min Warm-Up 40 min MSS 5 min Cool-down	
15	16	17	18	19	20	21
60 min Base Pace	Weight Training	5 min Warm-Up 5x2 min Intervals 5 min Cool-down 20 min Recovery	45 min Base Pace	5 min Warm-Up 5x2 min Intervals 5 min Cool-down 20 min Recovery	Weight Training	5 min Warm-Up 40 min MSS 5 min Cool-down
22	23	24	25	26	27	28
60 min Base Pace	Weight Training	5 min Warm-Up 40 min MSS 5 min Cool-down	45 min Base Pace	5 min Warm-Up 5x2 min Intervals 5 min Cool-down 20 min Recovery	Weight Training	60 min Base Pace

Training Modes are not listed because individuals should continue to progress to upright modes as they can tolerate. We recommend beginning Interval training on the rower, upright bike or elliptical.

Weight Training can be done on same days as Cardio workouts if necessary.

Month 6

<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
1 Weight Training	2 45 min Base Pace	3 45 min Base Pace	4 45 min Base Pace	5 Weight Training	6 5min Warm-Up 40 min MSS 5min Cool-down	7
8 60 min Base Pace	9 Weight Training	10 45 min Base Pace	11 5min Warm-Up 45 min MSS 5min Cool-down	12 45 min Base Pace	13 Weight Training	14 5min Warm-Up 7x2 min Intervals 5min Cool-down 20 min Recovery
15 Weight Training	16 5min Warm-Up 5x3 min Intervals 5min Cool-down 20 min Recovery	17 45 min Base Pace	18 5min Warm-Up 45 min MSS 5min Cool-down	19 45 min Base Pace	20 5min Warm-Up 5x3 min Intervals 5min Cool-down 20 min Recovery	21 Weight Training
22 60 min Base Pace	23 Weight Training	24 5min Warm-Up 10x2 min Intervals 5min Cool-down 20 min Recovery	25 45 min Base Pace	26 5min Warm-Up 45 min MSS 5min Cool-down	27 Weight Training	28 60 min Base Pace
29 Weight Training	30 5min Warm-Up 45 min MSS 5min Cool-down	31 45 min Base Pace	Weight Training	45 min Base Pace	45 min Base Pace	

Training Modes are not listed because individuals should continue to progress to upright modes as they can tolerate.
 We recommend beginning Interval training on the rower, upright bike or elliptical.
 Weight Training can be done on same days as Cardio workouts if necessary.