FEATURE

How to Support Mitochondrial Resilience Through Precision Exercise

The pandemic hasn't been kind to our mitochondria. Precision exercise protocols to the rescue! *The Pulse* sat down with Dr. David Duizer, ND, to chat about how he uses exercise protocols to boost mitochondrial density, function and resilience in his practice.

INTERVIEW BY ANNA-LIZA BADALOO

Anna-Liza Badaloo: Is there an ideal amount and type of exercise to improve mitochondrial resilience?

Dr. David Duizer, ND: To a certain extent, more exercise is better and varying type and intensity is important for all patients. Lots of different types of exercises are effective for supporting mitochondrial health including sprint interval training (SIT), high intensity interval training (HIIT), endurance training and resistance training. In clinical practice deciding on the amount and type of exercise required depends on patient goals, current exercise limitations and noted areas for improvement.

When discussing mitochondrial resilience in the context of exercise therapy it is important to refer to what we can objectively measure and how they correlate with mitochondrial function. For example, improving lean muscle mass through resistance training contributes to improved mitochondrial density and improving VO2Max through aerobic and anaerobic training contributes to improved mitochondrial function.

As NDs we can support healthy improvements in lean muscle mass – which is significant as lean muscle can comprise up to 50% of our body weight. If we improve lean muscle mass, it's likely that we will achieve improved mitochondrial density, especially in an elderly population.

Since we know as clinicians that improvements in VO2Max correlate with improved mitochondrial capacity, we use this measure as a clinical indicator as measures of mitochondrial health and guide our patients to improved fitness levels. If we improve our ability to use oxygen at high intensities (as measured by

a metabolic analysis device), we will improve mitochondrial resilience. That's what we strive to accomplish at our clinic.

Because mitochondria are responsible for energy production through the use of oxygen, using near-infrared spectroscopy, we can use oxygen utilization capacity and recovery time to assess their function. As a patient's muscles consume oxygen and subsequently become replenished, we are assessing how a cell's mitochondria are functioning.

We have 3 goals at our clinic for improving mitochondrial health:

First, VO2 max enhancement – improving cardiovascular fitness. Second, strength improvement – building lean muscle mass. Third, muscle oxygen utilization and recovery time. If it takes a significant amount of time to recover, it could reflect poor mitochondrial health. These are the three markers that can be tracked. No special tests or equipment are essential as patient questionnaires can be used to obtain data.

What steps can you take to improve these three markers?

Common strategies used to support mitochondrial wellness include high intensity interval training (HIIT), Zone 2 aerobic training (70% of max heart rate) and progressive overload strength training (building lean muscle mass). Each has value for enhancing VO2Max, muscle recovery and strength. It is equally important to provide adequate nutrition to facilitate mitochondrial health, a topic for another time.

Not all goals need to be applied to every patient. Starting with one is reasonable. For example, for an ME/CFS patient, we may only assess muscle recovery time. It could be as simple as asking a patient to do one exercise, and assessing how quickly they recover.

In my chronic disease practice, I have the fortunate ability to provide VO2Max and muscle recovery assessments. These in-office tests tend to support patient compliance.

What happens when you improve mitochondrial function? Activities of daily living are easier, we see improvements in quality of life, subjective energy as well as sleep and stress resilience measures.

How do we make these protocols patient-specific? We start by discussing the three goals outlined above, consider patient-specific factors like age, injury, fitness level, etc. and build a plan appropriate for them. In our practice we know everyone's zones of training because we do metabolic analysis, but the use of the Rate of Perceived Exertion (RPE) scale can be just as valuable. We also work hard to ensure that the exercises we recommend are accessible to the patient, and we encourage outdoor training when possible.

What is the most important factor to consider when designing a precision exercise protocol?

Definitely the patient's current fitness level and experience with different types of exercise. As my practice focuses on adjunctive cancer care, autoimmune conditions and cardiovascular health, many of my patients are starting their program at a VO2Max below the 50th percentile for their age. They tend to not have experience with exercise. I have to teach them how to lift weights and how to train both aerobically and anaerobically. I also provide practical guidance such as the best exercise bike to buy online, the least expensive treadmill and the best heart rate monitor for them (if any).

As an ND, I love that I have lots of time to go deep with patients. Tracking the markers that I mentioned is both easy and inspiring. It's so rewarding to see the results, and be able to pivot and make changes.

How do you best take into account the patient's training experience?

We do this by adequately assessing the patient prior to prescribing and starting their program slowly. This requires a proper health history including exercise history, health barriers to training and rapid follow-up to teach progression, periodization and autoregulation. Progression refers to starting slow and continually building on our program to increase fitness. Periodization refers to shifting exercise techniques to support a holistic approach to mitochondrial health. Autoregulation refers to empowering the patient to make changes to their program to suit their changing fitness level and recovery time.

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Next, we look to teach the value of using heart rate training. We set targets and form a prescription that includes the heart rate minimum and maximum, and the amount of time they should be exercising per session, and number of sessions per week. For patients without a heart monitor, we use the rate of perceived exertion scale.

For patients who don't do metabolic testing, we use an evidence-based approach of getting to 65% to 80% of heart rate max (220 minus your age) during aerobic training. I will suggest training at 70% of max heart rate, two or three times a week, which can improve VO2 max over time.

What are your go-to tests and assessments for mitochondrial function?

Conventionally, mitochondrial disorders are typically assessed by genetic specialists and other health professionals. Functional mitochondrial assessments used in chronic disease can include the OAT (Organic Acids Tests). It's not required, but we often find specifics that could support an individualized, holistic program. We consider nutrient assessments which can inform us – what goes into the Krebs cycle, and is there enough of it?

We also like to look at what impacts the mitochondria, and what markers are available. Inflammation impacts the mitochondria – we test CRP (C-reactive protein). Oxidative stress impacts the mitochondria – testing 8-OHdg (8-hydroxy-2-deoxyguanosine) can be valuable. We often consider doing an oxidative stress panel, including a nutrient test. The real question is: what is the insult that got us here? It could be environmental toxins, heavy metals, viral and bacterial infections, etc. This can be obtained through an efficient health history. Often our patients have already done these tests and simply bring me the results.

During metabolic testing we can assess fuel utilization at rest and during exercise. If a patient has to tap into their carbs too much (inefficient free fatty acid burning is a sign of mitochondrial dysfunction), they will burn out during training and shifting to recovery assessments could be valuable.

We need to be in tune with how our heart is responding to the intensity that we apply.

What indications do you look for when deciding whether to treat a patient from the mitochondrial wellness angle?

We tend to look at it from two different viewpoints. First, we think of the mitochondria as the energy producers for the body. If energy is low this is a place for us to intervene. In this same realm we look out for low mood, poor stress resilience, more mental/emotional issues, poor sleep and appetite, and toxin exposures.

Second, we consider condition-based management strategies. Metabolic conditions like insulin resistance, cardiovascular disease, and inflammatory conditions – is it the chicken or the egg? If CRP is elevated in inflammation, there will be poor mitochondrial function. Recently, I worked with someone with RA (Rheumatoid arthritis) and a CRP of 10. They can do exercises, but they can't recover well enough. Supporting mitochondrial health is achieved when we improve recovery times.

Part of this second angle is disease from exposure or environmental conditions. Viral conditions like Mono, Lyme disease and post-COVID syndrome likely affect our mitochondria and taking this approach to recovery might be valuable.

How can recovery time help assess mitochondrial wellness?

I find it really helpful. I came to this strategy the way that many NDs do – through patient frustration. If I don't see patients getting leaner and fitter with more energy, I have to ask what's going on. I'm driven to help people become well quickly. When it doesn't work, it incentivizes me to deepen my assessment.

That's how I started using technology to assess blood flow and oxygen levels during exercise. How quickly tissues replenish themselves is a direct reflection of how healthy the mitochondria are. You know those patients who follow your exercise protocols, but it just doesn't work or they tend to become burned out? Their recovery time is poor. After about a month of training, patients should recover within 12 hours after exercise.

Can over-exercising damage the mitochondria?

There was a great study showing that when a group of athletes were training at 90% of their heart rate max for interval sessions lasting 2 hours per week, their muscle biopsies showed mitochondrial dysfunction and lack of density building. Their blood work showed worsening of substrate utilization during aerobic respiration.

Compare that to those doing the same intensity training, but for only 1.5 hours per week. They saw improvement in mitochondrial function and density. What's important about this study? If you're not doing heart rate training, someone can get to 90% of the heart rate, but not feel it. They may feel that their legs are what's stopping them from going further. We need to be in tune with how our heart is responding to the intensity that we apply.

It's very difficult for most people to exercise too much – typically elite athletes are the ones who run this risk. It's like when you hear that exercise depresses the immune system. You would have to work out at 65% of your heart rate max for over an hour, for this to become an issue. Working out for less than an hour actually provides an immune boost. We have to keep our patients safe and so being clear about risk is important while also encouraging safe exercise progression.

How do you help patients prevent injuries?

We keep intensity, duration and frequency minimal at first. We choose exercise types that patients are familiar with or take extra steps to properly teach technique. We make sure patients understand the rationale for warm-ups – increasing blood flow and mobility. For strength training, have patients take the first few sets really easy. We do sometimes have challenges in getting people out of their old ways. The standard '3 sets of 30 reps' approach sets the stage for a chronic overuse injury. Have them lift heavier, but do less reps. We're going for strength, which means 8–12 reps. Any more than that could set them up for injury.

Many of our patients already have joint issues when they come to us. For them we do swimming, rowing and functional training while still trying to get their heart rate up. We strive to reduce the impact by encouraging patients to buy the best workout shoes they can afford.

What pandemic-specific factors that affect exercise should NDs keep in mind?

The two most important comorbidities to manage in COVID prevention are chronic lung disease and obesity. Neither of which is being talked about enough – these are two very modifiable conditions! Exercise prescriptions for cardiovascular exercise and strength resistance are appropriate for both of these comorbidities.

During this pandemic we have an opportunity to present our knowledge in a way that's highly applicable to the times. To improve lung health and metabolic wellness – both aerobic and anaerobic training are valuable. HIIT is great for the heart, and strength training is good for glucose management and all aspects of metabolic wellness.

Want to learn more? David's OAND webinar Optimizing Exercise for Mitochondrial Health and Longevity held on July 7 focused on mitochondrial wellness, and how to design precision exercise protocols to improve mitochondrial density, function, and prevent age-related decline. Look out soon for the recording!