



## Bruno Bytes 1<sup>st</sup> Quarter, 2023

From [Richard L. Bruno, HD, PhD](#)  
Director, International Centre for Polio Education

### 1st Quarter 2023 Topics Include:

Chronic Pain, Muscle Fibers, Muscle Sprouts, Muscle Spasms and the Types of Polio

### On the topic of Chronic Pain

Dr. Bruno's Original Post: "Flexibility" is the Key to Mental Wellbeing In Spite of Chronic Pain. Research has found the biggest threat to the mental health of people living with chronic pain isn't necessarily how intense their pain is, but the extent to which it interferes with their daily life...

From Australia's Edith Cowan University:

"Chronic pain impacts around 20 per cent of the population. Along with the medical and physical effects it can have far-reaching consequences for employment, lifestyle and mental health. A new Edith Cowan University (ECU) study has found that for people living with chronic pain it's not necessarily how intense their pain is, but the extent to which it interferes with their daily life that can pose the biggest threat to their mental health."

"ECU researchers Tara Swindells and Professor Joanne Dickson surveyed more than 300 people living with non-cancer-related chronic pain. Participants answered questions about their mental wellbeing, their 'pain intensity' and how much pain interfered ('pain interference') with their simple everyday pursuits and activities that mattered to them. Professor Dickson said their research findings suggest that as a result of pain, people might not have the psychological and/or physical capacity to participate in activities that help them attain their personal goals, which can have significant implications for their mental wellbeing."

"The good news is that this research showed personal goal flexibility (i.e., the ability to adapt and to adjust to life's difficulties and obstacles) in how we strive to maintain or achieve the things that matter to us can provide a protective buffer in maintaining and promoting mental wellbeing,' she said."

#### The Mental Health Impact

"Counter to prediction, Ms Swindells said the study showed 'pain interference' was reported as more problematic than 'pain intensity' for people living with chronic pain. 'These results suggest that it may be the pain interference on daily life, rather than the intensity of the pain, that impacts more negatively on mental wellbeing,' she said."

"Based on our results, it would seem that people can find ways to maintain their mental wellbeing when their pain intensity is high, so long as it does not interfere with important aspects of their daily life."

#### How Being 'Mentally' Flexible Helps

"Ms Swindells said the study investigated how persistently pursuing valued goals (goal tenacity) and adjusting those valued goals in response to setbacks or obstacles (goal flexibility) might help to explain how some individuals with chronic pain maintain a sense of mental wellbeing. 'The findings highlighted, for the first time, that distinct goal motivational processes appear to have a protective and buffering effect in maintaining mental wellbeing in those with chronic pain,' she said. 'Specifically, we found that goal flexibility and goal tenacity seem to buffer the negative emotional impacts of pain interference on mental wellbeing, and flexibility even more so than tenacity. So if you're able to adjust, adapt and find ways to still achieve what matters to you most in the face of life's obstacles, that's going to help protect your mental wellbeing.' "

Ms Swindells emphasised pain management and mental health are multi-faceted.

" 'Previous pain-related research has shown that physical factors (e.g., sleep, injury, disease) and social factors (e.g., employment, social support, economic factors) play a significant role in pain management,' she said. 'The findings from our study add to this body of knowledge. They indicate that variations in adaptive psychological processes provide another useful lens to understand the relationship between pain interference and mental wellbeing.' "

continued . . .

The findings from this study have implications for informing public health policy developments and public health campaigns focused on promoting psychological strengths rather than deficits, for example positive self-care messaging related to pain management.”

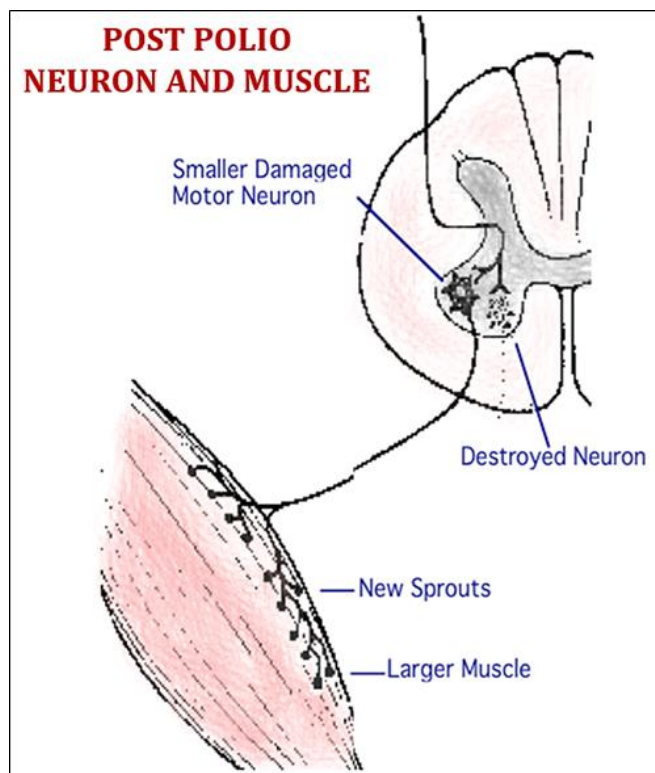
The paper ‘The Role of Adaptive Goal Processes in Mental Wellbeing in Chronic Pain’ was published in the [Int. Journal Environmental Res. and Pub. Health](https://doi.org/10.3389/fpsyg.2022.10278). Source: [www.mdpi.com/1660-4601/20/2/1278](https://www.mdpi.com/1660-4601/20/2/1278)

### On the Topic of Muscle Sprouts and “Fibers

#### SPROUTS AND FIBERS: The “Diet” of Polio Recovery

*“As polio survivors recovered strength after the initial onslaught, their individual muscles fibers grew and were on average twice the size of fibers in those who didn't have polio. Fibers also looked abnormal, appearing "moth eaten" and showing damage typically found only in heavy weight lifters. What's more, thanks to axonal sprouting, the remaining motor neurons turn on about 16 times more muscle fibers than in someone who didn't have polio.” From **The Polio Paradox***

Sprouting isn't unique to polio survivors. It occurs in motor neuron diseases and in normal aging; as motor neurons die their compatriots sprout to take over the newly orphaned muscle fibers. Unfortunately, older motor neurons sprouting to "adopt" orphaned muscle fibers comes at a cost. As polio survivors age, their reduced number of remaining, damaged motor neurons are metabolically stressed as they stimulate more and more muscle fibers. A handful of autopsies have been performed on polio survivors who died more than 40 years after having had polio and who reported muscle weakness later in life. Those polio survivors' motor neurons were found to be smaller in size and their sprouts were thinner than normal. This is no surprise. Neurons in older non-polio survivors have been found to be less able to make sprouts and, when they do, the sprouts are thinner and are not covered with myelin, the fatty insulation separating one sprout from another. What's more, fewer muscle fibers are reconnected to the new sprouts and less acetylcholine (the chemical that "tells" muscle fibers to contract) is released.



However, even if sprouts were insulated, fat and fully functioning, the muscle fibers they are supposed to turn on are not. Everyone who gets older, not just polio survivors, loses muscle fibers. Remaining fibers atrophy, get smaller in size. And aging muscle is not as pliable or as able to contract quickly as does younger muscle. These changes cause a loss of muscle strength, reduced muscle contraction speed and decreased muscle endurance as everyone ages. These effects of aging can further overwork polio survivors' decreasing number of damaged motor neurons and reduce polio survivors' muscle strength.

Given this description of the state of muscle fibers and motor neurons, is it any wonder that overexertion and exercise are the number one causes of PPS?

### On the Topic of Muscle Fibers and Polio

Question: When looking at people from the African nations we see a significant number of medal-winning long distance runners ...obviously due to their genetic makeup. So, this brings my thoughts to PPS: Did the poliovirus attack slow twitch, i.e., Type 1 endurance muscles more often than it attacked Type II fast acting muscles? Could one's muscle type leave one more genetically predisposed to contracting poliomyelitis?

continued . . .

## Dr. Bruno's Response: MUSCLE FIBERS and POLIO: SURPRISING CONNECTIONS

When we talk about polio and PPS, the focus is almost always on the damage poliovirus did to motor neurons, damage that prevented their stimulating muscle fibers and causing weakness or paralysis. But there's more to be said about post-polio muscle fibers. Let me try to give an oversimplified, but I hope understandable, description.

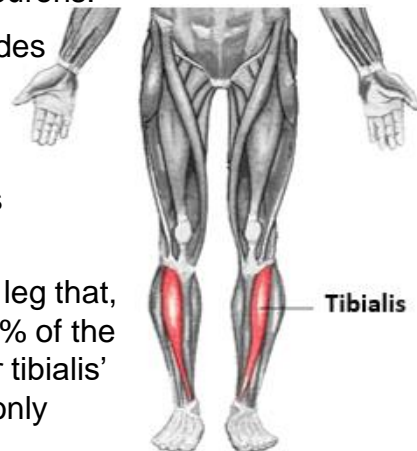
### MUSCLE FIBER TYPES

Muscles contains two types of fibers that contract when stimulated by motor neurons:

- Type I fibers are metabolically suited for sustained muscle activity that provides endurance.
- Type II fibers are metabolically suited for rapid movements, like sprinting, rather than running a marathon.

So while motor neurons activate all the fibers in a given muscle, the fiber types themselves have their own agendas: to provide endurance or speed.

For example, typically the anterior tibialis (the muscle in the front of your lower leg that, when its motor neurons are damaged by polio, causes foot drop) has about 75% of the "slow" Type I fibers and 25% of "fast" Type II fibers. When walking, the anterior tibialis' Type I fibers contract many times with each step, while Type II fibers contract only during rapid walking and then usually just a few times.

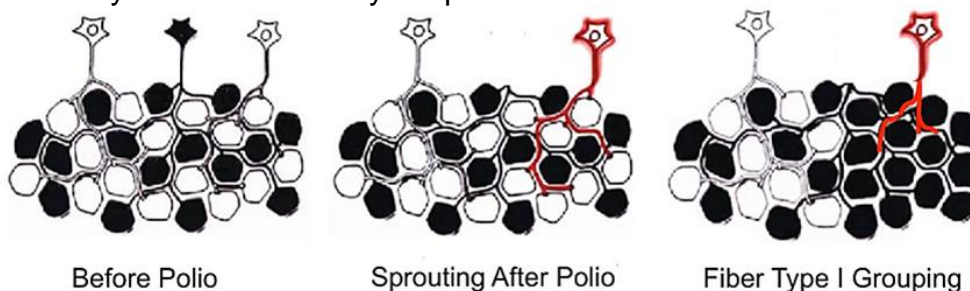


### POLIO AND MUSCLE FIBERS

The poliovirus did not attack muscle fibers. It attacked motor neurons. Yet muscle fibers were affected.

The above description of how Type I and Type II fibers function in walking is not the same for affected -- but still working -- post-polio muscles. Surviving motor neurons sent out "sprouts", like little telephone lines, to activate muscle fibers that were orphaned when their motor neurons died. This process of sprouting causes what's called "fiber type grouping". One study of the anterior tib muscle in polio survivors found that Type I "endurance" fibers predominated. Polio survivors had nearly 21% more Type I fibers as compared to nondisabled controls.

This Type I fiber "grouping" is seen in most other polio affected muscles where sprouting occurs. And grouping makes functional sense. Apparently the Type I muscle fibers "knew" that polio survivors needed endurance more than they needed the ability to sprint.



### ETHNICITY AND...MUSCLE FIBERS?

In his 2000 book *Taboo*, journalist Jon Entine makes a painstaking case that race and genetics are indeed "significant components" of the "stunning and undeniable dominance of black athletes."

Said Jim Holt in the "New York Times", "Entine cites credible research, for example, that blacks of West African ancestry (which would include most African-Americans) have a higher ratio of (Type II) muscle fibers than whites do, which gives them an edge at leaping and sprinting. East African blacks have more

continued . . .

energy-producing enzymes in their muscles and seem to process oxygen more efficiently, which translates into greater (Type I fiber) endurance.”

“But why conclude that such differences are encoded in the genes? Mightn't there be an environmental explanation? It is true that Kenyans have won every Boston Marathon since 1990, but these runners come from a mountainous region whose altitude is perfect for building aerobic capacity.”

The achievements of African runners “obviously due to their genetic makeup?”

Be careful not to separate nurture and nature.

### On the topic of Muscle Spasms

Question: I had polio at age 3 in 1954, affecting the left quadricep and ankle. I have not had to use assistive devices until now and I use a cane when I want to walk faster. I have just started doing Pilates but I am having muscle spasms making my left foot quiver a bit at rest. Is this related ? This has not happened before.

Additional Post: When I was diagnosed in 1999 I had an evaluation by the PT who treated the patients with neurological issues. One of the things she told me was not to take yoga. I also have muscle spasms, cramps, fasciculations, muscles that seize up. Sometimes the pain & acting up happens only when I'm at rest; other times it happens with activity, like when I'm trying to put on a coat or pull a shirt over my head. If I were you, I'd take those muscle spasms as a warning.

Dr. Bruno's Response: The easiest thing to do is stop Pilates and see what happens with the muscle spasms in your foot.

### On the Topic of the “Types” of Polio

Question: Can you get multiple “types” of Polio?

Dr. Bruno's Response: Yes, you can be infected at the same time with more than one type of poliovirus.

But, polio survivors should be very careful about their belief, often without evidence or as part of family lore, regarding the “types” of polio they had. This is especially important now that poliovirus from the oral vaccine has been found in wastewater in Canada, Israel, the UK and US, and you may be deciding if you need polio vaccination.

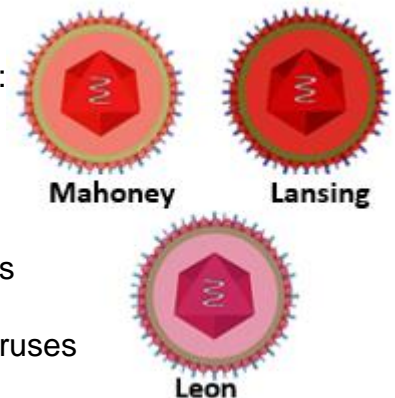
During the polio epidemics, and still today, there is confusion with there being three types of poliovirus and three types of clinical polio:

### **Three Types Of Polioviruses**

You could have been infected by one (or very rarely more than one) polioviruses:

- Type I (Mahoney, the epidemic strain that caused most cases of polio),
- Type II (Lansing) or
- Type III (Leon).

Statistically, polio survivors were infected only with the Type I poliovirus. Each of the three types of poliovirus is genetically different and therefore each requires its own unique polio vaccine to get the body to generate the specific antibodies needed to counteract each type of virus. Unfortunately, the three different polioviruses get confused with the “three types of clinical polio”:



### **Three Types Of Clinical Polio**

- Bulbar Polio
  - Indicates the virus affected your brain stem and would cause trouble swallowing and breathing;
- Spinal Polio
  - Indicates the virus primarily affected your spinal cord and would cause limb paralysis;

continued . . .

### Bulbar-Spinal Polio

- Indicates the virus affected both your brain stem and your spinal cord, which would cause limb paralysis and trouble swallowing and breathing.

Some polio survivors were told that the body areas affected were determined by infection with specific types of poliovirus. So, someone who had bulbar polio might have been told that they had one type of poliovirus, while someone with bulbar-spinal polio might have been told that they had two types of poliovirus. *Any* of the three polioviruses could have caused spinal, bulbar or bulbar-spinal symptoms.

The symptoms that you experienced were not predetermined by the type of poliovirus that got into your body. When you talk to your doctor about the need for polio vaccination, don't depend on your original polio symptoms or family memory to decide the type of poliovirus you had and type of vaccine you may need now.

**Check Your State's Health Department and CDC Websites  
and  
Talk To Your Doctor About The Need For Vaccination.**

- Adults who are unvaccinated or are unsure if they have been fully immunized (including polio survivors, who likely had only one type of polio) would need a total of 3 vaccine doses.
- Adults who only have had 1 or 2 doses of the polio vaccine would need to get all 3 doses.
- Adults who are at increased risk of exposure to poliovirus and who have previously completed a routine series of polio vaccine can consult with a health care provider and receive one lifetime "booster" dose of Injectable polio vaccine.

Polio Vaccination Recommendations for Specific Groups | CDC CDC.GOV

- <https://www.cdc.gov/vaccines/vpd/polio/public/index.html>
- <https://www.cdc.gov/vaccines/vpd/polio/hcp/recommendations.html?fbclid=IwAR330d-KK3yJWTAOwaWxioBbaVcgze-nnZuZwYESjaZoU3IS2cQU5yP8egI>

We have been collaborating with Dr. Bruno to publish [Bruno Bytes](#) since 2014.  
Every issue of Bruno "Bytes" is available PDF format.  
Feel free to download and share them.

[www.papolionetwork.org/bruno-bytes](http://www.papolionetwork.org/bruno-bytes)