

## Paralympics

### Dr. Jon Mulholland

Hi, everyone. My name is Dr. Jon Mulholland. I am a sports chiropractor and strength and conditioning coach in upstate New York. And what we're going to be discussing today is working with paralympic athletes and some of the medical concerns and treatment challenges that you have to be prepared to face and be familiar with as a sports medicine provider.

So what are we going to be covering? Number one-- we're going to be discussing very briefly just what are the different classifications of athletes, what types of disabilities compete against what other types of disabilities, and so on. Number two-- we're going to discuss some of the common injuries and common injury patterns that you're likely to see working with disabled athletes, and number 3, and probably most importantly, some of the unique medical concerns, injuries, et cetera that you need to be used to dealing with and handling, again, as sports medicine providers.

But very briefly, what are the Paralympics Games? Paralympic Games came about post World War II. And what they were finding was that with the tons of disabled soldiers and civilians with disabilities that traditional rehab were not meeting their needs. So enter this physician named Dr. Ludwig Guttmann, and what Dr. Guttmann did was founded something called the National Spinal Injuries Center. It became eventually known as the Stoke-Mandeville Hospital in Britain back in 1944.

Now where Dr. Guttmann was unique was that at the time it was unheard of to think of rehab and tying it together with sports and recreation. He was really the first, kind of a groundbreaker to tie together, hey, to rehab these individuals that are injured, maybe we can turn sport and get a moving better and making it more interesting for the athletes. Now, in July 29, 1948, so about three or four years later, Dr. Guttmann started to Stoke-Mandeville Games as they were known as then. And they were held right on the grounds of the facility.

And, initially, that first year they were only introduced with athletes with spinal cord injuries only as we'll talk about in a minute. They've grown significantly since. And even more interesting, archery was the only event offered that first year. Now, a lot of people ask, why archery? Well, interestingly, it is one of the only sports where people with spinal cord injuries, think people sitting in wheelchairs, actually have an equal chance of competing against able-bodied athletes, so he chose archery as a good introduction on fair play and how to make the two groups compete equally against one another.

It was such a popular event. It was held annually thereafter, eventually became known as the Paralympics Games, and now it just has exploded. The Paralympics Games are typically two to three weeks after the end of the traditional Olympic Games. The host cities of the Olympics now



are under contract. When they bid to host the Olympic Games, they also have to accept that they are also going to be hosting the Paralympic Games.

My introduction with paralympic athletes was I was the only chiropractor on the USA medical staff at the 2010 Paralympic Games in Vancouver and Whistler, British Columbia. I was thrown in not knowing what to expect. And, hopefully, what I can teach you here in the next 15 minutes or so are some of the lessons I learned. Now, in the Paralympic Games, athletes are divided into five categories based on their disabilities.

Now, among these five categories, there's a ton of different classifications. We're not going to get into that today, but be familiar with the five different groups of athletes. Number one are wheelchair athletes. Number two are anybody with amputees. That could be upper extremity, lower extremity, et cetera.


Number three are visual impairments, and, again, multiple different classifications under this category. They have fully blind athletes that use guides to lead them right down to partially blind. Number four are the cerebral palsy athletes, and number five is a group they call les autres, which is French for the others. OK, that might include osteogenesis imperfecta, dwarfism. Those would all fall under this category.

Now that we're familiar with the different groups, what are some of these common injuries and injury patterns you're likely to see with disabled athletes? Interestingly, looking back now, several Olympic and Paralympic Games-- they have some pretty interesting injury databases to draw from. And interestingly enough, the disabled athletes have similar injury rates as the able-bodied athletes. The difference is they can be very different patterns of injury. OK, again, going back over the last few Paralympic Games, it's about a 60 to 40 ratio.

60% of the injuries are acute, over use type things. 40% are more chronic type injuries. Now what are these patterns that are a little different in disabled athletes? Well, wheelchair athletes-- about 57% of all musculoskeletal injuries wheelchair athletes face are to do with the shoulder, elbow, and arm. Not surprising if you think of it. That's their primary means of locomotion is using the arms, and hands, and shoulder muscles to drive their chairs.

Visually impaired-- over half are ankle and lower extremity injuries. And, again, not to be callous, but the reason they injure their lower extremities is because they bump in and stumble to a lot of things, particularly when they're trying to compete while visually impaired. And the last group is cerebral palsy. About 21% of all musculoskeletal injuries with cerebral palsy occur to the knee.

Now, again, speculation, but one of the issues of cerebral palsy is a significant difficulty with motor control and the knee being primarily a fairly unstable joint people have trouble stabilizing the knee. There are able-bodied people who have trouble stabilizing the knee. Cerebral palsy people have even bigger difficulties that I think may be contributing to some of these high



incidence of knee injuries. Even though this overall risk of injury is the same, what I want you to be concerned with is that the functional consequences of these injuries in disabled athletes are much, much, much greater.

For example, let's say you've got a routine shoulder injury, maybe an AC joint sprain, maybe just a supraspinatus tendinitis. Well, that's fine in an able-bodied athlete. That becomes a nuisance. Maybe they have to tweak their training for a week or two. But in a let's say, for example, a C6 tetraplegic, it may compromise their life.

OK, if they've got an injury where they can't move their shoulder, now suddenly they can't remain independently mobile. They may not be able to perform activities of daily living. So the consequences are potentially much greater with these disabled athletes. You have to be aware of that.


Now those are the injuries. Now for the rest of the time, I want to talk to you about some of the unique medical concerns with this group of athletes. And there's four main conditions we will discuss-- two commonly known with most sports medicine people, two less commonly known. The four we're going to be covered is something called autonomic dysreflexia. We're going to mention thermoregulation issues.

We want to cover neurogenic bladder and pressure sores. Again, all of varying degrees of concern, some life threatening, others not so much, but you need to be familiar with all of them. So let's start with probably the most concerning one first. It's called autonomic dysreflexia.

A lot of people I lecture with have given this talk many, many times over the years, and most chiropractors and sports medicine people in general are not familiar if they've even heard of this condition before. What it is is it's typically seen in people with a spinal cord injury, SCI, people with spinal cord injuries at or above the level of T6, so T6 or higher are the group of people that tend to get this. And what it is is the end result is an uncontrolled sympathetic response to some sort of noxious stimuli.

If they get a noxious stimuli below the level of their spinal cord injuries, this is the chain of events that can start to happen. It is considered a medical emergency. You need to get him treated and evaluated and brought to the hospital as soon as possible. But to do that you need to recognize what it is and how to treat it. Prevention is crucial as is the case with most of these things we're going to discuss today.

Now, here's a little graphic for you. So what you're looking at here-- if you look in the bottom left, number one, this is the stimulus, potentially a noxious stimulus, but it could be as simple as a full bladder. It could be from a pressure sore that they're not feeling because, remember, this is below the level of their injury, so they have no sensation down here. So let's use the case of the graphic. So you've got a full bladder that's stimulating afferently up the spinal cord.



As that afferent stimulus goes up, there is a massive sympathetic response. And why that is is because you get this massive sympathetic response. It leads to vasoconstriction, step number 4 on the right of the screen. OK, so you get this vasoconstriction, which creates hypertension. And this is the key indicator of this disease or condition. You get this massive vasoconstriction.

You get a super spike in blood pressure. OK, now you've got baroreceptors in the blood vessels that detect this hypertension crisis going on, and it signals the brain to do something about it. So the brain starts to slow that heart rate to try to decrease the blood pressure. And you get these descending inhibitory signals.

The problem is because of the spinal cord injuries, these descending inhibitory signals are blocked. And so they're not effective at changing the vasoconstriction. They slow the heart rate, but because things have spiraled out of control, the blood pressure tends to continue to rise, and rise, and rise. Now, what are the symptoms you're looking for? Pounding headache is super common, hypertension, as I mentioned, and this can go through the roof.

There are instances with certain times exceeding 300 millimeters of mercury. This is another key one. They will tend to get profuse sweating and flushing but only above the level of the spinal cord lesion. Remember below that lesion, they're not going to be getting any of that, so they can get ridiculous amounts of flushing and sweating above the lesion.

They will also have bradycardia. Remember we mentioned that brain will signal descending inhibitory signals to slow that heart rate to try to get the blood pressure under control, so you will see a decrease in heart rate. You will see this gooseflesh, goose pimples on the skin. They will tend to get blurred vision as things get worse and also nasal congestion. That's part of this massive sympathetic response.

Now what are the complications once this condition starts to kick in? If it's not controlled quickly, seizures can develop, cerebral hemorrhage because, again, through the roof blood pressure. Cardiac arrhythmia can develop and ultimately death if things aren't fixed quickly. So, again, guys, make sure you recognize this as a life-threatening condition, autonomic dysreflexia.

Now what are the causes? I mentioned them before. Urinary tract infection would be one, this noxious stimulus below the level of a spinal cord injury, how about a blocked catheter with some of these athletes, constipation, urinary calculi, anal fissure-- OK, all problematic issues for these athletes, whether they're from sitting in wheelchairs or et cetera-- and, lastly, a skin infection.

Now interestingly enough, as a side note, similar to doping with able-bodied athletes-- and disabled athletes could also dope obviously-- there is something called boosting among paralympic athletes. It is 100% illegal. And what they actually do is try to create an autonomic dysreflexia to get the ergonomic benefits of having that increased blood pressure. So they will purposely clamp their catheter. They might tighten the leg straps on their wheelchair, or they



might even sit on sharp objects like a tack. Again, they're not feeling any of it, but they create this baseline initiation of this autonomic dysreflexia.

Now what are the effects of boosting? Increased blood pressure, obviously, but that leads to an increased cardiac output temporarily and possibly increased race performance. Now it's crazy to think about with the risks involved in doing this, but it is done from time to time. Considered completely unethical and illegal by the International Paralympic Committee.

Now how do you treat it? So you've got an athlete. You think this is going on. What are the steps you need to take? You need to sit them upright immediately if they're not already to try to induce some orthostatic hypotension to try to get that blood pressure down. Obviously, if you can, remove the precipitating stimulus if it's something you can do.

Obviously, if it's something internal, you're not going to be doing that on site. Again, anti-hypertensive meds-- if you've got a physician you're working with, anti-hypertensive meds if indicated. And then obviously if it's coming from a full bladder or constipation, you need to make sure they're maintaining bladder and bowel maintenance. So that's number one.

Number two-- thermoregulation issues. Now hot and cold-- these disabled athletes have a lot more trouble regulating heat and cold than able-bodied athletes do. That's because depending on the level of the spinal cord injury, they might have paralysis of some of the skeletal muscles and loss of some of this autonomic nervous system control, so don't need to memorize a bunch of stuff. Just understand that any of the threats able-bodied people have as far as heat and cold regulation disabled athletes are going to have a more difficult time in general at monitoring and controlling that.

Now with hyperthermia, so an increase in body temperature, you're going to see fatigue, weakness, dizziness, vomiting, all the same symptoms you'd see in able-bodied athletes. Sweating, however, may be excessive, again, above the level of the spinal cord injury. They can't sweat below, so they're going to make up for it by doubling or tripling down on the sweat where they can above the lesion. Again, this can be six times regular sweating rates.

Now the opposite, hypothermia-- what are the signs and symptoms? Confusion, apathy, clumsiness, again, all the same symptoms you see in anybody with hypothermia. They're just going to have trouble and going to be more susceptible to it at earlier times in the cold and at more moderate temperatures than you and I would be. Now, you've got someone having hyperthermic or hypothermic issues.

What do you do? Remove or add clothing depending on if they're hot or cold, get them out of the hot or cold, move them into an average environment, appropriate environment, and then either heat them or cool on gradually both internally and externally, and make sure they're staying hydrated. Now the third condition is something called neurogenic bladder. Again, very common

problem with spinal cord injury athletes. It predisposes them to a urinary tract infection, which, as we'll explain in a second, has big issues on its own.

This is the key is that they're more susceptible to getting a UTI, but the typical signs and symptoms we're used to looking for of a urinary tract infection may indeed be completely absent in spinal cord injury athletes. They don't have that sensation below the level of a lesion, so they're not going to have burning or pain with urination. They're not going to have this increased urgency to have to pee all the time. They're not going to have a full bladder sensation. So we're not going to see the typical early warning signs that you might, which makes prevention crucial.

Talk to them. Make sure they're maintaining bladder and bowel maintenance. Now what are the signs and symptoms of a neurogenic bladder? Fever, kidney or bladder pain in some cases, again, depending on the spinal cord injury, urinary incontinence, spasticity. And, again, it may ultimately lead to this condition of autonomic dysreflexia we just discussed.

Treatment, prevention of neurogenic bladder-- again if you've got physician's notes or working with a physician, antibiotic therapy is indicated and get the bladder empty if that's the cause and making sure they're maintaining proper hydration. Now, lastly, real quick, we want you to familiarize yourself with pressure sores. Now pressure sores are significant issues for wheelchair athletes, particular endurance wheelchair athletes that are spending more time in the chair.

The most commonly affected areas, common sense, would be the sacrum and along the ischial tuberosities. Now the problem is-- and I put this picture up of a cross-country ski athlete-- a lot of the racing wheelchairs, whether it's summer or winter games, they have a very aerodynamic and aggressive setup. You can see in this athlete how high those knees are pinned right to the chest. What that does is it puts a lot of extra body weight onto the sacrum and ischial tuberosity, which makes them even more susceptible, especially in an endurance athlete like this to developing these pressure sores.

Again, prevention is key. Now most of these athletes have been in wheelchairs for most, if not all, of their lives in some cases. So they're familiar with bladder maintenance and skin care, but it's your job to make sure that they're maintaining, shifting weight in the chair, using padding if it does develop into a problem and just keeping an eye on the skin. If you do see pressure sores starting to develop, dressing it properly, bio-occlusive dressing, maybe some electrical stimulation, and debridement as indicated depending on your scope of practice.

Now those are the big four. I love to end on this quote by Klenck and Gebke, two authors of one of the kind of leading textbooks on working with paralympians. "As the number of disabled athletes continues to grow, so do the challenges and responsibilities to care for this group. Sports medicine professionals must be ready to accept this responsibility."

That's where we come in. So I hope I was able to introduce a few new concepts, make you a little more aware, open your eyes to some of the unique challenges in working with disabled athletes. Hope you learned a few things, and it was a pleasure speaking to you.