Dr. Clewley: [00:00:00] Hey everyone this is Derek Clewley and glad you are joining us for this episode of this podcast where we discuss the Duke K lab with the program director, Dr. Tim Sell.

Intro: [00:00:13] Welcome to the Duke DPT podcast, a show designed to bridge academics and researchers with health care professionals. Now here is your host Derek Clewley - a faculty member and a budding academician at Duke University in the Doctor Physical Therapy division.

Dr. Clewley: [00:00:29] Today I am joined by our special guest Dr. Tim Sell the recording of this podcast time is very well with March Madness. And here at Duke University we get a little bit crazy about March Madness of course. So Dr. Sell has over 100 publications and this last year held close to one million dollars in external funding for his research work. Sell received a Bachelor of Science in physical therapy as well as a Master of Science in Human Movement Science with a biomechanics focus from the University of North Carolina at Chapel Hill and completing his Ph.D. in rehab science from the University of Pittsburgh. During his research career Tim has focused on the role of functional joint stability in the prevention of musculoskeletal injuries and the recovery of following injury and in reestablishing neuromuscular control following surgery. He has conducted research in many different populations from youth athletes to masters athletes recreational active individuals to professional athletes and in military service men and women. So please welcome to the show Dr. Tim. Sell OK. Well welcome listeners.

Dr. Clewley: [00:01:37] We've got said Dr Tim Sell from the Duke K lab as a guest with us today. So before we go into some of the question about the K lab and all that kind of thing you mind actually give us a little bit more introduction a little bit more about yourself maybe even a little bit about your professional journey and kind of brought you here to Duke in the K lab et cetera.

Dr. Sell: [00:01:58] So first a lot of people think the K stands for kinesiology so it is just Krzyzweski. So it's the Michael Krzyweski Human Performance Laboratory and in that kind of details into my my background I am a double graduate of the University of North Carolina at Chapel Hill. So there are a lot of us here and there is a lot of Duke there. So I get asked that a lot. But so I'm by training a physical therapist a bachelor's of science in physical therapy from USC Chapel Hill in 1993. I think something maybe unique about me is I knew I wanted to be a physical therapist as a sophomore in high school. And then during my first day of class as a as a physical therapy student I knew I wanted to go get my PhD. So I've always kind of had some direction and an idea of what I wanted to do. But after graduating you see a practice that Moses Cone Hospital. I consider myself mostly an orthopedic physical therapist so I practice in many different settings but around 1999 I decided it's time for me to kind of go back to school to get my PhD. So I commuted back to UNC. It was a Master's of Science and Human Movement Human Movement Science kind of a pseudo biomechanics degree. And so I don't I'm not a card carrying bio mechanistic but I do a lot of biomechanics research so. But after that kind of started doing some research within that program doing ACL injury prevention research and a lot of low extremity biomechanics and there is a laboratory at the University of Pittsburgh who was doing that type of research and needed someone who had motion analysis experience and it was a great opportunity to do a PhD and a really great lab and a new Center for Sports Medicine. In Pittsburgh. I think were a little hesitant at the time but.

Dr. Sell: [00:03:54] Both my brothers lived there so it was kind of a nice change taking my wife who is a a southern girl out of North Carolina was kind of a challenge for her parents not for her. So we went up there thought we'd stay there for three years and then find the next position we ended up staying for 15 years. And then summer of 2015. This position where I'm at now director of the K lab opened up and where I was was kind of changing a new director doing different types of research not as much sports medicine not as much about studying functional joint stability and balance and EMG and the K lab needed someone and they wanted to do exactly what I wanted to do
and I think I was trained exactly for what they needed and came down. I'd already I knew Dr. Bill Garrett he was on the search committee and that was a big deal and sometime. In the three months before the job opened up my wife kind of said she was ready to go home. So first time she said that 14 years so I said OK. So. And then I interviewed in August of 2015 and then took the position January of 2016. So I've been here for three years. Yeah. Nice.

Dr. Clewley: [00:05:08] Fun little fact. Tim and I have been here for the a time I think we started the exact same same day. So Tim and I will always be forever connected that way I guess to some perspective.

Dr. Clewley: [00:05:21] So you already dispelled one of the myths of the K lab that it's not the kinesiology lab although it's very conveniently named as such. But beyond it actually being the K lab what is it? Tell us a little more about the K lab. I think a lot of our listeners here probably don't really know fully what that is and probably this this could go beyond even an hour but maybe just some general things about the K lab and even some things some exciting things that are going on within the K lab at this point.

Dr. Sell: [00:05:52] So the K lab has been around since it's hard to pinpoint it but have been around since probably 1996.

Dr. Sell: [00:05:59] But the initial dedication was 1998. So I have the invitation it's framed and we had Coach K signed it. I just happened to find it in the closet.

Dr. Sell: [00:06:10] It wasn't like Raiders Of The Ark archaeological dig it was just it was just on the shelf so and it was dedicated to injury prevention and athletes and so before I took the job and I did a lot of research on what they had been doing.

Dr. Sell: [00:06:24] On to figure out what the goals and the mission were of the K lab and certainly talking to individuals here what they wanted the K lab to be and then I'd kind of create this mission statement- but the K lab is at the Duke Sports Sciences Institute and we're just one aspect of eight or nine different programs from sports rehabilitation, sports performance, orthopedic surgery, sports medicine, and primary care, so there's a lot of us there and the three pillars of the Duke Sports Sciences Institute of education, research, and care and certainly we are 100 percent research we don't do any clinical services. One of the orthopedic surgeons can't say I'd like for you to do a gait analysis on this individual because we want to see other walking, unless that individual is Coach K and then we would. So. Everybody who goes through the lab and tested in lab fits into one of our IRB's but if you were to come into the lab and leave and you needed to know one thing or tell somebody one thing about what we do or at least two things we do injury prevention research and we do we study functional joint stability. So the idea that you know when someone's participating in sports or some type of activity that places a lot of demand on the joint the knee joint pairings for existence how do they maintain joint stability despite all these potentially destabilizing forces. And so the laboratory is designed to do that. Now the injury prevention side is really just this kind of public health approach. The same thing could be applied to preventing heart disease. And so we apply that approach and that's systematically studying different things from epidemiology to risk factors for injury. The validation of interventions on the functional joint stability side it's examining individuals after injury after surgery during the rehabilitation process. So we can study how someone moves. We can study muscle performance characteristics from EMG. We can look at strength characteristics like just just overall force production or time to torque. We have appropriate exception testing and then we have a couple other things that we do with inertial measurement units but it's all about studying motion measuring muscle performance examining muscle activity just kind of somatosensory data points that we look at now. Right now what we're doing we have a lot of research going on. We have about 14 or 15 different IRB's. Some of those are data use agreements but. We have studies looking at student athletes over the last two years we've tested about 30 percent of the student athletes at Duke University from initially starting
with the baseball team and worked with men's basketball and we'll be working with wrestling relatively soon. So we do the student athlete injury prevention. We do some work with an Air Force group that comes up from Fort Bragg about every four months. Again injury prevention and what that means is we test them and we look at the previous injury to see what the previous injury tells us about their current capabilities and then we follow them over time to see you know why does someone get injured. Essentially what we do is once we have enough people we look at the individuals who suffer an injury for instance an ankle injury and compare them to those individuals who don't. Now with our injury prevention research with student athletes we take a different approach. We have a different philosophy. We believe that the K Lab should be a resource for student athletes and Duke University student athletes. So everything we do we keep in mind one thing we're doing the research for that athlete for that student athlete. They get all of their data so that they can use it for individualized injury prevention team based Injury Prevention and then if they suffer an injury they can come back and go through testing the kind of the elevator pitch is why not take advantage of the research expertise at Duke University for the student athletes competitive advantage. Maybe more importantly we believe what we do is part of just an overall health and wellness program for the student athletes. They have put together Duke athletics this integrated performance group that brings brings individuals from nutrition to psychology the athletic trainers and orthopedic surgeons. And we are one part of that. And then the other aspect of what we do is two other points that I'd like to make as we do a lot of research with different populations who have had some type of injury so ACL injury or those individuals who are having to have had surgery or we'll be having surgery for Femoral Acetabular Impingement Syndrome superior capsular reconstruction of the shoulder and concussion. So there are a lot of really good concussion researchers around the world. I'm not one of them but I do a lot of injury prevention research and concussion has been demonstrated to be a risk factor for lower future lower extremity injuries. So we're looking at that. We have a little bit of funding from Major League Soccer for that. And then we have some technology development designing an app and a sensor not quite a wearable more but diagnostic sensor to measure knee joint stability. And then one other piece to this is that the K lab is virtually two labs it is a shared resource lab at Duke University. So there are about seventy four, seventy five those so individuals can come to the K lab and say we would like you to do motion analysis or we would like for you to do this test and they contract with us. We're a little different because most of the time we help them with the project and design the project and a lot of those times are included as investigators. And then the other part of this the K lab is kind of the research that I want to do and that's mostly about the surgical interventions and functional joint stability and the student athlete and military injury prevention. Then I knocked off about 10 minutes there.

Dr. Clewley: [00:12:23] No no that's fine okay. That problem deserves a lot more than just 10 minutes but I think sounds like some very exciting things that are have been done already and certainly in the process and the long term vision seems like some really interesting things that could come out of that. So Tim it's not accidental that we have you in these Duke PT podcast studios if you will in essentially March it's March Madness. We've already talked about Coach K and I think at least that's my understanding that Duke typically fields a basketball team every now and again and that basketball team does fairly decently and so we here on tobacco road although we'll have to ask Tim later where his heart lies at this point because he's got some he's got mixtures of blood and that are blue running and so hard to find that out there maybe get him on record. But I so we're slightly excited about basketball so specific to basketball that maybe all sports because it sounds like you probably have a little bit more of a hand in some of the other sports and I speak to this a little better but what role do you see the physical therapist maybe some of the things that you're finding in the K lab maybe playing currently and do you see that role as the physical therapist evolving maybe either in prevention or in rehabilitation or those kinds of things and how do you see the K lab kind of facilitating that.

[00:13:55] So we at the K lab try to kind of stay in our lane relative to what we're doing with student athletes because they have excellent physical therapists and athletic trainers. And as a
researcher we just try to provide them information. Certainly we interpret that information and so they they can use it. But I think Duke athletics has a really nice model because they have physical therapist and they have athletic trainers and and they they work together closely to take care of their athletes so if a physical therapist is interested in working with that type of athlete there are really nice models around the country. I think I remember Stanford was one of the first ones that I wrote that I heard about but Duke is is definitely doing that. But I think one of the points I'd make is we collect a lot of data on the injury prevention and that's not necessary. You don't necessarily need a lab for that. So if you are a physical therapist working in a clinic there are certainly some ways you can you know you can you can look to collect data. We have wonderful motion analysis system but there are other ways to do motion to study motion to look at motion like the landing area scoring system and certainly quantifying measures of strength is it can be relatively easy. With a handheld dynamometer. But I would say you know for us we try to but try to provide them data that they can use. We work really hard to make sure that every measure every test is is reliable whether it's interrater reliability or intersession reliability. We make sure that it's valid so if it's a different type of test of strength then we've validated against the gold standard. We try not to waste the athlete's time we have very little time. So part of our philosophy is we don't want to waste the athletes time and we don't want to waste their energy and then we don't do any exploratory research so we may get asked hey could you look at this. Well you know we don't know much about that there isn't much evidence to suggest that that's a risk factor for Andrew. Now they may ask us to do that for their purposes but we focus on things that that are actionable. So as a physical therapist I think there are ways that you can use data collection whether it's research or not that can guide.

**Dr. Sell:** [00:16:14] Guide your care with your athlete.

**Dr. Clewley:** [00:16:17] And so a little bit on that note. Have you seen anything that has come out of the K lab already speculating coming out the K lab. Maybe the specific things that you've been able to identify that has now translated into clinical practice.

**Dr. Clewley:** [00:16:34] If I need to restate that question.

**Dr. Sell:** [00:16:35] No no you don't have to restate that question. We're probably a little bit early on. Most of what we're doing is looking because we don't have large numbers yet. I would say what we've learned that's been consistent with some of the research I did previously mostly with the military is we know that previous injury is is consistently or frequently noted as a risk factor for future injury. But the reason for that we don't know. And so in the military I did a couple studies in that area that if one of the one of the individuals in a cohort has had any low back pain in their medical record we saw balance differences that were worse than those who didn't report it. And so we talk about why I don't know if the low back pain caused the balance issues or the balance issues caused the low back. But I know balance is a risk factor for lower extremity injury. We saw the same with any report of knee or shoulder injury that if they had any report of that in their record medical record as a group no differences between sides or compared to a control group but there was individuals within the cohort that had differences greater than 10 or 20 percent. So we're starting to see that with some of our other populations our student athlete populations that even though they've kind of probably. Gone through that that physical therapy rehabilitation and they're probably pain free and now they're released to full duty if you're in the military or full activity if you're an athlete I still think there's that period of time and in the military they talk about this bridge program but you know what are still what are some of the deficits still present that may contribute to the risk of injury.

**Dr. Clewley:** [00:18:17] I got a couple of questions from some of our listeners and actually they're students.

**Dr. Clewley:** [00:18:23] And so I just shoot a few of these off here for you and some of them you've alluded to a little bit as well.
Dr. Clewley: [00:18:29] I guess the first one here is especially with your background your experience in sports medicine and that sort of thing. Where do you see the field of research and innovation in sports medicine as we go forward whether that's with technology or whatever it might be.

Dr. Sell: [00:18:48] So I would say there's two parts to that. And one of them is looking at if you if you want to call it precision medicine or personalized medicine but if you if you do a pub med search and you look up know all the different concept all the different terms for personalized medicine and precision medicine and you add nursing to it or if you add cancer to it you'll get hundreds and hundreds of results if you add. Injury prevention or musculoskeletal research you'll get like two. And to me you could have 100 people. Have an ankle sprain and person no one's reason may be very different than person number eight. And so I'm not a precision medicine expert but if you look it up you'll see that what it's really trying to do is count for the variability between individuals and how you take care of them. And so I think that's part of it. And I think that that really is kind of linked to what are the analytics that you're going to use. And we're spending some time with data plus group here this summer data science and we've done a couple forays into using machine learning supervised and unsupervised to predict injury risk or to identify increased risk of injury. So I think that's part of it. How do we how do we use machine learning and precision medicine and analytics to do a better job of trying to predict injury or certainly could be applied to taking care of other individuals I know that they just recently published one looking at total ankle after policy. So that's part of it. And then the other part of it at least in my world is what are the data points. So we do a really good job in our lab of collecting musculoskeletal characteristics neuromuscular characteristics and biomechanical characteristics but we know that fatigue and pain and soreness and rest and sleep so many other characteristics are important relative to risk of injury and so there's a couple groups the Center for Applied Genomics and precision seems to me the Center for Applied Genomics and precision medicine here have really good tools where they can track data on a daily basis to try to predict in one of their studies I think they are able to predict illness within about 36 hours beforehand and we're able to demonstrate that individuals tend to be tend to have to get sick around midterms and final exams. Maybe those of us who offer those midterms and finals that we already knew that. So in general it's better analytics and looking being creative with looking at these things. I think there are also better metrics to gather and making sure that if you can gather a more comprehensive set of metrics and then it's this idea of what can we process on a daily basis that will predict when someone may be at greater risk.

Dr. Clewley: [00:21:41] Yeah you touched on quite a few things. It's really interesting to see even just the future of research in the translation of research into practice and how that actually comes into play. I think that precision medicine and that sort of thing are going to be fascinating whether that's with athletes whether that's with our patients that are coming in for back pain those kinds of things how we can better manage those individual patients. I think clinicians will really appreciate having that kind of data and information as opposed to trying to treat according to the means and things like that. So. Obviously a very strong background of research gave us limited information about sort of your.

Dr. Sell: [00:22:49] Well for me the continuum of research goes from just speaking to someone who is an expert in an area in that area and reading about it to doing research or participating in research or you know working in a laboratory or doing what we do here. The first step is is probably contacting someone who's doing that type of research. I was pretty fortunate. I don't know what
would have happened if at the master's level the person I was working with was doing neuro
research but I think probably we match pretty well because I was already interested in ACL injury
prevention and an ACL injury in high school not mine was really the reason why I wanted to be
a PT.

**Dr. Sell:** [00:23:34] The other reason and this is don't share this but I also had an ankle sprain is
like a junior and I already kind of knew I wanted to do P.T. and the PT who had been working with
me had to leave early and handed me off to someone else and I happened to be looking out the
window and he jumped into a red Porsche and drove away so I don't want to I don't want to give
him I don't want to say that that's what's going to happen because I don't know maybe he was the
owner of the clinic but that didn't that didn't hurt.

**Dr. Sell:** [00:24:06] So I think you know what happens here at Duke is the DPT students will just
email me and say hey can we talk.

**Dr. Sell:** [00:24:13] And and sometimes we just talk and want to try to get involved in some cases
that's hard to do because you know they're full time students but there's some opportunities for
research electives here and there's other opportunities as well and that could be anything from just
kind of sitting in and observing. But I think the first step if you're interested in doing research in this
area is you've just got to find who in your area is doing that type of research. I hope that
everybody's willing to at least have a conversation with you because we are here at Duke across the
board. But I think that's the first step. Yeah that's a good point and I think you obviously.

**Dr. Clewley:** [00:24:49] Identifying the location and then obviously the typical progressions toward
doing research. Me personally it's one of those things that you expose yourself to little by little you
know you go into more formal structures.

**Dr. Clewley:** [00:25:04] So I just want to ask you a couple softball questions here. Not specifically
softball is in the sport just easy question we test softball players too. You do. Okay well do you test
so my other question was going to be your you're also a pretty busy guy and then you just let it chat
with you really quick cause I was I think everything I see on your eyes is that I know you as a father
of the golden retriever. So tell us a little about low aspect of your life. It's always about upbringing.

**Dr. Sell:** [00:25:34] Yes. So we have four at one point we have three under the age of one and so
we have an older one who's about 13 and then we have a one who's about one year old. He's he's
about I guess 14 months and they're the twelve year old just gets around the one year old or so he's
he's he's rough and tumble he's a big he's a big boy but the other two.

**Dr. Sell:** [00:25:58] Are rescues. And so one of them both of them are through an organization on
the West Coast who works with individuals in China who rescue dogs from the meat industry.

**Dr. Sell:** [00:26:14] And so I was on Instagram and I saw this three legged dog and I told my wife I
want that dog and I convinced them to adopt outside of their area and so that's how we got the first
one. His name's Preston. Interesting. And I think this is interesting from a physical therapist and
research standpoint he's very strong pound for pound he's the strongest dog I've had and I think it's
because he hops all the time so I could see his whole core I'm not saying we should jump on three
stronger but he's so strong.

**Dr. Sell:** [00:26:46] And then so that put us at three and we've had three a couple times but the
same group posted on Instagram this is blind dog and I said well we might as well go get that one
too. So we're able to rescue both of those or they rescue them we adopt them and so we have a very
strange household. You know we have I don't want to I don't know if it's adaptive equipment but we
have adapted the household to the dogs so we don't we try to we don't have a lot we have hardwood
floors but we put some some rugs down but in the end we actually pull those up because the three
legged dog. Hop and he likes to kind of slide. So but the other thing we've done with the blind dog and she can't see anything. And she was born that way.

**Dr. Sell:** [00:27:32] We the older dog forced us to put some little carpet pieces on the wood stairs so she had some traction as well so we had some of those left over so we put those in certain places in the house so she as she's walking around she'll feel that and she knows the direction to go. Let's pass something. Yes it is. I was looking at I was watching yesterday just to see if she was actually using them and she does now when she gets excited and it's feeding time it's all bets are off and there's certainly some.

**Dr. Sell:** [00:28:02] I don't know if I've ever heard.

**Dr. Sell:** [00:28:03] When if a tennis ball hits the spokes of your wheel while riding but it can occasionally when she goes really hard and she'll hit her nose on one of our gates and we have lots of gates in our house so we can close off different rooms because there's I call it dog math. And when all four of them were together in one room it's terrible but if you can subtract one dog and put that dog in another room you reduce the chaos by more than one fourth or maybe a third. So we have to kind of break them up but they're both they're great dogs. All for them together especially at feeding time is just terrible though.

**Dr. Clewley:** [00:28:40] That's good dog so you give bringing in your analytical and your caring side of your personality there. That's fantastic.

**Dr. Clewley:** [00:28:47] So you have a couple just a couple other little easy questions. So who's in and who's in your final four right now.

**Dr. Sell:** [00:28:54] Both the teams here. So you can see Duke don't probably watch enough to say but I got to believe Kentucky is going to be in there the fourth team. I don't have a fourth team. I don't watch enough to say no Michigan State had been doing pretty well. I know they beat Michigan recently so I'm not going to go any crazy kind of big teams.

**Dr. Clewley:** [00:29:21] Yeah it's all kind of the match up and who's hot who's up who's up who's healthy and the time right. So that's probably a big thing that plays into it. So if it comes down to Duke in North Carolina and the national championship game.

**Dr. Sell:** [00:29:36] Who who who you root for who you pulling for here. So that's a question I get asked a lot. Know I Said I never have to answer that question until they play in the tournament and then they've never had to.

**Dr. Clewley:** [00:29:48] But let's go with the hypothetical hot mike now. Yeah.

**Dr. Sell:** [00:29:53] I know. I'd just like a really good competition. So you got to love the one there with and I know he's playing it myself.

**Dr. Clewley:** [00:30:04] That's right yeah. You're under big loud and you're not allowed to wear any shade of blue. That is no although my office has a curiously close that you can see shades of blue but in and you. Well deserved few diplomas from there so it is interesting coming here I was never much into basketball but we all this area you have to drink the kool aid for sure.

**Dr. Sell:** [00:30:28] It is interesting because you know what you and see you learn to. You know you're supposed to hate Duke and hate State. And usually during a basketball football season at the time and I was there but and Duke primarily in basketball but they have pretty good team Jimbo Barnett was still there. So you learn about basketball when I went. When I moved to Pittsburgh. You kind of get the gist it's not a big basketball community certainly Pittsburgh Steelers football
and fans.

**Dr. Sell:** [00:30:56] But the other thing down in North Carolina is that you're immersed in maybe not as much as in Durham as in like Greensboro. I don't know about you but you'll learn a lot about NASCAR.

**Dr. Sell:** [00:31:05] I mean you just you just you can help and you just learn about it and it's interesting.

**Dr. Sell:** [00:31:11] You know it's just it's just it's a different kind of sport. But you can't help it just you just saw osmosis of information.

**Dr. Clewley:** [00:31:18] So part of the culture part of where you're at. Well thank you very much Tim for being on your show and I definitely learned a lot and hopefully a lot of other folks that are listening to this learned a little more me together inspired maybe piqued the curiosity in regards to some of the research and such. But thank you again for very much. Thank you very much for being on and I guess the last thing I want to do you I don't know do you I don't think you have a Twitter profile or anything like that right.

**Dr. Sell:** [00:31:42] I am on Twitter. You are on Twitter. I'm on Twitter. I'm not an active Twitter user.

**Dr. Clewley:** [00:31:48] So if our listeners want to get a hold of you they could probably find you at your handle on Twitter think it's @TCSELL I joined a long time to think of that. So maybe the better way to contact you is to actually go to the Duke University Web site. Yeah they find you now. Yeah yeah yeah yeah.

[00:32:05] All right.

[00:32:06] Well good. Well thank you very much Jeff. Thanks there Yep.

[00:32:09] Thank you for listening to the Duke DPT podcast if you like what you just heard. We hope you'll pass it along to your friends and colleagues.

[00:32:16] For more information about all that is happening at Duke DPT please check out our Web site. Otherwise we hope you join us next time in our pursuit to bridge research and clinical practice.