You're listening to “Moving Ahead,” the Physical Therapy podcast by Washington University Program in Physical Therapy. In this episode, Dr. Linda Van Dillen, Division Director of Research and Professor of Physical Therapy, speaks to Dr. Michael Harris, Assistant Professor of Physical Therapy about his engineering background and why he purposely sought a research career in a Physical Therapy Program, they discuss his work and how it contributes to our understanding of the human movement system and his current collaborations.

Linda: Hi, my name is Linda Van Dillen and I'm a professor in the Program in Physical Therapy in the Department of Orthopedic Surgery at Washington University in St. Louis, and I'm also the Director of the Research Division in the Program in Physical Therapy here at Washington University, and I'm here today to talk to Dr. Mike Harris.

Just a little bit about Mike. He is an Assistant Professor of Physical Therapy, Orthopedic Surgery, Mechanical Engineering and Material Science here at Washington University in St. Louis. He completed his PhD in Bio Engineering at the University of Utah and then a postdoctoral fellowship in the Center for Orthopedic Bio Mechanics at the University of Denver. He then joined the Program in Physical Therapy here at Washington University in 2016, and currently he's funded by the NIH through a K01 mentored Research Scientist award and by the American Society of Bio Mechanics through a junior Faculty Research award. And the focus of his research program that he'll tell us more about is on investigating joint shape, musculature, and associated bio mechanics as they change due to injury or disease. And the goal is to understand how we can improve interventions to preserve or restore joint health. His current funding examines these questions in people with hip dysplasia.

So, hi Mike, how are you?

Mike: Hi Linda, good.

Linda: Good to see you. Let's just get started. Can you just tell us a little bit about your earliest experiences that set you on the path to where you are now? So, was there someone or an experience in your childhood that influenced you to pursue a career in engineering and research?

Mike: Yeah, that's a really good question.

Linda: Thank you.

Mike: You would think with all the applications you have to write in academia, that that would be a, I would have a really well thought out answer to that. Actually, it's kind of hard to answer as I look back. I recently found a yearbook from 6th grade saying that I was for sure going to end up in the medical field. That was my pronounced path. And then I went through school.

And honestly when I started in college, I thought I wanted to do something in business. So, I used to drive around eating a burger and French fries and driving with my steering wheel saying I was in businessman training. It's kind of a weird time, but no, I but I turned away from that and I started in engineering and I don't honestly know what motivated me, but it's just felt right. I enjoyed math. I enjoyed physics. And so, I thought, well, engineering is the way to go and I started on one engineering path and it turned out to be not a good fit for me.

I always had this draw to something more related to the medical field, even despite being in engineering and so. Over time, I think it was just an evolution of those dual interests of something related to helping people within the medical field and at least somewhat of an aptitude for math and physics. So, there wasn't a real person or an event that sent me that way that was just kind of what pulled me over a number of years to the direction I headed in eventually.

Linda: What kind of engineering you said you were going down one path and you changed it?

Mike: Yeah, I wasn't very good at it. I started in mechanical engineering and the very early courses in mechanical engineering just kind of blew me away which is interesting now 'cause I teach those same principles now within bio mechanics courses, but it pretty much wiped the floor with me. So, I wondered if that was not the right path for me and there were also just hundreds and hundreds of mechanical engineers and I wondered where would my place really be among all these different mechanical engineers? So, you combine that with my interest in something more related to the medical field and then that turned me towards biomedical engineering.

Linda: Great. OK, well tell us a little bit about your career path before you pursued the PhD.

Mike: Sure, when you saw a little bit of it there ‘cause I started college thinking I wanted to do one thing and then very quickly determined that was not it. So, I actually started at one university, which was great, but when I wanted to move more towards biomedical engineering, they didn't have the right program for me so I switched to a different university which had a great biomedical engineering program which is also very hard. But I really enjoyed that because it that type of a program gave me a lot of knowledge about a lot of different areas, and so it was sort of like a mile wide and an inch deep with respect to the knowledge that it gave me.

But I really enjoyed what I was learning there and so I finished with a bachelors in biomedical engineering. It seemed like a good thing. I had gotten involved in some research that was a little more orthopedics related as an undergraduate. I continued doing that after I graduated and split my time between that and working for a prosthetics company. I always thought, well, you know, a good fit of all these is to start designing prosthesis right, and so that would be a good fit.

So, I took an internship with a research and development group for a big prosthetics company, a big international prosthetics company and split my time between those two different interests and I think that was a really good thing, 'cause it also gave me time to explore other paths. I really considered being a physical therapist and so I shadowed physical therapists for a while and what I learned from them was that to be a good physical therapist, you have to love your job. There's a lot that goes along with it that your love is really going to sustain you in that field, and I realized I liked it, but I did not love it to the degree that those who were successful loved it. And so I kept looking after college and continued with that research and development group and my research in the academic campus. And really, came to find that I just wanted to dig deeper. Everything I was doing with the R&D group was really cool, but I wanted to dig deeper into understanding how people were moving with and without their prostheses, how they were dealing with that, what the real physics were behind designing those types of devices and what the long-term effects would be. So that kind of pointed me back to a PhD, and it seemed to make sense as a good way to dig deeper down in and really get to the bottom of some of these problems that these patients were dealing with.

Linda: So, I think that's really interesting because as an engineer you can ask all those questions without getting a PhD. And so, there's something really unique I think about getting a PhD.

And so, can you talk a little bit more about that motivation? 'Cause that's a big step.

Mike: Yeah, oh yeah, it's a big, it's a big commitment and it's a challenging road and it's a challenging commitment to take. I think there's so much about it that makes it worth it because you can ask, you can ask a lot of interesting questions. The training you get as a PhD student and as a graduate with a PhD is invaluable in my opinion with respect to its ability to really help you to develop questions and then dig deeper into them and critically access what you know, assess what's already out there, critically assess your own interests and your own work into answering those questions. There's just something about the formal training in developing research questions and then answering them that you can't get in my opinion, without a PhD or at least it comes along with the PhD training that really amplifies your ability to give solid, meaningful answers to questions that can impact the clinic or can go all the way the other direction and impact very basic science. The PhD training is just key to really understanding how to do that.

Linda: Yeah, I would agree and it puts you into a different into a different career, I mean it's a whole, it's a different world then not having that so. What were the factors that you think went into your decision to get a PhD in bio engineering versus some other discipline? You've been in the world of engineering for quite a while at the point you went back for your PhD.

Mike: Well, you know bio engineers they were the cool kids, right? Among engineers.

No, what I really liked about it was again that you can see a lot of different fields come together and you can see that in biomedical engineering and you can definitely see it in the type of PhD program that we have in movement science where you have a lot of different disciplines that come together to solve problems, and so where I was, it made sense to stay in bio engineering to get that type of exposure. It was the best degree choice and that offered the best opportunities with respect to building skills and really figuring out what the next step in life would be.

Linda: OK. So, with your training and engineering you have a lot of options in terms of your career path. Why did you... you've talked about this already a little bit... Why did you pursue academics rather than industry? So, I think we've talked about this quite a bit already.

Mike: But yeah, we have although I mean I have to say, maybe nobody else feels like this, but I felt a pull towards industry and academia all the way through a PhD, all the way through a postdoc. There were always some of those questions remaining 'cause there's a lot of attractive reasons to go into industry, and there's a lot of attractive reasons to stay in academia. Right now, I can't think of any but. No, it's great.

What really sold me on staying in academia is the freedom that we have to pursue problems that we think are important that are reflected in the clinic and to have the freedom to try to find solutions to those. So even as late as coming to Wash U, you know there was a debate for me about whether I take a very good job in industry with a really great strong orthopedics company, or whether I come and stay in academia as a faculty member. And you know, I interviewed several places as we all do, but it came down to two and one was here at Wash U and one was in industry. Although I loved the people at the company I would have worked for and I loved some of the products they were making it was clear to me that the freedom of thought, the freedom to pursue the questions that you want was just way more attractive to me, and so that really pulled me back or kept me in academia. I mean, I never thought growing up I want to be my own boss that was not me. I was fine having a boss somebody to tell me what to do, but then you get a little taste of it as a graduate student and you get a little feel for just how fun it is to come up with your own ideas. Once you have that, it's hard to go back to just being given directives on what you should be working on. And sometimes those directives can change in industry and that can be a little bit frustrating as well.

So, academia is fun. It's scary, because if your ideas are not that great and they don't pan out well. Are you sunk? You know you've gotta change your direction you're never totally sunk, but it's still really fun to be able to come up with your own research pursuits and then have the freedom to go after them.

Linda: Yeah, I totally agree. And because I was someone who also never envisioned myself as driving something and but that's what you do as an academician, a scientist, and it is really fun. It's a lot, but I think it's a lot of work...

Mike: Oh yeah.

Linda: …But the idea of getting to drive the car in the direction you want to go is pretty amazing.

Mike: Even if there's the risk of driving it off the cliff.

Linda: Yes. But we'll catch you and bring you back and for sure, as you've seen. OK. So, this is getting into the physical therapy versus engineering, you're not a PT, but you chose to take a faculty position in a physical therapy program and we were really excited about that. We knew that you were thinking about industry or coming to us to our program. So, what do you think motivated you to get into this type of a faculty position? And in particular here at Wash U PT.

Mike: Well, I actually sought it out, a position within physical therapy. I thought there's a niche there that I can carve out and then camp out in because I did have, you know, mediocre engineering skills that may be useful, but definitely clinical interests and you know, as a graduate student, I studied the hip as I do now and we did a lot looking at bone and cartilage and from a surgical point of view, how to correct those. But for me a big question was what about the muscles? You know what about the way that these patients move? What about their recovery with respect to the muscles? 'Cause I would visit with some of the physical therapists and visit with some of the patients and for those set of patients, there were a lot of question marks about what to do with them after surgery, so these were surgeries that didn't involve a total hip replacement but it was the nearest thing that people could think of, and so they treated them like total hip replacement patients, which was really odd because a lot of them were younger and pretty active, very similar to the patients that I work with now.

And so, I saw that, and I thought there's an opportunity there for someone with my skill sets if you can call them that, but my interests to cross over and hopefully to build a bridge between these engineering principles and physical therapists and surgeons that I had worked with, I just saw a lot of potential bridge building and thought I can be the bridge. So that pulled me into an, I mean, I really did seek out opportunities to work in a department like a physical therapy program.

Linda: You had some exposure to physical therapy even when you were doing your postdoctoral fellowship, is that right?

Mike: Right, yeah, I did, we tried to build some good connections with others at the University of Colorado, which was near the University of Denver and we had we had great collaborators or friends over there that we would work with, so it was good to start to get their perspective and start to give me an understanding of research and practice within the physical therapy space and what that looks like. I was still pretty ignorant when I came here. I did not have a full appreciation for what physical therapists do and what physical therapy involves. Like I say, I had seen it and I had gone through physical therapy for my own problems, but I've learned a lot since being here and being integrated in this type of program about how physical therapists think about problems and the type of tools that they have available.

Linda: Interesting, I would of thought, I just assume everybody knows what we do and...

Mike: Yeah, well, I assumed that I did. I thought so you know we talked a lot about movement system and movement within our program and I thought, well, of course I mean isn't that what physical therapy is like teaching people about movement. I mean, it turns out there's more to it, and some people didn't even think very much about that. But to me I just thought, well, it's all movement and it's all bio mechanics, so that seems like a pretty good fit for me.

Linda: Right, and it's what do you think about that? You're saying, well, it's you thought it was all bio mechanics. Do you think that still?

Mike:

Yeah, I think it's a big piece of it. But you know, there's more around it that I'm coming to appreciate. But just as a layperson, if you will, it really seemed like, well, it all involves the mechanics of and movement.

Linda: At least at the beginning.

Mike: At least at the beginning.

Linda: Well, there's still some controversy around those kinds of questions.

Mike: So, I'm learning, yeah, I didn't realize not everybody was on the same page, so it's good that we're doing the research right to try to understand different points of view and which ones have the evidence that supports them.

Linda: Right. So, what do you think is a strength of being a faculty member at Wash U PT and in the Movement Science Program?

Mike: Well, there are strengths of the program itself that helped me. I mean, this is a fantastic place for mentoring really, totally different than any place I had experienced and I think I had been to some pretty good institutions and I had seen and had some great mentors but.

The quality and even the formal nature of the mentoring here is beyond anything that I had experienced, so I think that's the strength of the program. It's a strength of Wash U in general, but especially within our program the mentoring is just phenomenal and it it's at every level you know. It's for students to younger faculty to like me to more senior faculty. Everybody provides feedback. Everybody is trying to help everyone else succeed at whatever stage that they're at. So that's I mean, that's a huge strength.

Linda: Do you do you think that's true across departments at Wash U or do you think it's unique to the PT Program or?

Mike: So, I don't know well enough to know how strong it is. I think there are a lot of departments that do try to do a good job with mentoring. Obviously, the environment at the whole university is amazingly collaborative. I mean, I've never encountered anybody who did not have a collaborative spirit, and I think some of them incorporate good mentoring into that. Certainly, at the School of Medicine they have provided so many resources as far as mentoring, whether you're a grad student or a post doc, a faculty member, so it's definitely common here at Wash U.

Linda: Yeah, I think when you talk to other people because the culture here is that everyone should succeed and we're going to help you to succeed and other people you talk to there's a price that that is, that is the culture, but if the junior people or students, trainees succeed, then the university as a whole succeeds and our success is contributing to healthcare, and I think that's been... I've been here such a long time. I'm surprised when I hear that's not always, you know how it goes at other institutions. So, it's good to hear that you feel like you're getting what you need to move forward.

Mike: Yeah, I think in general you know the mindset of the university is just awesome.

You know, as far as supporting each other, which is really cool because it’s such a great university and you know the school medicine so strong the program in PT is so strong. There are a lot of very ambitious people, and so the fact that it still remains a collaborative environment is impressive in my opinion.

Linda: Yeah, yeah, I would agree. And so, let's talk a little bit about the framework for research. You touched on a little bit in one of your other answers. The framework for research in the program is the Movement System and the studies that all of the research faculty conduct in the program that's the framework, that's the basis for the questions we're asking and the questions you know... People are asking the questions about the movement system at the cellular level all the way out to the societal level, so you know. Can you talk about where your work is on that continuum? And how your work contributes to our understanding of Human Movement System. That's a long question.

Mike: Yeah. Well, it's right in the middle of the continuum, right? And it's the most important what I'm doing? That's the general consensus, isn't it?

Linda: Right after me, yeah, right after me.

Mike: So, I mean that's, but we are kind of right in the middle as far as like the scale that we look at. You know we are dealing with human research participants and they're coming in and we are looking at their whole-body motion down to their joint specific motion down to the loads on specific joints and then even within the joints. The types of loads that they're experiencing and so we work across several different scales within that continuum. Cell up to like public health type of studies. And I think it's a good fit for us. It definitely helps me keep our work in perspective by seeing what other people are doing at you know further out on the continuum one way or another but I think what we're doing is helping to establish from a biomechanical point of view really, how movement can be effective and can be helpful for people and when it goes awry, what the causes are for that and the effects of it.

Linda: So, I think you are very focused in. You know in your answers about the bio mechanics, but you have, you've explored some other associations between the kinds of variables that you measure and other self-report or patient reported outcomes. Can you touch on that? Just a little bit.

Mike: Yeah. We've been diving into that a little bit more recently, because really, we want everything that we do to actually have some clinical take away or make an impact, you know, on the way that patients are seen and treated clinically. It's very easy for us to get down in our own little hole and answer these little physics-based questions. But in the end, it is really important for me to for our work to have an impact and I hope that it does. Sometimes I think I just imagine it and I think oh I'm out here helping people when I'm really just solving physics questions. But to help have that impact that we're looking for, we are starting to explore more and more of the relationships between biomechanical variables at whatever different scale and what patients are actually experiencing and reporting. And sometimes the connections are loose, sometimes they're not even there, but we've been surprised about some that appear stronger than we would have thought as far as a mechanical environment inside the hip in this instance, and what the patients are actually feeling with respect to their overall function and their ability to complete tasks in daily life. So, we're going to continue pursuing that because that helps us really focus with respect to our research and our bio mechanics, like what is coming across as the most impactful on the way that patients are interpreting their own pain or symptoms.

Linda: Right, which is really, really super important because there's so many things you can measure in your patients and you do. But if you can really focus on variables that are associated with how the patient is functioning, how they're feeling, what their pain is, I think is going to be key to providing really targeted surgical or rehab kind of treatment, yeah, I think it's great.

Mike: I hope so. That's the goal.

Linda: That’s what we all hope, right?

Mike: I'll have an impact.

Linda: So, you've already talked about collaborations at Washington University and beyond.

Can you talk about your collaborations here across the campus, across the university?

And what do you think as being a biomechanist? But a movement scientist? What do you think you bring to those collaborations that is unique? Compared to the other members of the team.

Mike: What do I bring to the collaborations?

Linda: Yeah, well who? Who are you collaborate? You have a large team that you collaborate with.

Mike: I've got a really great group of collaborators and very intelligent people doing great work. I mean, pretty much what I contribute is just donuts. I just bring donuts.

Linda: Is that right? You don't do that when we meet.

Mike: Well, we're still working on it, OK?

No, I collaborate a lot with people in orthopedic surgery. We do a lot with orthopedic surgeons. Seeing the problems from their eyes is really important to me from a surgical perspective from a clinical evaluation perspective. We work a lot with people in radiology as well, really trying to push forward the musculoskeletal radiological strengths here at Wash U and build those.

And then you know, I still have engineering questions that I'll check back with friends and collaborators in engineering. Ask them questions, help keep me grounded with respect to good engineering principles. So those are some of our strongest collaborators and we have really great teams where we get to meet together and we could share these types of perspectives and I'm trying to make sure that we're not all answering questions at the same time in different ways when we could be working together and bringing our skills together to answer, you know the most important current questions. And I mean I, I like to think I do bring something to the table when it comes to this and I think what I bring is really just you know the fundamentals, the fundamentals of bio mechanics, and I mean a lot of these are kind of physics-based problems and so understanding the Physiology and the bio mechanics and how that is playing a role in what you can actually assess in the clinic or change in the clinic or in the operating room.

Linda: So what do you think? Like when people 'cause... I know you are part of a hip research group here on the campus. What do you think? Is there... how does their input really impact what you are? What questions are you're asking?

Mike: Well, it really helps drive them in a lot of ways and I'm I am totally upfront about it. I had a meeting last week where that was one of the themes of it is what are you seeing? What are the questions that you have? Because I have a lot of skills, I may be able to contribute to answering that and also, we you know as researchers, we don't want to be trying to answer questions that the physicians and other clinicians feel like they've already answered. You know that can happen a lot. It's like we're really digging in on this, and we've spent 15 years and you know, the surgeons may say, well, we made up our own mind about this ten years ago, and this is how we do things now. This is how we treat patients in in this particular way, and so that question you're looking at is really just not even interesting to us anymore. I think it's crucial to have the conversations with different types of clinicians say what are you seeing? What are the problems you're encountering. And since we're all doing research to one extent like what research projects, are you even working on right now? Are we doing things in parallel or are there you know, tools that I could offer to you? Or you could offer to me to help answer these questions more effectively?

Linda: Yeah, I know in following your career since you've been at Wash U I think you’ve done a really nice job working with lots of different disciplines and trying to, rather than move just your career for move the questions forward and take a team approach to it, which I think is much more important kind of questions and much more efficient to getting to the answers than just worrying about your own area of research.

Mike: Hopefully, we'll see how that works out.

Linda: All right, how do you think your work can be used to optimize function through movements? So that's kind of a big theme, and in the program, and it's kind of a global question, but can you address that a little bit?

Mike: Yeah, I think I can. I think a lot of what we're doing is towards that goal of optimizing movement right? And understanding the different contributors to it, I mean especially with what we look at with hip dysplasia, you know at its core it involves bone that hasn't formed correctly, so you have this deformed bone and the way that the hip moves is just not correct. So, you could look at it at that level and say the bone is changing the way that the you know the femur moves within the pelvis at your hip joint. And then we can scale that up to see how that may be affecting you know whole movement during running or walking or other activities.

I mean our patients are really active and unfortunately the more active they are, the more aggravated the pain becomes in their hip and the higher the potential for damage.

And so, what we're doing with respect to trying to move and optimize movement is we're trying to understand the different factors that play in it. You know, when you see someone in a physical therapy clinic, you have access just to them, right? But we think it's important to also have access to the images that show the underlying bone and we want to provide information about what's going on with the underlying musculature. I mean you can help people retrain the way that they are activating certain muscles or moving and we want to then provide the information on how that's changing the forces that those muscles generate and how that is ultimately loading the hip and does that lead to better health for that hip? Or is it leading to possibly degeneration of that hip?

Linda: OK, given your success so far and everything you shared with us during this conversation, what are you most grateful for in your career?

Mike: I am... That's a good question. You know it's interesting I'm grateful for a lot of things.

It was for the first few years I worked here at Wash U really every morning that I would walk in I honestly felt man I am so lucky to work here. I hated the drive in. I didn't feel lucky about that at all, but once I saw our building, I walked in and I thought you know I'm getting the best mentoring I've ever had. And we've been able to start a research program that I think is meaningful, and I just felt really grateful to be a part of this organization. I mean, not every day is you know rainbows and roses and there are hard days and there are some days where you think what am I even doing here. I've made so many mistakes, but there's a lot to be grateful for here in this program we talked about the mentorship, I mean the mentorship is phenomenal, you can take that personally, since you're one of my mentors.

Linda: Thank you. I am.

Mike: But everybody tries to mentor well and that happens across different departments.

They try to make the tools that you need accessible, and so I'm grateful for that.

'Cause there are a lot of places where you have to kick and scratch and really dig to get at the resources that you need and so. Being at a place that understands what it takes, you know they really get it when it comes to helping faculty succeed and they try to make everything available. That's something I'm definitely grateful for.

Linda: OK, one final question. What are you hopeful for for our students in those pursuing research in physical therapy?

Mike: I am hopeful for the very same thing that my PhD mentor was hopeful for with me is that they will come away from their education as good scientists, even if they're you know, physical therapists that they will understand how to see what's going on out there and think what are the flaws here? What's not supported? And what do we need to do to fix those flaws? What are the problems that aren't being addressed right now and how do we? And, you know, create the right questions to then fix this. And when you see solutions thrown out there be able to look at those solutions and say I don't know like you know, did they think about this? Did they think about that? And understand the limitations and the strengths of every solution that's put forward out there and then be able to move forward and make your own decisions about whether you trust it and then how to guide your own care or how to come up with your own research questions so? Well trained scientists is what I'm hoping for.

Linda: That's great, that's the goal that every everybody does a great job and does better than we will have done in our careers I think it's right.

Mike: Yeah, for sure.

Linda: Super important. Well that that's all the questions that was great. I really appreciate that you spent the time with us. I think it's really important for people to see how you don't have to be a physical therapist to be part of a physical therapy faculty that people from all disciplines can contribute and you're an excellent example of that. So, thanks for your time.

Mike: Yeah, thanks for having me here. It's definitely it's great to be in this program.

It's great to come in from a different perspective and to be welcomed in.

Linda: Great, thank you.

This has been moving ahead, The Physical Therapy podcast by Washington University program in physical therapy.