Just Footwear Size Matters_2018 IPTES_036

Intro [00:00:05] Now this is recording. RTI International Center for Forensic Science presents Just Science.

Intro [00:00:25] Welcome to Just Science, a podcast for forensic science professionals and anyone who is interested in learning more about how real crime laboratories work. In this season, we will cover content given at the NIJ Forensic Technology Center of Excellence's Impression, Pattern and Trace Evidence Symposium. In Episode Six of the IPTES season Just Science interviews Chris Hamburg from Oregon State Police Forensic Services Division and Jeff Jagmin from the WSP Crime Laboratory Division in Seattle. Our guests discuss the process a footwear examiner goes through in order to capture test impressions. Their interactive workshop intra and inter variability of footwear test impressions had attendees go through this footwear examiner process. The attendees were able to see for themselves what variations occurred on the test impressions depending on the examiners different physical characteristics such as height and weight. This season is funded by the National Institute of Justice's Forensic Technology Center of Excellence. Here's your host, Dr. John Morgan.

Dr. John Morgan [00:01:32] And welcome to Just Science, the podcast for Forensic Science Professionals. I'm John Morgan, your host. We're here at the Impression Pattern Trace Evidence Symposium in Arlington, Virginia, on January 23rd, 2018. Today, we have two guests with us, both from the great Pacific Northwest. There is Chris Hamburg from the Oregon State Police Forensic Sciences Division, the Portland Metro lab. Chris graduated from Willamette University in 1996 with a B.S. in chemistry as a member of AFS, IAI and just about every other related association that you've heard of, including a member of the OSAC Footwear and Tire subcommittee and certified in general criminalistics by the ABC. Jeff Jagmin is also with us. Jeff graduated from the University of Washington in 1995 with a bachelor's in chemistry. Forensics career started in that Tacoma crime laboratory in Washington State. He stayed in Washington State. Chris was in Washington, then went back home to Oregon.

Chris Hamburg [00:02:28] Yeah, that's correct.

Dr. John Morgan [00:02:28] And Jeff Jagmin, he is also a member of AFS, IAI, at Northwest Association of Forensic Scientists.

Jeff Jagmin [00:02:36] That's correct.

Dr. John Morgan [00:02:36] Okay. And has been, has served on the OSAC Footwear and Tire committee was on (indiscernible) and we're very glad to have them with us. They're giving a workshop this week on the intra and inter variability of footwear test impressions, interactive workshop, and you all are actually using this as kind of a research opportunity as well, right? The workshop, you're actually looking at some of the data that's coming out of the workshop as part of a kind of some analysis work you're doing.

Jeff Jagmin [00:03:04] Correct will be taking data and collecting that data and writing a paper on that.

Dr. John Morgan [00:03:10] Okay.

Chris Hamburg [00:03:11] So this is something that we've done before. The Northwest Association, it's basically conducting some baseline research with the workshop participants rather than just having us in front of the classroom, just talking away for hours and hours and hours. It's an interactive workshop. They're doing things, they're working, collecting the data. And at the end of the day, we're pretty much done collecting it. And then we'll analyze it and get some results back.

Dr. John Morgan [00:03:34] Okay, fascinating. Of course, I have to start by saying how footwear is underutilized in the United States and underappreciated as well by the law enforcement community. We were talking before the podcast about some of the things that are going on around the world and footwear impression evidence. In the United Kingdom now, they're actually routinely collecting footwear from every arrestee in London and oftentimes in some of the other areas of the UK and in some cases up to 8% of prime clearances are coming from footwear. There's probably not an American jurisdiction that is within an order of magnitude of that, I would guess.

Jeff Jagmin [00:04:11] I mean, every agency might have a specialty. Definitely trace evidence impression wise, we have seen a reduction in cases, submissions. If you don't have a particular interest in something, not to say that law enforcement doesn't, they might not have the knowledge. We are seeing loss of experienced detectives, which then the next generation of detectives, they might not have that information. So you might be seeing it as a loss of that. Some agencies are very aggressive with footwear. I know that Washington State has a couple of agencies, but in general it's really under submitted.

Chris Hamburg [00:04:49] Yeah, it's easy to overlook. It's easy to not even think about because you can't see it right away. And it's not latent prints, which is what everybody's going for, at least latent prints and DNA collection. And so we're not getting the footwear, which I always find interesting because criminals are either walking to or driving to or walking through a crime scene. So all these footwear impressions or tire tracks should be out there...

Dr. John Morgan [00:05:13] Sure.

Chris Hamburg [00:05:14] ...and just aren't collected.

Dr. John Morgan [00:05:15] The story I always hear, you know, even in a serial murderer, you know, might burn his clothes, but he's not going to throw away his shoes, you know?

Jeff Jagmin [00:05:22] Yeah, they like to keep them. Sometimes, very particular with shoes. I guess.

Dr. John Morgan [00:05:28] They're expensive. They can be expensive. These guys are wearing, you know, some pretty expensive shoes. They can get. They can get pretty unique in that regard and part of their personality at some times.

Jeff Jagmin [00:05:37] Yeah. In general, though, I mean, DNA advances are absolutely amazing. It's a great technology. It is individualization of a person, footwear does not necessarily do that. And so not only footwear, but other trace evidence emissions are just seems to be reduced. But Chris and I certainly know the value of footwear, which can lead you to an individual and possible additional crimes. We realize the struggle and we just have to keep a good attitude and smile because the potential is there.

Dr. John Morgan [00:06:13] So in general, footwear examiners are going to focus in on type classification, but your workshop was really looking even at the next level and that is to individualize the shoe and in particular from the wear pattern in the shoe. Is that right?

Chris Hamburg [00:06:26] It's pretty close. We were. One aspect of footwear comparisons is, number one, looking at outsole design. So that's the first part of the comparison process. And I think all the listeners might be familiar with what an Air Force One might look like or what a Nike Air Jordan outsole might look like. And so when we do our initial comparison, we're looking to make sure that those patterns visibly look the same. And then we're going on to the next step, which is size comparison or physical size comparison. And one of the ways that is typically done is with an overlay. So the examiner is wearing the shoe, the suspect shoe that's been submitted to the lab. They're making a test impression by wearing it and then transferring some sort of media onto either a clear acetate or a regular piece of paper and then using that as an overlay and then comparing it to the question impression. Main part of what we're looking at in our workshop is how much size variation happens when a person is making this test impression. So is the test impression the first one they make 10.5in long and will they make the second one 10.6in long and the third one is 10.7in long? Is there a real variation there? And then we're going to look at that data to see if that's true or not as well as, you know, if Jeff makes an impression. Jeff's taller than I am. He's got a bigger foot than I do. So when he makes the test impression, is that going to be a different size than when I make it? And so we need this baseline research to figure out whether are similarities in physical size when we do make that comparison, is that a legitimate comparison point.

Jeff Jagmin [00:08:03] And can it be shared across footwear examiners, i.e. someone who might be much smaller in height, such as Chris making the test impression and someone you know in Kansas City making that test impression. So is there any differences from one another?

Dr. John Morgan [00:08:21] Tell us about the process, at least the one that used during the workshop to capture the impression. Let's just go through the mechanics of that real quick. I'll be honest with you guys. I'm a skeptic. I don't like the way in which it's done. I feel like, how can it even be reproducible at all? So let's go through the mechanics of the approach for actually capturing a particular impression.

Jeff Jagmin [00:08:43] So the workshop that we had, we are using a paper that sensitized, which receives a kind of a wet media, and then you can make a mark on a sensitized paper so people will actually walk in this slightly moist ink pad and then walk over your test paper. And this was based upon it might not be the best way to make a test impression, but it's a reasonable way to make a first test impression. Sometimes back when we're doing casework, it might be just totally different class characteristics. So the outsoles are completely different. We might just use this inkless pad as an elimination and we have the documentation for that elimination in our case file or for the courts if need be. So in this particular exercise we had Chris and his contacts at Nike got numerous shoes.

Chris Hamburg [00:09:39] So there was two, two types of shoes. There was the Nike Air Max 90 and then Nike Zoom Blazer. One has a flat continuous outsole and then the other one is broken up where the toe and the heel are kind of separated. There's not one continuous piece of rubber down there.

Dr. John Morgan [00:09:56] Okay.

Chris Hamburg [00:09:56] And so we had those.

Dr. John Morgan [00:09:58] Not exactly high heels, but there's a separation there.

Chris Hamburg [00:10:00] Yeah, there's a separation there. And then we had those in various sizes. So a nine, an 11, a 13 and a 15 for each of those two shoes. And so what we're looking to see is if one person, you know, depending on what their foot size or their stature or their weight might have an effect on the physical size of the test impressions that they're making.

Dr. John Morgan [00:10:21] I actually talked to one of your students. A female student and she indicated that she felt like as the sizes went up, that, you know, she could not keep a uniform pressure across the entire size 15 shoe, which is a rather large, much larger than her foot. Yes. And that got progressively worse as she went up to 11, 13, and 15. And so there was definitely for her, visible variation that she was seeing in the impressions. Which is not unexpected, right?

Jeff Jagmin [00:10:51] I don't know about the variation. I think what is being recorded might be lessened. Such as? If it's a larger shoe. Your heel is still in the heel area. Assuming that you're not putting your toes forward into the toe box. Let's just say that so that heel is in the back. Your pressure is going to be pretty close to being in the heel, except your heel is now spread out in a larger area because of the outsole being bigger, the shoe being bigger. So the distribution of your weight is not coming across. So what we might be seeing is the loss of detail is being recorded. I'd say so variation might not be the best word, but really, as you have that 15 everyone was struggling with that 15. And so, you know, my toe wasn't getting that information recorded as appropriately versus a size 11 shoes that I'm very comfortable my foot would be appropriately distributed across that shoe outsole. And then getting that information collected.

Dr. John Morgan [00:11:59] So we are looking mostly at the dimensional matching of the shoes or were you actually looking at some of that more individualized detail as well using this technique?

Chris Hamburg [00:12:10] So we got brand new shoes from Nike right out of the shoe while they were pristine. And then I created some marks in them. A couple measuring reference marks for one. And then there were some randomly acquired characteristics that I imparted on the shoes themselves. And then when we were looking to see how many of those were reproduced in a series of when we were walking across the acid ink pad and then on to the paper, we did a series of three. And so it was kind of heavy ink and then lighter ink and lighter inks and more of a serial dilution of these impressions. And then we could see whether or not those little marks were being reproduced every time.

Dr. John Morgan [00:12:47] Now, some of that is dependent upon the pressure that the person is applying fairly significantly, right? So I had thought that you tried to match up the person's foot with the shoe, like you would bring in Ben from upstairs. We had a size 15 to deal with because he's the big dude, right? And he's going to be able to give you something that's closer to what the suspect would have produced in a footprint, right?

Jeff Jagmin [00:13:08] Yeah. And that comes historically if you were trained by someone that might be. So if you have these size shoes, you will seek some other comparable shoes. I don't see anything out there scientifically that states that you have to or don't have to. So in a way, this was kind of a premise. I think some of our students realized that even

though they had small shoes that 11 or 13, they could still do it and retain that information for that first go and possibly into the comparison process.

Chris Hamburg [00:13:43] Yeah. And we might see after we analyze this data that a size 8 shoe foot might be able to make test impressions reliably up until an 11. But then past that, they're going to need to get assistance from somebody else. But maybe after we analyze the data, then everybody can produce a reliable sized test impression at any exercise. We just don't know that.

Jeff Jagmin [00:14:04] Getting ready for this, I was working with one of our scientists in the lab and she had a much smaller foot size. Well, when I put this was like a size 12 Vans shoe flat outsole. I wasn't retaining much information in the arch area based upon my foot morphology, the outsole itself and my weight, possible gait. All of these things could contribute to making this test impression. But when she put on her smaller foot, she was able to retain all the information in the arch. So if your case has partial impression with most of the arch area present, she's going to be brilliant at collecting that. So there's no reason, just in our experience, if there's a size 12, certainly you can try to do that if you have a size eight foot, because in that particular case, she was able to retain the information of importance. Now, she had some difficulty with the ball toe area, but that's part of evaluation of yourself as a scientist, knowing some of your limitations on what you're doing and what you might not be retaining. So you might have to take some different exemplars in different ways.

Dr. John Morgan [00:15:19] So what do you think in terms of where footwear is going as a discipline right now? I'll just give you one. My Holy Grail on the whole thing would be a purely digital collection. You know, you basically put the shoe in a box and you're able to get a 3-D optical picture of the entirety of the shoe. Then you don't have to worry about whose foot is in there. Would that be better or worse than current practice? Because it's certainly possible, right? It is 2018 after all.

Chris Hamburg [00:15:45] I think it's different. I think a picture of the outsole of the shoe digitally or otherwise, doesn't necessarily represent what that shoe does when it impacts a substrate.

Dr. John Morgan [00:15:55] Sure.

Chris Hamburg [00:15:55] And so I think you have to know that.

Dr. John Morgan [00:15:58] Yeah, but is your foot impression doing that? Have we ever really looked at whether the collection mechanism you're looking at truly is different from that? I mean, in other words, are you picking up differences because of pressure points? I mean, if you're able to have a size eight person and a size 11 shoe, still give you a lot of the detail. It may not be that you're getting a lot of information from the pressure points that are occurring.

Jeff Jagmin [00:16:25] I mean, as the examiners in the field, in practice, in the field and stuff, we have to deal with this. In case work, it's a dynamic environment. We get a lot of door kickings in and it doesn't always open the door on that first kick and you're not left with the pristine impression. Some examiners may not do any dynamic reproductions, and I'm not saying that's right or wrong. They might then just do a hand press to make the exemplars or they might do a walking motion. But clearly, when someone's doing something dynamically, which we cannot satisfy everything of what's going on a crime

scene. But sometimes we have to consider that. So I know that Chris and I, when we were in training, we did do stomps, store stomps, and stuff like that to kind of understand some of the dynamics, which could be a limitation in your exam.

Dr. John Morgan [00:17:18] Yeah, it's not that much different, though, than a latent print, right? I mean, very few people very delicately, you know, hold the knife and give you a beautiful breath. There's always distortions in almost any real evidence that aren't that much different of what you're talking about in footwear. It's a question of, like you're saying, understanding those distortions.

Jeff Jagmin [00:17:36] I think that's the most important aspect is understanding, as you say, distortions, limitations of the evidence. And these are the issues that I think, you know, Chris and I discuss and we try to be cognizant of that and articulate that in our notes and reports. It can offer some serious limitations to what we can conclude or not conclude.

Dr. John Morgan [00:18:00] So how did you all get involved in doing this kind of work? Looking at, you know, basically almost a research question, right, and doing these workshops.

Chris Hamburg [00:18:08] It's been bouncing around in my head for a while about this. I know Jeff had a case that touched on this a little bit. And so, you know, coming up with the question and knowing that we've completed these types of interactive workshops before, and this seemed like a simple question that we could gather enough data within a day to do. And so I think that's how we kind of landed on this one.

Jeff Jagmin [00:18:29] It falls in every forensic discipline. When you're doing casework, I would hope that you have questions or haven't encountered something. It happens all the time. How do we best answer that? Typically, it has been where you're in your lab and you may be getting some time to perform some experiments. There is also, you know, the ability to get stuff done. So several years ago, the Northwest Association of Forensic Scientists, one of my friends and a firearms examiner, Matthew Noedel, we were talking about how do we solve some of these everyday questions. And so we kind of figured out maybe we can do a mentor based research project one day and try to answer some of these. I guess they're relatively simple. These research projects are a lot of work. If you asked any of our people that attended this meeting, I would hope that they said that they did a lot of work because they were really running around. There was real life cases. I had a case where a bloody stairwell with footprints was covered up with clear tape. So I couldn't do enhancement on the tape with the blood enhancements. So I had to remove the tape. If I remove the tape, I'm going to possibly damage the evidence. So that's a very serious question. So do you even do that step or not? So I made the call and we pulled the tape. I did not enhance the tape, but that was one of my questions. So I was able to do chemical enhancements on the stair tread. Once the tape was removed. But I was also able to take this as a special research topic. So we went and we took some stair treads and I varnished them. I did all kinds of stains on them. We obviously made bloody impressions on them. I did a serial dilution. Ten impressions. So the first one being the heaviest. Fifth ones being about medium. And then by the 10th one, it's really faint. So in blood enhancements, you want to get that sweet spot. Whereas the footwear impression is not saturated with blood, but it's somewhere where there's a sweet spot. So when you spray it with your blood enhancement, it shows all the detail. Yeah. So we did this experiment, so we took it to a meeting and we did that and we actually sprayed the tapes and boards just to see. And it's a question of what happens when someone from some other agency gets this. And by having this as a written paper, which I still have to write up,

that would be a resource that, look, my same situation happened over here and they did remove the tape and they didn't really necessarily have to spray the tape. They were able to develop just on the board. So that then gets communicated across to other scientists. So we're not beating the same wheel in different locations. So we're trying to be collaborative and share. So this is just one of those things, although writing it all up still has to be done. That baseline research has been done and it's pretty good to have that.

Dr. John Morgan [00:21:40] So there is some movement. I mean, there is some interest, I think, in footwear. I know the FBI is looking at trying to improve the sharing of footwear investigative information across the country. And I know that West Virginia University is doing a major look at footwear evidence from a statistical representation perspective and that kind of thing. And of course, there's folks like yourself who are really out there working in terms of trying to understand the field better. So it to some extent, maybe there is some hope. I hope that law enforcement starts to recognize how footwear could be relevant and be used much, much more broadly. I think we're way under utilized, especially in volume crime. I think we could be using it much more broadly.

Chris Hamburg [00:22:21] Absolutely. I think what happens oftentimes is that we have such diverse types of jurisdictions around this country in which we have a police department and a county sheriff and then the state police all interacting in the same location. And then you may have multiple police departments and they're not necessarily communicating with each other about their serial burglars or those types of situations. And then we may at the state level, at the main crime lab that services all of the state, see only 1 or 2 of those cases, whereas they're collecting ten or 20 or 30 of them. And we don't really have a mechanism for all of those to get correlated together. And then having some information spit back out to all of them.

Jeff Jagmin [00:23:05] And what's important, too, is there's really two examinations that can be done in footwear. I think law enforcement thinks that they have to have a suspect with shoes to submit, and that's the comparison process. I know that Chris and Oregon State Police, along with Washington State Patrol, we do utilize shoe databases such as SICAR. And what we are trying to do, WSP and I believe Oregon is, is we are trying to do it in a timely manner. So we established in 2013 our SICAR system and OSP has been doing this for many years. What we're trying to do is to try to get that interest and those submissions up is we take in images via email and hopefully we try to do it within 3 to 5 days so that they have timely investigative leads. So that is one of the things that oh trace cases take so long. We're trying to satisfy that need so that law enforcement and the community can help solve some of these crimes, which then hopefully stops further crime. And then that second exam, when they do find a suspect or they have an idea to look for this funky shoe, they can then possibly collect them and then submit that for the comparison. So there's really two types of exams. And I think the understanding of that is not across the country, not every forensic organization offers that service, nor do I think law enforcement realizes that.

Dr. John Morgan [00:24:43] Sure. Well, yeah, it's interesting. And there are some new approaches. I mean, SICAR is obviously out there and has been for some time. We talked before the podcast, Everspry is now taking what I call a big data approach, right? Looking at every bloody issue possible that's out there. And of course, as I mentioned, you know, I had some involvement with Blue Star in the Home Office where they it was easier for them to decide, okay, the Home Office is going to create a system that everybody in the United Kingdom can use, right? And it'd be really exciting if instead of having to email back and forth, you all could just decide, okay, we're just going to share everything across the

Washington Oregon State border with a common system that can do a true forensic intelligence on. Because I think that's what you're really talking about here, is to be able to use footwear as a forensic intelligence tool as much as just, you know, we're going to do 1 to 1 comparisons.

Jeff Jagmin [00:25:33] Right after the fact.

Dr. John Morgan [00:25:34] Yeah.

Chris Hamburg [00:25:34] Absolutely. Because in Oregon and Washington, I don't know if you're really familiar with the geography, but Portland is a major city in Oregon. And right across the river is Vancouver, which is becoming a larger and larger, more or less bedroom community of Portland. But we don't communicate. We're separated by a mile and we don't communicate at all in regards to the collection of evidence such as footwear. So that's a significant challenge.

Dr. John Morgan [00:26:01] Yeah, absolutely. Well, I appreciate you all being on here. Chris Hamburg from the Oregon State Police and Jeff Jagmin from the Washington State Police Crime Laboratory. And love to hear about your workshop and the other work you're doing in footwear. Thank you for being on Just Science.

Chris Hamburg [00:26:16] Thank you, John.

Intro [00:26:19] Next week, Just Science sits down with Robert Thompson from NIST with regards to consecutively manufactured barrels. Opinions or points of views expressed in this podcast represent a consensus of the authors and do not necessarily represent the official position or policies of its funding.