Creating pain in the lab: research into chronic functional pain

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Intro VO: *Welcome to the Ideas Lab Predictor Podcast from the University of Birmingham. In each edition we hear from an expert in a different field, who gives us insider information on key trends, upcoming events, and what they think the near future holds.*

Andy: Hello, today I'm with Dr Stuart Derbyshire (http://www.birmingham.ac.uk/schools/psychology/people/profile.aspx?ReferenceId=10014) who is Director of Pain Imaging at the University of Birmingham and a reader in Psychology (http://www.birmingham.ac.uk/schools/psychology/index.aspx). Hello Stuart.

Stuart: Hello.

Andy: So, can you tell us a little bit about what it is that you do.

Stuart: Yes, so I'm particularly interested in pain, obviously, and the types of disorders that I'm really interested in are disorders where there's no obvious cause for the person's pain. So they have pain, they'll feel bruised all over, for example in fibromyalgia, patients with irritable bowel syndrome have gut pain, patients with idiopathic facial pain have face pain and all these different disorders. The thing that underlies them is that we can't find anything obviously wrong, there's no disease process which can account for their pain and so we think something in the brain has potentially gone wrong and that's what we're trying to find out. We're looking for what it is that's gone wrong.

Andy: So what do we know about pain? What do *you* know about pain, more precisely?

Stuart: If anybody's ever really thought about pain, probably they think well pain's simple, it's that thing that's caused by something painful, which straight away gives you a clue that there's something wrong there because we're defining something based on what it is. Pain is caused by pain, that doesn't sound very useful and the reason for that is actually pain has some content to it. There's a particular feel to it, there's a particular sensation, a particular unpleasantness to it and that's really what we should focus on and the really surprising thing about pain that we've learnt over the last fifty to a hundred years is that there's no obvious relationship between an injury and an experience of pain. A very famous experiment, quite old now, about twenty years old, two researchers sat in an A&E department and just asked people as they were coming in 'are you in pain?' and what they found was that in about 40% of cases people said 'no, there's no pain at all' and they had pretty nasty injuries, and in about 40% of cases people reported perhaps rather more pain than they should, which left only 20% of people reporting the right amount of pain for their injury. So there's something clearly wrong with the idea that a given injury produces a given pain. Pain's much more plastic than that.

Andy: And there are some people who have a congenital insensitivity to pain which, you know, for anyone who's felt pain it seems like quite a good thing to have but it can be fatal.

Stuart: Yeah, you know, reasonably. Most people think well a pain-free life would be a good life but actually no, not at all. There are some fairly obvious reasons for that so if you're taking something out of the oven and you don't have enough cover on your hands, you'll feel the pain and you'll drop what it is. If you don't feel that pain you're not going to drop it and you're going to give yourself a third-degree burn. So pain has a very obvious protection factor to it which is necessary but actually the people with congenital insensitivity to pain, it's more gruesome than that really. So every time you stand or any position you adopt in fact, there are these little movements that you make all the time, and what those movements are for are just to basically protect the joints so that you don't put too much pressure on one joint versus another and so forth. And if you don't make those movements what happens is that blood gets trapped in the joints, the blood goes rotten and then when you do move it's released and it causes a bacterial infection and that's what tends to do serious damage to people with congenital insensitivity to pain.

Andy: And what can be done for these people? Is there anything that...you work in pain imaging and these people don't suffer pain, can you -

Stuart: Yeah, so there's a couple of reasons why they don't suffer pain. Either the peripheral nervous system, that's the nerves in the skin that usually conduct noxious information, they're not there so they don't feel pain for that reason. Or alternatively the brain pathways that are necessary for pain, they're somehow compromised, they're not there either and so they don't feel pain for that reason. Regardless of which reason it is, it's actually remarkably difficult to treat this disorder because they just don't feel any pain so if they do something that is damaging, like grab a casserole out of the oven without appropriate wear on their hands, they just don't feel it. So they'll put the casserole down and then look at their hands and they'll see the burns and they may giggle, which is because they recognise that there's an injury there and that's a problem, but they also recognise that it doesn't bother them and that incongruity between what they see and what they feel is actually quite funny, or at least we use humour to try and fill that gap between what we see and we know. You would think well you just learn not to do that kind of thing, but it's actually very difficult to learn not to do that kind of thing when it doesn't hurt. There's even been research where people have been strapped up to an electrical generator attached to their armpits - for some reason the armpits tend to remain a bit sensitive - and so that when somebody does something that's going to cause them damage they put sensors on the hands so when they grab something hot it gives them an electric shock in the armpit. You'd think well that's going to work, but actually what tends to happen is people get irritated by it and they just rip the generator off.

Andy: Wow.

Stuart: So if you don't have the ability to feel pain it's remarkably difficult to rectify it.

Andy: So what are you hoping to learn about functional pain and will there potentially be any therapeutic benefits to the outcomes of your research in the future?

Stuart: Functional pain is a very challenging disorder. Depending on which surveys you believe, anywhere between 5 and 20% of the population has a chronic functional pain and they're pretty devastating to quality of life, you know, patients can't go out and enjoy their lives in the way they used to, they tend not to be able to work in the way they could before and they just are in a state of fairly constant discomfort, so it's a very pressing clinical problem and as I've mentioned, we've got no real idea of the disease process underlying it, we've got this conception that maybe something's going wrong in the central nervous system in the brain and so with brain imaging what we've done is we've basically tracked pain through the brain to see if we can find where there's a blockage, where there's a problem in these patients. We haven't really found anything yet and a few years ago what I decided was we should perhaps take a different tack. Rather than taking the patients and looking to see what's going on in their brains, perhaps we should take people who don't have pain and see if we can make them have pain without a traditional noxious stimulus. So I've used things like hypnosis, I've used pictures of people with injuries, I've used a rubber arm illusion where you give people a fake limb and then have a stab to the limb and all kinds of strange things in our lab and basically what we're trying to do in our lab is create pain without touching. Touching is cheating. And if we can do that then I think we've got something that models the core feature of functional pain which is this pain in the absence of something that should cause pain and we've been fairly successful at doing this. We've generated pain without touching people in lots of different ways, we've imaged their brain while they're experiencing this pain and we're building a picture of what the brain does when it's created an experience of pain in the absence of something that should and then we've taken those techniques and now we're starting to

apply them to patients with functional pain to see if their brains have an exaggerated response or if they work in the same way, that kind of thing. And what we're basically hoping to do is get a better understanding of how the brain works in patients with functional pain and how it might be generating the pain that they have.

Andy: So what's on the horizon in your field in general? Are there any interesting developments?

Stuart: I suppose the new development which I've been a part of is that increasingly we've come to understand that pain's kind of metaphorical and this is not an easy idea to get across but as I say, we tend to associate pain with a smack in the face or a cut to the wrist, you know, that kind of thing, you know, stuff that should cause pain. But increasingly a number of researchers, including myself, have been demonstrating that well, if you have some really upsetting news, if you have a break-up, if you see somebody else in pain, if you're told that something is painful when it isn't, all of these different circumstances can sometimes in some people create an experience of pain which is hard to distinguish from the pain that's created by a cut, a punch, that kind of thing. And so what we're basically doing now is building up a suite of circumstances and understanding around this research to try and understand how you can get pain in the absence of what should be painful. And there's a group in Australia looking at phantom limb pain. I mean this is very difficult pain to treat. The limb has gone, the patient has an amputation but they continue to feel pain in the limb and there's lots of reasons why that might happen. But in a fair proportion of these patients when they observe someone else in pain it triggers an experience of pain in their limb. Anecdotally I've done quite a lot of work with back pain patients and we've noticed that when they see someone else doing a bad lift or a bad bend, they will wince and they will say 'yeah, that hurts my back'. So we're thinking that there's different avenues that create pain and if we can start to understand those, we can perhaps give better education and better treatment for our patients.

Andy: Dr Stuart Derbyshire, thank you very much.

Stuart: You're very welcome.

Outro VO: *This podcast and others in the series are available on the Ideas Lab website:* ***www.ideaslabuk.com (http://www.ideaslabuk.com/)*** *. On the website, you can find out how to e-mail us with comments, questions or suggestions for future topics for the podcast. There's also information on the free support Ideas Lab has to offer to TV and radio producers, new media producers and journalists. The interviewer and producer for the Ideas Lab Predictor Podcast was Andy Tootell.*