Paul Evans
This is *Airing Pain*, a programme brought to you by Pain Concern, the UK charity providing information and support for those of us living with pain, our family and supporters, and the healthcare professionals who care for us. I'm Paul Evans, and this episode of *Airing Pain* is produced in partnership with the British Pain Society.

Katelynn Boerner
The timing of puberty makes quite a big difference for girls in terms of a variety of different outcomes, including pain. So, going through puberty early is actually associated with a lot of detrimental outcomes for girls.

Rebecca Pearson
I've got some footage from the recent Scottish Cup final where Aberdeen beat Celtic on penalties, and I said to my father, who's an Aberdeen fan, I said, 'I think they're going to do it', by the look of the face of the goalkeeper. And that is a real thing of just how important, that's – you know, you've said, 'What's an interaction' – that's an interaction. Goalkeeper, striker.

Paul Evans
I promise it'll all come clear soon. Now, if you're a regular listener to *Airing Pain*, you'll know all about the biopsychosocial model for chronic, or persistent, pain. That is: the physiological, our physical health; the psychological, our thoughts, emotions and behaviours; and the social, that's everything from our environment, relationships, school, work, money, cultural factors and so on.

So why is this biopsychosocial model so important? Cormac Ryan is Professor of Clinical Rehabilitation at Teesside University. He is also a Community Pain Champion for the Flippin' Pain campaign, a public health campaign funded by Connect Health. Its mission is to change the way that we think about, talk about and treat persistent pain.

Cormac Ryan
We are as human beings a single entity, and we use the term biopsychosocial as a shorthand way of understanding the different factors that might influence us and how we behave, how we experience things, how we action things. But it's a bit of a false dichotomy to say that 'Oh, there are distinct biological things, distinct psychological things and distinct social things'. They're so interwoven, they play upon each other in such a way that to understand one area is to have some understanding of the others. Understanding how they integrate with each other, how they play with each other, that can be really, really powerful, knowing how things like social communication can actually influence your biology, how your thoughts and your fears can influence your biology and subsequently influence how you interact with people.

Paul Evans
We are socially interacting now. We're speaking with each other. Our minds, hopefully, are working – well, we're concentrating. How could that affect our biology? Or, if we weren't happy doing this, how would that affect our biology?

Cormac Ryan
When we're doing our public health road shows within the Flippin' Pain campaign, there's some studies that I like to draw on particularly, because I just find them so fascinating, they're great stories.

It's a rat study. I appreciate it's not a human study, but you'll see as I go through why it couldn't be a human study. But how we are made up is quite similar as mammals, for want of a better word. Rat Community One have noisy neighbours, but considerate neighbours. They play lots of loud music a bit randomly, but between nine and five, normal working hours. The rest of the time, they're quiet and they're good neighbours. Rat Community Two have equally noisy neighbours, but they're really inconsiderate. They will play loud music and make loud noises at any time of the day or night, at really random times.

What the scientists found is that in Rat Community Two, where they had the inconsiderate neighbours, they developed classic signs synonymous with having persistent pain – hypersensitive to pain, fatigue, withdrawal, lots of those signs that we can relate to people. The scientists described these as 'fibromyalgia-like' symptoms, but I think one could see it more broadly as just chronic pain-like symptoms.

Another reason why you couldn't do this with humans is that afterwards all the animals were euthanised, and the scientists then explored their biology. The biology of Rat Community Two, who had the inconsiderate neighbours, had changed – so their physiology was now more in keeping with the physiology of someone with persistent pain. Their nervous system and their immune system had altered in such a way as, essentially, you become better at processing stimuli in such a way as it produces that pain experience. So, stressful-based social interactions had influenced the biology of the individual in such a way as they were more likely to develop and experience pain.

Paul Evans
That's Cormac Ryan.

So, as I said, in this edition of *Airing Pain*, I'm focusing on the social component of the biopsychosocial model for pain, and in particular, social interactions – in the broadest terms, any communication that occurs between people.

Adverse conscious interactions – we're talking the physical and facial and tangible – they can be interpreted by the person you're interacting with. Joy, sorrow, anger, pain and more. There are unconscious actions that we don't know we're making, feelings that we don't wish to reveal, or even that we don't know we're experiencing.

Rebecca Pearson is Professor of Developmental Psychology and Epidemiology at Manchester Metropolitan University. Her research area is in psychological mechanisms underlying child and adolescent mental health and development, including pain.

Rebecca Pearson

We know that people mask emotions. I think that probably stemmed out of work on social masking and autism. I've got some footage from the recent Scottish Cup final where Aberdeen beat Celtic on penalties, and I said to my father, who's an Aberdeen fan, I said, 'I think they're going to do it', by the look of the face of the goalkeeper. And that is a real thing of just how important, that's – you know, you've said, 'What's an interaction' – that's an interaction. Goalkeeper, striker.

If you think about being in pain and then your loved one, whether that's your child – so I'm very interested in mum–child interactions, looking at that intergenerational pain – or your partner. You want to protect your child from knowing you're in pain. You want to protect your partner, you don't want them to be like, 'Let's not go out actually, after all'. What is that doing to the subtleties of human interaction?

So pain masking might be, and this is again where I come to the example, which I do think is a useful one, about the goalkeeper. What's the ground truth. The ground truth is a concept of, let's say, the real truth. What's the emotion? Is the emotion that's relevant what you feel? And you're feeling like, 'I don't want to be here, I'm in pain, it's bothering me'. Then there's the emotion that you show, and how that's perceived by the other person. Not knowing about the pain, they might be like, 'They're annoyed with me'. Then that means two people have a sequence that, over time, gets a bit misaligned. These interactions occur in the moment, but they gain meaning over time, that kind of interplay of sequences.

So you take that tiny interaction of suppressing the pain. Maybe you're looking a bit not-quite-right to someone who knows you really well. It's like something's a bit off. But people tend to make it about themselves, because we all do. I think I've annoyed them, right? And then they start to be a bit different. And then the person in pain is like, 'Oh, they're now annoyed with me because I'm ruining their day.' I've heard from public contributors and those living with pain, they feel a burden. So it's all of this – do you see what I mean – this interaction.

Paul Evans
I sort of see masking in that sense, as I have pain. Somebody says, 'How are you today?'. I'm fine. Well, it's a lie, but that is masking. But what you're saying is there are more tells than just me saying I'm fine, but I'm not.

Rebecca Pearson
Yeah, it will be more complex than that, because, actually, probably what you want – or maybe you don't, I think I would – is you want them to know you're not really fine.

Let's flip it to some more strength-based moments. This is what's been researched heavily and understood heavily as parent–child interactions. We know that you can really pull out those strengths-based moments where the mum has really been attuned to the baby and worked, because the babies can't tell us, worked out what they want – perhaps all that attunement.

So we know that supportive relationships can be really protective in living with pain. Can we get that understanding of the subtleties to be understanding that actually maybe they're beginning to feel that it's a bit much for them, or those precursors, and that little bit of reassurance, it's okay to tell me you're in pain.

And one of the other things that's quite interesting. Again, I'm really afraid I keep going back to this football example, but it's very good because we've got this emotion-reading software, and I've just for a demo purpose ran it free. You can break the mask, and you'll see that outside of this composure, when they win and his teammate comes over, there's a spike of this happiness, so it's lifted the emotions out, and that's a positive emotion. But it's like, how can we have those safe moments to unlift that, because it's tiring. We know that from autistic burnout. It's called that. It's tiring holding that in. So that might be what's happening in pain. You're not just dealing with pain, you're holding it in for everyone else. And then there's that burnout. So where are those safe spaces and those connected people that you can say, 'Actually, I want to go home, I'm feeling, you know'.

Paul Evans
So going back to your goalkeeper and penalty taker. You had worked out that the goalkeeper was going to fail.

Rebecca Pearson
No, he saved.

Paul Evans.
Oh right. Okay. So you had worked out that the goal would be saved and the goalkeeper was –

Rebecca Pearson
Ready for it.

Paul Evans
He was the winner. What would have been in his facial expression hidden from most of us that you thought, ohh.

Rebecca Pearson
Yeah. And I've actually put it through the AI software – that agrees with me. Honestly, I'm on record saying it. It's because he believed he was confident. And when he was interviewed afterwards, they said, well, what was going through your mind? And he said, the manager – I think it's manager, not a football expert – had said, *when* we win, not *if*. And he said, 'This is your moment to be a hero'. And the reason I thought, 'I think he might', was because he micro-smiled. It was almost like, 'Okay, I'm going to enjoy this', not 'I'm scared'. But he was then composed. So I said 'I think he might'. And he did. He saved two penalties. I mean, this is a little, you know, who knows if I've got a career in penalty prediction.

Paul Evans

Well, there's money in it, I'll tell you.

Rebecca Pearson
Oh, well, there you go. But it's something about that, just how powerful that actually is. And maybe I was lucky, but it's something about that interaction. And I know that they do that in that training. Does this, and all the expertise I bring from a completely different area of work, can that help us understand how living with pain impacts relationships and, most importantly, how to draw on the strengths of those close relationships?

Paul Evans
I put it down. This sort of double masking, if you like. It's me masking my pain, but you masking what you think of my pain.

Rebecca Pearson
Oh, that's brilliant. I'll be quoting double masking. You've come up with that? You'll be on record. Yeah, well, that's what I said. There's double ground. Exactly. Because then you can see a cycle. I'm sure we've all experienced some loved one being in some form of pain or illness. And you're like, 'Oh, I don't want them to think I'm mollycoddling them either. If they want to carry on, that's fine'. So exactly. Double masking and double interpretation.

And then you can see it escalating. Because what we're seeing in the epidemiological work that I'm also involved in is that over time, in large datasets, young people who are living with pain later on report less social connections, less feeling support. And our hypothesis is that they're withdrawing because they don't want to be a burden. Or another thing is, might they be getting misinterpreted, as maybe people are like, 'Oh, what's up with them?'. You know, but if they just said, 'Oh, actually, I'm in pain' or 'I don't like you', it might help that kind of double-de-masking then, perhaps.

Paul Evans
So how does your software, your AI software, work? I mean, what is it looking for.

Rebecca Pearson
This is something that's out there commercially available. It's something called FaceReader. I and many researchers use it. It's been well validated based on the FACS: Facial Action Coding System. It's based on facial muscles that are well validated to show particular emotions. So that's what you're looking for. Every frame is nought-point-nought-two seconds, usually. It will compute based on the specific facial expressions and intensities of emotion. This is yet to be applied to pain research, but certainly in teenagers it's very predictive of how they're feeling. So the self-report questionnaire, you get the same as if you got a psychology student to pick that emotion. But it's giving us that tiny fine-grained time, which I think is nought-point-nought-two seconds. So that's, you know where I said about, the goalkeeper micro-moment. Now software is opening up that possibility to see these tiny changes.

Paul Evans

Firstly, there's no end to a research programme. There might be an end to the funding, but learning continues. How do you think this will be used in the future?

Rebecca Pearson
This is the beginning of saying, well, all those things that you've raised. What parts of that are helpful in understanding if we can use some of it to reduce the impact on relationships that being in pain has? Can we get those people, whether it's parents, children, friends, intimate partners, to say, 'Okay, well, how can we use the strength of our relationship and those momentary interactions, understanding each other's features and emotional signatures'? Most people with pain say it's not that they want necessarily the pain to stop – they don't want it to be having such an impact on their lives. So maybe it can reduce the impact on people's lives if we understand the strengths of relationships.

Paul Evans
Rebecca Pearson, Professor of Developmental Psychology and Epidemiology at Manchester Metropolitan University.

So, the social component of the biopsychosocial model for pain – that is how everything from our environment to our relationships, school, work, money, cultural factors and so on affects us. Gender and gender identity must be part of that equation. So do boys, girls, non-binary, trans children and young adults experience pain and the care they receive differently?

Katelynn Boerner is Assistant Professor in the Department of Paediatrics at the University of British Columbia in Vancouver, Canada.

Katelynn Boerner
We know that that experience is quite different, and that a lot of that comes from the social expectations. I think from very early on, young people are exposed to the message that boys should 'Tough it up' and be stoic and not show their pain – you know, 'Big boys don't cry'. Really, what we now call toxic masculinity. I think boys from quite early on learn not to express their pain, particularly in social settings, if they want to appear masculine. And on the flipside, I think those gender biases are also very harmful for girls and young women, who, also from quite early on, can be told that they're being dramatic or hysterical, or that their pain is all in their head, that it's not real.

So there's these toxic gender biases that are imposed on both boys and girls. And what some of my more recent research has been looking at is how do transgender, gender-diverse, non-binary youth experience some of those same norms. A lot of gender-diverse youth will talk about being very aware of those norms and actually using them, even if it's not helpful in terms of managing their pain, as a way of sharing their gender identity with the world and having people treat them in the way they want to be treated, which I think is fascinating – that these young people are aware, like 'This is an unhelpful stereotype, but this is the game that I need to play if I want people to take me seriously'.

Paul Evans

I mean, the transgender thing is interesting, isn't it, because somebody who's brought up as a boy and transitions into being a girl, you're really shifting the stream. You know, ‘Big boys don't cry’ and ‘Be a man about this’ to, as you were saying, ‘Come on now, you know girls don't do that’.

Katelynn Boerner
Yeah, and then there's this extra layer of – I think a lot of transgender youth have this experience of not being believed. You know, that idea that they don't know themselves, or that maybe their gender identity is something's that going to change again, so nobody wants to take them seriously. So there's this additional layer of suspicion that a lot of them encounter in the healthcare system, even if actually what they're seeking treatment for has nothing to do with their gender identity. It still has the potential to colour that healthcare interaction, and that's where I think we need some of this research in the pain world, because the way that we're interacting with boys, girls, gender-diverse youth, in theory, should have nothing to do with their gender if we're focused on their pain. But actually, it's so relevant.

Paul Evans
It has everything to do with it.

Katelynn Boerner
It does, yeah, and I think what we're also trying to figure out is, what are the psychosocial components related to gender that impact the pain experience? And what are the things like hormonal experiences that are impacting pain? And we have a lot of reason to believe that the sex hormones that emerge around the time of puberty are playing a big role in discrepancies that we see between men and women in terms of their pain experience, but we don't really understand enough about how those two things intersect, and we don't have a really good biopsychosocial perspective.

Paul Evans
What do you think is going on?

Katelynn Boerner
Well, one finding that we see pretty consistently is that differences based on sex and gender tend to emerge after puberty, so there's certainly a sex hormone role, but puberty in adolescence is also when there's a lot of social context happening, a lot of social pressure for young people to determine their identity and figure out how to share that with the world. A lot of pressure to start to have some independence in how they're navigating the healthcare system. So I think it's a little bit more complicated than just you hit puberty, the hormones appear, and that explains all the differences.

One other thing that we've found in our research is that there's differences in terms of how boys and girls experience social modelling. So we know that pain tends to run in families, and if a child is exposed to pain from a parent, that impacts girls differently than it does boys.

Paul Evans

You mean if the parent has pain?

Katelynn Boerner
If the parent has pain, yes, it impacts the child's own pain experience differently depending on the sex of the child. What's interesting is that it doesn't seem to matter so much the sex of the parent. We initially thought boys would be more impacted by observing a dad than a mom, and vice versa for girls. But from some of our experimental work, we found that actually that's not the case. It's girls who see an exaggerated or more intense pain expression from either parent, who experience more pain themselves.

Paul Evans
I thought you were talking about the empathy side of it, but the experience of their own pain is different.

Katelynn Boerner
Which could very well be, at least in part, because of a difference in empathy or social attunement. There's some other research that suggests that girls might pay more attention to social cues in their environment than boys. It's entirely possible that what's going on there is just girls are more attuned to or alerted to what is happening for their parent when they're undergoing a painful experience, and then when the child undergoes pain, subsequently, that is impacting girls in a different way than boys.

Paul Evans
One thing you have to take into account, I guess, is that boys and girls develop at different times. So a 14-year-old girl might be the equivalent of a 16-year-old boy in maturity.

Katelynn Boerner
Yeah, and there's some interesting research showing that timing of puberty makes quite a big difference for girls in terms of a variety of different outcomes, including pain. So, going through puberty early is actually associated with a lot of detrimental outcomes for girls, and that would further widen the gap between them and boys. But then the other thing that's also happening during puberty is, for young girls and women, the start of menstruation. That's a monthly pain experience, one that, for many young people, is significantly painful. And if you think about that co-occurring with the emergence of other types of pain conditions, it's a complicated picture. It looks very different for girls than it does for boys. And that’s also why there might be unique experiences for trans and gender-diverse youth.

Something I've been thinking a lot about is, how do we use this information to inform healthcare providers about the biases that they might be running up against when they're assessing pain? There's a growing body of research that suggests that pain tends to be underestimated for girls relative to boys, and there's some really interesting experimental research that I cannot take any credit for, I haven't done, but where they've shown adults and healthcare professionals pictures or videos of children undergoing a painful experience. If the adult caregiver or health professional is told this child is a boy,

then they rate their pain as being higher than if they're told this child is a girl, even if everything else remains constant. And these are really profound findings, I think, because the stimuli that are used in these studies are of relatively young children, like children that would be of an age where we actually wouldn't expect to see any sex differences emerging yet, because they haven't reached puberty.

Paul Evans
Let me illustrate. Before even you've seen the child, there's a built-in bias. If you're male, you are scored higher for pain.

Katelynn Boerner
I think part of that comes from this idea that boys are socialised not to show pain. So if you're seeing pain, then it must be really bad. Whereas we've sort of, I think, become desensitised to the pain of girls and women, it's sort of expected and normalised. So girls and women don't get rated as having the same level of pain, even if the expression and the stimuli – in some cases, they even use the exact same video of a child who's dressed and appears androgynously, so that the video is exactly the same, but people are rating their pain differently.

Paul Evans
So girls go through menstruation, they go through childbirth, so women are used to pain, therefore they can cope with it better.

Katelynn Boerner
But it's interesting to think about how we do normalise different types of pain for different genders. If you think about for boys and men, we really normalise experiencing pain related to physical pursuits like sports or where there's an aspect of competition, and that's pain that's sort of celebrated, but the pain that's really normalised for girls and women is illness and menstruation and childbirth, maybe that's celebrated. Those are pains that are perceived differently in terms of what a normal pain experience is for genders.

Paul Evans
So men get man flu. In other words, they go to bed on day one, but women hold their own.

Katelynn Boerner
This is where I think there's some fascinating work that's being done looking at gender role threat, which is if you identify as being masculine or feminine, and I think this seems to be true regardless of the sex that you're assigned at birth, if you identify as masculine, and something interferes with your ability to feel masculine – and if you think about it, pain is a huge interference when it comes to gender roles – if you're not able to be stoic and strong because you're in pain, that's a threat to masculinity. On the femininity side, we can see something similar, where, if pain is interfering with traditional feminine activities, like caring for others, that can feel like a gender role threat as well.

We've often thought about sex and gender differences in pain as almost being a bit of a competition. You know, somebody is always being left behind, and whether it's that not enough women are represented in preclinical research or not enough men are represented in clinical research, and gender-diverse folks aren't being represented anywhere, really everyone suffers when there's these inequities, and these gendered stereotypes and biases are harmful to everyone in some way or another.

Paul Evans
This is a societal issue as well in the world of pain medicine. I mean, how do you get around this?

Katelynn Boerner
It's a great question, because I think it is bigger than what an individual clinician can do. I do think that as we get more awareness of where these biases exist, how they influence our research and then subsequently our clinical care, I think the awareness is a really good start. And we're still working on that.

Paul Evans
I know it's easy to pay lip service to these things, but of course, we know that. But actually, if you stick a young trans person in front of somebody with a very, very fixed mind...

Katelynn Boerner
It's really interesting because we did a qualitative study recently where we talked to trans and gender-diverse youth who have chronic pain, and one of the things that we wanted to hear about was what had their healthcare experiences been like. It was so striking to me, to hear these young people talk about what they needed from their healthcare provider. To be clear, we were talking about healthcare in the context of receiving care for their pain. We weren't talking about going and getting gender-affirming surgery or hormones or anything like that. Really, when it came to their healthcare, what these young people wanted was just to be treated with respect.

I was admittedly shocked by that, because I was expecting that we were going to come out of this study with a huge list of recommendations for providers to say here's all your dos and don'ts, and here's exactly how you should practice if you want to be inclusive and create a welcoming environment. And really it was just respect, like if somebody tells you their name, to use that name, and if a young person is still in the process of figuring out their gender identity, to be okay with the fact that that they're figuring that out, and to not pressure them. A big one was really things that should probably be standard practice anyway, like asking for consent before conducting a physical exam, and just practicing in a trauma-informed way. It was surprising, and I have to admit a little disappointing, and maybe I was naive in assuming that that would have been the standard, but that was not what I was hearing from these young people.

Paul Evans
That was Katelynn Boerner of the University of British Columbia in Canada, and we'll return to her in just a minute.

But for now, I'll remind you that whilst we at Pain Concern believe the information and opinions on *Airing Pain* are accurate and sound, based on the best judgements available, you should always consult your health professionals on any matter relating to your health and wellbeing. They're the only people who know you and your circumstances and therefore the appropriate action to take on your behalf.

Now it's important for us at Pain Concern to have your feedback on these podcasts so that we know that what we're doing is relevant and useful, and to know what we're doing well, or maybe not so well. So do please leave your comments or ratings on whichever platform you're listening to this on, or the Pain Concern website, of course, which is painconcern.org.uk. That'll help us develop and plan future editions of *Airing Pain*.

So I'll end this edition of *Airing Pain* with Katelynn Boerner's advice for healthcare professionals when dealing with young people.

Katelynn Boerner
There's some shocking statistics in trans and gender-diverse healthcare research about the incredibly powerful impact of having one adult provide a safe and affirming environment for a young person in terms of how well that can predict risk of suicide. You know, as pain providers, again we're not necessarily in any sort of position to comment on the legitimacy of someone's gender identity or to make decisions about gender-related healthcare, but we are in a position to provide support. And I think that is a very privileged position we hold.