Academy of PHYSICAL MEDICINE

Transcript

OA Knee: Rehab for the Masses With Claire Minshull

Cast List

Steven Bruce	SB
Claire Minshull	CM
Dave Hutchins	DH

SB: Most important of course is this evening speaker who is back with us by popular demand because she was so good last time. She is probably one of the UK's leading rehab experts. Has a particular interest in Synovial joints that was the topic of her PHD thesis and a special interest in knees. She has lectured at various universities. She's speaking tomorrow at Orthopedic Consultants Symposium on the knee itself. She's been published in countless journals as either an author or a co-author of various articles well anyway, she's Claire Minshull welcome back Claire.

CM: Thank you.

SB: Really great to have you with us.

CM: I was wondering how you were talking that.

SB: The last time I had to get the title of your PHD.

CM: Oh my goodness yes.

SB: You can't remember what that is, so it doesn't matter that I couldn't-

CM: Long time ago.

SB: Before we get into tonight's subject, I forgot to mention, you also run hands on courses, that you're running two of those at the moment-

CM: Yeah two in person classes.

SB: And you run online courses as well, we'll talk about those later on, but one of our team has actually been on one of your hands on courses. Jay our sound technician is also a sports therapist .... Kara can we get the camera on Jay for a minute in the booth there up in the gallery ... And Jay did the, which course was it? Muscle re-

CM: Strength-

Jay: It was Neuromuscular strength.

SB: Neuromuscular strength. Was it any good Jay?

Jay: Yeah, it's fantastic actually. Yeah, it's intense. It was an intense two days, but it's totally changed the way I work with patient group and actually-

SB: Yeah that's enough, the thing with Jay if you don't shut him up he'll go on for hours and hours and hours.

Jay: Have a good show guys.

CM: Thank you.

Jay: Okay.

SB: I just thought we'd bring that up because he came back raving about you.

CM: Oh wonderful.

SB: He really did. Just that it was influencing his treatment of other people. And then we had one of our speakers was in the other week and afterwards we started talking about, problems with knees and she knew some stuff and I thought, "You did know that you're okay I'm sure." Anyway, let's get right to where we're talking about this evening, we're particularly interested to see the OA of the knee and I mentioned that you have a special interest in it, why?

CM: Why of the knee or why OA?

SB: Of the knee.

CM: It's a joint that we give a lot of pounding to, it sparked up when I was an undergraduate actually and I was particularly, my appetite was whetted when I discovered Kinesiology and that was like my final year of my degree, unfortunately. But then from then on PHD became available and I went straight down to PHD after my undergraduate degree.

SB: Which was in Synovial joints particularly the-

CM: In the knee. The model in which we understand the exercise stress and thus potentially injury risk and therefore informing rehabilitation. Trauma sends all synovial joints, but the knee being a particularly important joint in terms of mobility, but also one that we injure frequently and from a sporting perspective, but as we get older then it's also OA is highly prevalent in that joint as well. So we could do with understanding the muscular joint and that complex a little better.

SB: We've been an audience of primarily Osteopaths and Chiropractors and some Physiotherapists, watching this evening, so they'll have a really good idea and understanding of OA, but just walk us through the development of OA in the knee, whether it's traumatic, whether it through… in the knees or whatever.

CM: It's varied, isn't it? So we don't really know why OA a develops in that. It's multifactorial so you've got things like genetics that can inform whether or not you were succumb to Osteoarthritic changes, things such as prior injury. So we know some evidence to suggest that a prior ACL injury brings on earlier onset of Osteoarthritis. Things like that combined plus or minus with your physical activity status, your job, your lifestyle and behaviors so it's multifactorial there's not one single, I suppose main risk factor that informs whether or not you succumb come to that and then interestingly as well, just because you have Osteoarthritic changes in the joint doesn't necessarily mean the symptomatic. It's a complex thing.

SB: Yeah, see I hadn't realized that and I should have done because of course you look at an MRI of a lower back and you yourself, have had plenty of low back problems in the past and given we touched on those in the last podcast, but you can see plenty of problems in the back in inverted commas which then produce symptoms.

CM: Exactly, yeah.

SB: You've looked into the research into a way in knees, is presumably pretty extensive. Why haven't we got on a better idea of how we developed them.

CM: I think we have, we're discovering more and more, as research is progress. So my particular interest is more about management rather than discovery of why it happens and perhaps some of the cell biology, but our understanding of it has improved over time. And also we're kind of getting there as well with management of it as well. So we were focusing more as a research

community on the disease and we have to as well because it's so damned expensive to the economy, to the community, to the quality of life that we need to continue to push research boundaries but also quality research. So previously, several years ago, I did a systematic review recently, which looked at the management of knee Osteoarthritis through a resistance training and unfortunately, the quality of some of these gold standard randomized control trials weren't really up to scratch.

So I think what's happened over time as well, not just the breadth of the research and our understanding of the condition is improved, gradually we're starting to improve the quality of research and interventions particularly for management, in management of that disease.

SB: Which makes me think of two things. One is are you still engaged in research yourself? Primary research?

CM: Yeah, so I've just finished a clinical trial actually and I with my partners in the, Orthopedic Hospital in Oswestry, Shropshire. So we're looking at ways in which we enhance rehabilitation post operatively by using the cross education affects something that Jay would have learned about in one of my courses so, trying to forge, again, improving rehabilitation by using some really actually quite basic, I suppose you call them sport performance concepts, but they aren't really translated into rehabilitation so much.

SB: The second question, built on what you said was that why are so many of the trials falling short of what is supposed to be a gold standard and we know that lots of research fall short is it intentional shortcutting the system, is it ignorance on the part of the research. Is it like a funds is it, can’t be a lack of patients because there are millions of patients out there.

CM: Well without kind of making a big sweeping criticism of research community of which I'm a part of. It's clearly, it's not intentional but I think it's probably, certainly the research that I've done into the research of those systematic reviews. It's methodological approach and delivery of intervention so that particular study looked at, as I said, the management of knee Osteoarthritis through resistance training.

So a systematic review involves a very lengthy and deep troll of all those primary kind of randomized controlled trials. So just to give you a flavor, only out of the thousands that were available only 34 met the criteria, which we assigned which is a part and quality criteria. But then when we looked at the methodologies, each one of those studies explicitly stated in the methodology that they were applying a strength training protocol or strength training rehabilitation intervention to those knee OA patients. But when you looked at the methodologies none of them were replicable to start with, so you wouldn't be able to have enough detail to replicate them and only one of those 34 studies came somewhere close to actually playing a strength

training protocol. So the heterogeneity or the difference between one research group are doing to another research group was absolutely vast. And most of them were actually coming close to delivering something that would elicit a strength gain. That's getting better now much better so those RCTs are improving.

SB: Was your review a Cochrane review?

CM: No, it wasn't a Cochrane review, but a systematic we had published in Osteoarthritis and Cartilage.

SB: What can we the medical community do to help with the research. And I'm not suggesting that everybody sends all their patients to you from Edinburgh and Truro and wherever else. There got to be a way of improving the quality of our knowledge.

CM: Actually if you slightly modify that question in just, everything that we're doing as a treatment or as an intervention, which is generally we're hoping it's evidenced based or at least there's some hypothesis behind that. I would say that, just be aware of when you're reading the evidence and I say evidence because don't be critical when you read a review paper, research paper, what is the quality of that paper and critique it. So rather than just read the abstract and x works on y dig a little bit deeper and just be mindful that, not everything that's published is going to work across several populations or indeed, maybe you've got an issue with or criticism perhaps of as we did with the way in which exercise has been dosed, whether or not it's been measured, monitored and this is a lot of publications out there and then you get the arguments between research groups as well. So just be, I'd say be a little bit more mindful of reading the evidence and just read it with a critical eye.

SB: It is tough reading research there, isn't it? Because it's not easy to see the flaws in research which is presented in what is in most cases are very boring series.

CM: Very true.

SB: ... And paragraphs. And so lots of people will look at the abstract and probably not going to go much further than that. I presume you read Ben Goldacre stuff because, I love reading and sometimes I even understand Ben Goldacre, I love reading it because of course he brings out the flaws in research. He wrote the bad science column for the Guardian. He's written a couple of books. I'm not sure if he's published it yet, but he's writing one on Statins which was supposed to be coming out this year but hasn't… but when you read through his stuff, he would tell you, well you know the way they picked their sample was wrong or the power of the sample wasn't sufficient or look at the statistics they've applied to this. It just doesn't work or it's not

replicable and therefore how can it be meaningful? You just can't understand how they got from here to here.

And he talked about some really bizarre ones where they'll have some dates in one part of it, which I never refer to again and then some other dates but no explanation of why these dates are picked or where these numbers came from or why they followed up for the length of time they did. And the reason I went on at length about Ben Goldacre because he's usually funny. But also I find it's the better way of, a really good way of learning how to read research.

CM: Yeah and that's what I try to do in the courses both online and in person. On any talk that I do actually It's evidence based but from a critical standpoint and you don't want to be sat there to, certainly I don't and I'm Part academic. Just listening to reams and reams of data. You want to know the key bits of information, what that means, the critique of that and then importantly how does that get applied in practice. So you've got a busy job as it is dealing with patients on a day to day basis to try and then curve out extra time to one DCPD and then go searching the literature for research papers and then thinking, "Okay, I need to read a paper on how to critique that to make sure it's," it's an impossible task to do that. We do all of those things superbly well so that's where those good CPD, opportunities and courses are really useful.

SB: So what's your approach to a knee then? What's the typical person who comes to you? Your expertise is in rehabilitation, isn't it? Get back to sport is the site of your website, your organization, although, your emphasize it's not just for sports, people is for anybody. It's all about rehabbing joints and muscles. But what's your approach to a knee when someone comes to you, do you send them off to have scans before you start doing any rehab.

CM: So first and foremost, I'm not a clinician, I have a very varied background which includes research and academia and then practice. So I'm not a clinician. I work within and with a multidisciplinary team so if I know physiotherapy is required or any allied health practitioners I've got a good linkage with the surgeons so they often send people to me and it's more about the end stage rehabilitation. So treatment is not my bag as your bag. It's everybody else's expertise. My area is looking at how the muscles and joints function and then how we can optimize those interventions to bring about the muscle adaptation, the Neuromuscular adaptation to get people back to either sport or whether it be with a OA knee walking the dog for four miles on unstable ground with OA or post total knee replacement.So it would be from my perspective, who's in front of me, what are their goals and what's our current status and then build up the program from there.

SB: So when one of the allied health professionals sends someone to you for Rehab, do they tell you what they want you to do or they just leave that to you?

CM: It's very varied because they come from different places. But we'll generally have a discussion and the important thing is for me that there's a linkage between the clinical and the fitness if you want to categorize things. And that's where I also run other courses for fitness professionals in injury management because what happens currently, you've got people going to see clinicians and then they might get a little bit of physiotherapy and then they drop off the face of the earth and the maybe the told to go to the gym, but you go to the gym and there's nobody there that knows what to do and actually probably quite fearful of somebody with an injury.

We need this linkage, so I've been working, trying to get the NHS to take up, an exercise referral scheme particularly for knee OA. We've got very close but that involves that as a model whereby we're using already skilled individuals within conditioning and we've got the skilled individuals within the clinical environment that are talking to each other and in a loop. So there's that constant communication, constant referral in and out whenever it's needed, but with a focus on wellness improvement and health, to optimize the-

SB: You got almost there, need I ask what the obstacle is to the NHS incorporating this model.

CM: Do you know what? We get to the meeting of being commissioned. So I was almost commissioned four times last year and the next stage would be literally swapping contracts and then there's a meeting that happens, I'm not privy to. Could it be cost? is cost a lot it does save the money.

SB: Yeah, but they didn't at the long term generally do they-

CM: Well it stayed the same when you're within six months but that for some years you're quite right is longterm. The risk of us making changes within the NHS is like turning an oil tanker around, you need really forward thinking people in the NHS when in positions of influence to make cogs turn and introduce novelty so it's a real challenge.

SB: And of course, like so many things which have a huge political direction the focus is not on anything beyond the next couple of years.

CM: Yeah, I learned the language of all the different stakeholders involved in this model that I created. And it's so unfortunate that the first things that you talk about within the NHS is the bottom line and numbers not patient outcomes unfortunately.

SB: The model you were proposing to the NHS was what, what did they have to be?

CM: So I've set it privately now because I can't sit on things I know will help people. But it's like an exercise referral scheme that you would get for let's say cardiac rehab or for stroke or a weight management programs. They

understand that as a model so we're not going to change too many things. And the ideal would be the individual goes to the GP with a sore knee, also hip because it was for hips as well. Person aged over 45 and then some extra patient criteria within that. They would then be triaged by an up skilled Physiotherapist into 12 week exercise referral program. So those candidate patients, some will need straight away kind of a joint replacement we understand that, but we reckoned about three quarters of all these people within a particular clinical commissioning group around the country Probably the same about three quarters would benefit from strength training and that's the difference.

So it's strength focused, exercise referral and then they get referred into a gym and that gym is one of our partners and they are managed and supervised on a strength focused, 12 week program that is delivered and overseen by upscale fitness professionals of which we up skill them. And importantly that Triaged Physio or those Triaged Physio therapists have a presence within the gym. So we're taking it from hospital into the community from illness to wellness and within a group environment they then go through this 12 week program and that Physiotherapist is there for as a clinical link back in if it's needed. They're there for supervision or as a backstop for those fitness professionals and also as just a friendly clinical phase to the patients that are in there during their rehab, their conditioning. So that simple, it's not rocket science it's just doing the basics very well of which-

SB: No, when I think that what we want to get from this evening's broadcast, is this discussion is pretty much as we did last time, is some stuff which is evidence based that people can put into practice in their own clinics because you can't be everywhere, you can't see everybody's patients and like it or not, patients don't often want to be referred somewhere. They just want to get away and be given some exercises which they allowed to do or won't do and that's one of challenges and we talked about that last time to. When you were talking about, you mentioned knee replacement a moment ago, we had a chunk called Jeremy Howick on the show a month or two ago.

I don't know if you know him, he's the director of the empathy program at Oxford University, but he's also done a lot of work in placebo and there was a trial I think within a Canadian sports team where, I don't know how they got the ethic permissions for this but they divided people with knee problems into two groups. One which had sham surgery and one which had surgery and the outcomes were just as good for sham surgery. How does that play into what you've just said about, some will need-

CM: So I think, I think that was Arthroscopy, wasn't it? So Arthroscopy for meniscal pathology, I think. So yeah, and it's been replicated since that original study. I was actually talking about it to somebody the other day actually-

SB: We should elaborate for people. By sham surgery means-

CM: So basically you have a group of people who have any condition where they would, and I think it was a meniscal pathology where the valid treatment option for them would be an Arthroscopy. I can take away that the time bit of Meniscus, or wash out or whatever he wants to call it. so they randomly allocated double blind. So the surgeon obviously knew what was happening, but the experimental team didn't, they randomly allocated a group to surgery and agree to, like you said, a sham surgery, and the patients-

SB: Which was an incision.

CM: So yeah, the patients didn't know which group they were going to be in. So like ethics probably would have been a challenge there but basically from the patient's perspective, they woke up, both groups had the little cuts to indicate that they'd had Arthroscopy but yet one group only had a small incision with no Arthroscopy. The other group had the full Arthroscopy and when they measure the outcomes, then there was no significant difference between the groups which is really interesting.

SB: Yeah. How long did they follow up for, do you remember?

CM: I can't remember that for the top of my head. Forgive me, no.

SB: Because there will be some response to the insult to the tissue won't there? Maybe that had an effect I don't know. So take us through then, Where I'm going with this is in the old days when my Physiotherapy colleagues would say, "Well, when you have a knee that you've got problems with, all you need to do is strengthen Vastus Medialis," and that's what you do. That's presumably what you do?

CM: Well, I'm probably rectus femoris and biceps femoris and the glutes, yeah. We have a conversation as well-

SB: I've insulted a whole lot of Physiotherapist I was exaggerating of course, but Vastus Medialis was the muscle of the month for a long time.

CM: It was, and it's still debated on whether or not you can isolate at that single muscle from the group, maybe with slightly different foot positionings perhaps. But, within that, just to go back and which links to this placebo as well. There's a huge cognitive and psychological component to rehab as we know. So within the exercise referral scheme, we have a psychology focus patient education stream that runs alongside that, which talks ... Say talks ... He trains people, helps them set goals, but also has a positive outlook. So whereby patients are told they've got wear and tear, they got damaged and they've going to get better and they set off on this negative spiral, "What's the point, I'm never going to get better." I was just, yesterday at a versus

Arthritis meeting, I gave a talk to them and the thing that came up most was that psychological component.

Everybody's in chronic pain, but some people felt like they were a fraud for it. Some people, nobody's acknowledging that this is a pain and nobody gave them any explanation about what that pain meant and actually it didn't necessarily correlate with the damage. And also there is a positive outlook. So yes, we train the musculature, but we also address the mind and the person as a holistic being. We're not robots, we don't just treat a little bit or we rehab a little bit and expect that to work we know adherence is really important as well. As much as that person feels empowered and apart of their own pathway understand, what's going on within the joint, but yet we can get better that all kinds of layers up to, I suppose an improvement in outcomes that, you can get improvement in outcomes with just a conversation.

SB: Yes. It's hard to explain to anybody, especially perhaps a lay person who's been told that they've got Osteoarthritis therefore the joint surface in their knees buggered how simply making it stronger, making the muscles around it stronger is going to improve the pain and their performance.

CM: I don't think it is that hard actually. I have this conversation, weekly, multiple times a week with people that I see they're in that situation. So yes, whilst this joint surface might be damaged as we said before, you can x-ray hundred knees of people age over 45, some will have damage the Arthritic changes someone will be pain but those, those physical changes on imagery doesn't correlate with the symptoms. So that's one thing, the other thing is that I explained that the musculature around the joint is like it's biological scaffolding. So the better quality, the better functioning that muscular trays, the better stabilize that joint is. And we know there's a link between pain and lack of strength or a weakness and vice versa from-

SB: You know that from?

CM: From research, some research. So we look retrospectively those papers that survey symptoms of Osteoarthritis from pain, from the quality of life and the muscle strength and the weaker experience, poorer physical status if you like and greater pain, but you can help to reverse that by improving strength.

And the other important thing is as well is when that person goes to the GP with a sore knee, then invariably they're left to their own devices with very little advice, very little support and very little option other than, "Here's a prescription, go get some paracetamol and then come back when it's even sorer so then now you go get some neproxin, and all we're doing is medicating on what's happening that pain is queuing people to disengage from exercise because they're not educated at that, they're not doing harm. And then the muscle conditioning gets worse, which means the pain gets

worse and the motion they do less. So they're on this rapid spiral of decline down. I think people relate to that very well. So I don't think it is actually that much of a challenge.

SB: I want to address some of the questions that have been coming in while you, and I've been talking, Hannah, first of all, has sent in a useful comment that she recommends the end core hopes for people who want to read and critically review papers. End core is the National Council for Osteopathic Research. There's probably a chiropractic equivalent with which I'm not familiar. but also of course we do post research reviews on our own website, so it's worth having a good look through that because you'll find a lot of knee injury, knee rehabilitation in those and they're not research papers, their reviews of research so that it's being critiqued by the reviewers. So thanks Hannah that was very useful. No names on these following the Arthroscopy in the placebo study, were both groups given rehab, do you know?

CM: To my knowledge, as I said, it's been a while since I read that particular paper, but no if they weren't, it was just that particular one I read. No.

SB: Now, the next one is what time frame would it be from initial appointments to starting should it be from the initial appointment to starting rehab? I asked because simple problems often become chronic waiting for NHS for referrals. I brought this up before when we had our contract with the NHS. I went to one meeting where they debated the protocols for acute chronic, but they didn't see anybody before they became chronic so what was the point? You're going to need one protocol. Sorry, digress.

CM: Yeah. So what was the question? Sorry.

SB: I shouldn't waffle on shore. What time frame should it be from initial appointments to starting Rehab and person asks because simple problems often become chronic waiting for NHS referrals.

CM: Yeah, it depends what it is but exactly what you've just said. I very rarely see somebody in the state that I want to see them, where they've just with a little bit of knee pain, or a little bit of hip pain and they're in that degenerate category. It's usually they've gone from pillar to post and been in that NHS system for so long that it is chronic.

SB: I imagine having gone through the process you have to try and get your own model established, you must have gone through what the NHS, the nice protocols are for this. So, what are GPs told to do when someone comes in with a sore knee?

CM: Do you know what, we wanted to model a prevention and an early intervention if you like, for those younger patients. But what was more enticing was to take those patients that were already on the books, that were, the next treatment option for them was a joint replacement, of which

there are 100s. Literally 100s. An average clinical commission group might do somewhere between two and 400 joint replacements, knee joint, not hips, knee, per year. Of a cost of between one point two, to two million pounds.

SB: That doesn't sound like very many to me for a whole CCG.

CM: Yup. That's primary, not revision. If you then go to the patient reported outcome measures and look at the scores of pain. Somewhere between 25 to 40% of those patients are no better or worse following joint replacement surgery. So, this huge spend, and huge wasted spend. And that's because, in my view one of the main reasons, is because they go to the GP and they're left without any physical conditioning, any pain education, until they get to point where, "Come back when you can't sleep, or you can't walk up stairs."

SB: So there is no actual nice protocol for dealing with this?

CM: Oh, it's suggested. So, non-pharmacological interventions are suggested and you visit the Escape Pain, which is fine. But for me that only addresses a very, very small percentage of those people.

SB: What's that, Escape Pain?

CM: Escape Pain is an exercise program that's delivered in class format, it's like an OA&E class basically, but the exercises are quite low, excuse me, low grade. So, very little resistance, for those people that are so impaired. Which is of benefit for those people, but for me the majority of the category, that's probably the top pinnacle of the pyramid of people with OA. So, it's suggested but there isn't a systematic provision for this.

SB: And I'm also guessing that as a result of the approach that GPs are left to take, and I want to phrase that that way, because it's not that GPs don't care about OA&Es but they haven't really got any alternatives. Patients are probably left feeling, "Well there's no point in going back." Until it's so bad that they can't walk on it. And I confess I was in that same category myself, probably, I just thought, admittedly I've got a bit more medical knowledge. I am one of those who's had the total knee replacement and it's been bloody marvelous, but I consider myself lucky.

CM: Yeah, but also you've got a knowledge, and probably a network of people in which you can help.

SB: I've got a wife. Who is an osteopath, who beasted me. I like this question, and it's got two sides to it I suppose. Does diet, do you think, play a role in osteoarthritis of the knee? More than two sides, because can it help to cause it, can it help to resolve it, and should you just lose weight?

CM: Well yes. So, I'm not aware, forgive me, of any research that has a cause and affect link of diet to onset of osteoarthritis. So, whether you're eating a high

acidic diet, or a paleo diet, or you're chronically consume, I don't know, a lot of fat. I'm not aware of any risks. I could be wrong, but I personally am not aware of that.

In terms of other dietary things, yes, weight clearly is mass, is load going through a knee. So, if you have the changes to those joint surfaces that are symptomatic and you pile on the pound, it's going to be sorer, isn't it?

SB: Now that sounds like good old, honest common sense. Is it backed up research? If you lose weight the pain gets better?

CM: Yeah. It can. Some, and also unfortunately just as an aside to that as well, the average BMI of your total knee replacement patient is going up, and up, and up, unfortunately.

SB: But you could ask whether the BMI is the cause of the knee problem, or the fact you've got to that stage.

CM: I don't think it's the cause. It's not the cause, and also, again, the conversations that I have frequently is that if you're in pain it's difficult to keep high levels of physical activity, which, and calories. And maybe people feel a bit down and comfort eat. I know it's a difficult thing to overcome, but it does play a part in the experience of pain.

SB: But it is good to know that there is research to back up the idea that if you lose weight it will help with your symptoms, and your functionality in osteoarthritis, because it's common sense, but at the same time-

CM: It's multi-factorial. So, for me it's not just losing mass. It's exchanging fat mass for lean tissue. So, fat mass is useless, apart from maybe it keeps us warm. We're able to do that quite well, and we don't need as much ... We don't need to be obese. You can have still the same mass. So, in our programs we're not particularly worried about how much people weigh. It's more about what kind of tissue they've got.

So, if you're exchanging fat mass for lean mass, for muscle tissue, muscle tissue is useful. So, for me it's more about the strength to body mass ratios, because let's say you're 90 kilos and you've got a 30% body fat percentage for example, or more, and then you go through a strengthening program, you still might weigh the same. But let's say that body fat percentage is reduced, and you've put in a lot more muscle tissue. That muscle tissue as I said, helps a joint function better. Stabilizes a joint better, absorbs shock and-

SB: That's worth pointing out, actually, isn't it? Shock is absorbed in the muscle, as well as in the, we might always have thought the cushioning structure.

CM: Yeah. Absolutely.

SB: Can I distract you with a couple of other questions? Related to diet, I guess, two of them have come in.

One person says, "Hello." That's nice.

CM: Hello.

SB: And they both ask about boswellia, turmeric and glucosamine. Do you recommend them, is there evidence for them? Fish oil is mentioned as well.

CM: Yeah, and then there's also vitamin D, too. So, I did a systematic review on vitamin D. So, in terms of glucosamine, chondroitin, the evidence is probably in the balance of actually, it probably doesn't have that much of an affect biologically.

That said, it probably doesn't do you any harm. I'm not a nutrition expert, or a dietician, so take this as a personal, lay opinion, I suppose. But in terms of the evidence there, there may be some potential evidence for it. If it makes them feel better, then they can take it, as long as it does no harm.

And then in terms of vitamin D. So, vitamin D is this new elixir vitamin, isn't it? But the potential for that, or certainly deficiency, or how we experience pain and its influence on muscles and bones. So, there's vitamin D receptors in muscle too. That can play an influence. So, we know that correction of vitamin D deficiency has beneficial affects for those people that are in pain that possibly is reduced to, or caused by a deficiency. The review that we did looked at whether or not vitamin D supplementation would help with muscle tissue repair and nerve tissue repair.

So, there's some suggestion, very limited research only done so far in humans, it may well do. And there's quite a bit of evidence in animal models that shows that it can help with repair of muscle and nerve tissue following injury.

SB: So, this is the model for the use of vitamin D is through muscle repair?

CM: Yeah.

SB: A question about it has come in. Do you think vitamin D3 supplements help reduce, or delay degenerative conditions, osteopenia, OA and so on?

CM: Again, can do, in my opinion. But in terms of the robust evidence, we still need to get there. That said, I take vitamin D, three supplements, as do my parents, as do ... Having done the research, and read around the research, it's got a very low risk profile to it.

SB: Can I ask a slightly personal question? You're a gym bunny, does that mean you're one of these people who takes loads of supplements? Buckets full of protein, and stuff like this?

CM: No, no I don't.

SB: So you just take what you think is necessary?

CM: So, I will take vitamin D supplement, and I'll have an odd protein shake here and there, just to make sure I get enough protein in my diet. I don't take anything else.

SB: Right, okay.

I don't know who's asked this one, I don't know, but she says, "May I ask Claire please, if she would support physical rehab for OA needs with recommending patients glucosamine chondroitin supplement, and do you recommend any particular doses? Also, any thoughts of bromelain, MSN, turmeric?" Sorry, you answered that question, and I got that one before, I realized.

CM: Yeah, physical rehab, definitely.

SB: Yeah, well, it's what we're here to discuss really, isn't it? And we'll get on to doing some physical rehab in a minute. God, there's loads of questions coming in.

Do you recommend protein for people who got to the gym now and then? Is it really needed? In fact, should I emphasize that, just for people who go now and then, rather than proper gym bunnies.

CM: Yeah, so protein, I'm trying to put this in a context so it's meaningful for today. So, as people get older they tend to, one, eat less generally.

SB: I wish.

CM: And two, if we're talking about OA, and two, don't consume enough protein. So, there is the risk then, that if we put people through a resistance conditioning program which stimulates muscle protein synthesis then if you're not replenishing or eating enough protein, then the muscular adaptation we want, could be curtailed.

So, we're hopeful in that we're going to be doing some research on that soon. But it's a question that I would have in my mind, if we've got somebody who looks particularly, sarcopenic, who we want them to ... You know, once you've established a habit, you don't want to change too many things at once. So, you get somebody in, you know, "You're going to be coming to the

gym, you're going to be doing this, that and the other." Once you start changing too many things it's a recipe for all the wheels falling off, isn't it?

But in due course, once we've got that exercise habit, and we're really trying to develop that musculature, then we'd probably have a look at diet as well.

SB: I've just had one in here that says, "Can you make Steven eat less?" And it's signed by Claire Short. We'll ignore that, and the people in the gallery are laughing. I'll have a word with them afterwards as well.

Anyway, "Is there any evidence to suggest that exercise training modifies the physiology that promotes tissue resolution, rather than chronic inflammation, maybe provoking acute inflammatory mechanisms?" Asks Robyn.

CM: Read that again.

SB: "Does the evidence suggest that exercise training modifies the physiology to promotes tissue resolution, rather than chronic inflammation?"

CM: I'm not-

SB: Could it provoke acute inflammatory responses, perhaps?

CM: Right. Again, it would depend on condition. Again, that's not my area. I wouldn't be able to comment on that too much, but in terms of that balance of inflammation, injury and flaring up of a condition than versus loading it. You get that balance right, loading will provoke some changes. But if we use an example whereby these patients that are coming through our program have got knee pain, you load them up. You're putting a lot more load through their knees, because we are loading them, literally, getting them up to five repetitions maximum on a leg press. Or putting some significant load through there.

What we find is that initially that, you do get a bit of a response. So, there is some inflammation, and the pain, interestingly, doesn't really change. So, the pain doesn't get any worse in that first acute period. But what happens then when that musculature is developed even more, then the pain decreases. So, the level of function in that acute phase goes up. So, what we do, a lot more exercise, a lot more loading. The knee may swell a little bit, but we can control that.

SB: Using ice or drugs?

CM: Ice, whatever they usually use. So, I don't prescribe, but I'll definitely say, "Put a cold compress on, elevate your foot a little bit." And it doesn't take too long for them to settle into that program, but what they do find is their level of function goes up very quickly. Their level of pain stays about the same, and

then after about six weeks or so, their level of functioning is going up. Their strength is still going up, and their pain is coming down.

SB: Right, but it takes six weeks.

Should we go and look at a real patient and do something more interesting for the viewers than sitting and chatting?

CM: Sure.

SB: Right, come over her then, and we'll have a look at today's patient. We're bringing back somebody we've had in before. And we're going to try very hard not to call him Mike.

Dave, thank you very much for coming back in again today.

DH: You're welcome.

CM: Hi.

DH: Hi Claire.

SB: We're going to start off with you showing us what you would do perhaps with a more sedentary person than Dave, and then we'll get on later to talking about the specifics of his own condition. So, where would we start?

CM: Yeah, so, a question I'm asked all the time when I'm doing talks to surgeons, to physios, to people with knee OA that aren't on the program. That's fine, but what happens when you know that patient is never, ever going to set foot in the gym? It's an intimidating environment. Or indeed that they're at such a low level of function already, how can we start to load them up at home? So, is it possible to strength train at home?

SB: So, we've got elderly Dave, who's been sent to you by one of the team... Because they know it's an OA knee, and he doesn't work, and he can't walk as well as he'd like to. So, what's your first step with him?

CM: So, I did this as I said, a couple of days ago when I spoke at the Versus Arthritis meeting. We had everybody doing this exercise. So, what have you got at home that you could use as kit? This is a brilliant bit of kit. A chair, so, if we're talking about knee osteoarthritis, the quadriceps that are at the front of the thigh are really important in joint function and activities of daily life. So, if you wouldn't mind having a sit on the chair.

This sit to stand exercise, if you have a sit down for me please, the sit to stand exercise is a great exercise that we can use and adapt to try then and increase the strength of the muscles. So, what you want to do is a pick a chair that's quite stable, so, no wheels on the chair because we don't want people

sliding and falling on the floor. And also I'd recommend that you put this against a table, or against a wall. So, if you do need to sit back quickly it doesn't fly off.

So, then what we want a person to do is sit with their, sorry, sit quite close to the front of the chair, "Like you are, you were perfect, you were perfect." And then place the heels underneath the knees, so you've got that 90 degree bend, "If you come forward a little bit." Then what we get the person to do if they're able to, so we've got a nice 90 degree knee bend there. It's just you put your hands out in front of you, and then stand up by pushing through your heels, and then back down onto the chair. "Okay, so if you do that about three times." So, what we're getting the person to do there is control, feel comfortable, and hopefully it doesn't elicit too much of a pain response. That's great.

SB: What faults are you likely to see with this exercise in somebody who is particularly badly affected?

CM: So, one thing, we know that with knee OA, and you probably see it as well with your patients is that particularly going down, and standing up with a very flexed knee can be painful. So, what we do in that circumstance is increase the seat of the height, seat of the height. Yeah. We can do that. But we can also increase the height of the seat.

So, that means that the knee flexes less, we're putting less load through a more flexed position. Another thing that people might do, is they might lead with the leg that's not painful.

SB: Do you mean it'll be in front, or they're not putting weight on it?

CM: Oh, either they put it in front or when they stand up they edge to the side and pushing through that, so sometimes we get them to do it in front of a mirror to try and rectify that. So, that's fine. So, we can do that, but you could probably do 100 of those without even thinking. So, when we're thinking about training the strength of the musculature, we're really thinking about increasing the load. So, having a very heavy load, but doing very few repetitions.

So, how can we modify the sit to stand to make it more challenging. So, what a really good, very simple technique is, is to take a backpack here. So, we've got a backpack, and then we load that backpack with weight. So, not everybody has got loads of dumbbells at home. So, what we've got here are liter bottles of water, or in this case we've got orangeade. So, two liters is two kilograms. So, we've got two of those in there. So, we put that on the person's back.

SB: Three or four Ks in that bag?

CM: Four kilograms in this bag, thereabouts. Will you put that on your back?

DH: Sure.

CM: So, I had a couple of 70 year old ladies doing this the other day, it was brilliant.

CM: Yeah.

SB: We'll see if Dave can cope.

CM: Okay. So, if you want to then repeat that exercise.

DH: Make sure I've got the seat right.

CM: So, make sure you're sat on the seat nice and stabley.

Yup, so hand out in front of you and then up, and then back down.

SB: Four K doesn't seem much, I mean you're noticing the difference there, David?

DH: Marginally.

CM: So, that for somebody of this physical conditioning, this is not going to be a type that will train strength at all, but-

SB: How heavy would you go? Would you consider putting much more weight into someone as fit as this?

CM: Yes. So, there will come a point where you will need to generate more load and probably visit a gym. So, what we're trying to do is make sure that that weight is sufficiently heavy, so that person can only do about five repetitions, and they can't do a sixth, because it's heavy. Not because they're bored, or we've said six. So, that means increasing the weight, not increasing the repetitions. So, that's clearly very, very easy for you, but for some people that are really low in conditioning. You know that person that's been to the GP for six, seven years with knee pain, have been sent home, and they're taking painkillers all the time. Increases their seat height, gets a backpack on their back, and then chucks some, four kilograms might be quite challenging for them.

If they get pain, having it on the back, we can experiment by putting the rucksack on the front. So, if you take that off, and that biases the quads a little bit more. So, if you put it on the front, and literally just hug it.

SB: So, no hands out in front now?

CM: Yup, so if you then sit back down.

CM: Yup, so start with the seated. Same thing, you stand up, and then back down. So, that's a modification that might make some people's symptoms less.

SB: Okay, there's a question in here which is-

CM: Thank you, sorry about that.

SB: ... asking about the opposite type of exercise. Has there been any research on high volume, low intensity exercise like lower than body weight squats using a variable incline plane to improve the actual joint surface?

CM: Not in terms of the joint surface, but there's a lot of trials that have looked at high volume, low load, versus high load-

SB: Yeah, what you've just recommended which is high load-

CM: Yeah, high load. And in terms of the strength gains. We see it time and time again, the strength gains are far superior in the high load.

SB: And therefor the outcomes are better, which is obviously what we care about.

CM: Yeah. I did read a paper, I reviewed a paper actually last year, that looked at plyometric training with post-menopausal women with knee osteoarthritis. So you would think that that would be just horrific to consider that bounding, and jumping with a sore knee. But the outcomes were quite good. They were particularly interested in their cell biology and those cartilage cells, although they don't regenerate, the water content of them was much better post plyometric training. So, actually, we're not going to do any more damage. So, if that person is able to tolerate that, it's also another option.

SB: And for the benefit of people who aren't familiar with gym terminology, plyometric training means from a standing or a bent knee start, jumping up onto a box or a step.

CM: So, they didn't do that from the start, but it can be literally jumping on the spot. So, a kind of bounding, and then jumping up onto a low step, and then back down. So, kind of jumping up on something like this and then back down. So it's that stretch shortening cycle. And then when you get really good, you've obviously assumed you are for your total knee replacement rehab jumping onto something like this and then-

SB: Oh easy.

CM: One legged and then back down.

SB: Usually over it, and then back again.

CM: Good. So, that's one way in which we can start to think about what's in the house to help strength train.

SB: Okay.

CM: Any more questions, do you want to go on to the next?

SB: There's loads, I'm trying not to be too distracted from what you're saying. This came in a while ago, because you said the exercises might cause swelling in the knee, and someone has said that they're interested that you say you don't mind if the knee swells up, because many of us would think that inflammation was undesirable. So, they're grateful for that advice. But of course inflammation around the knee actually reduces its function for a period of time, doesn't it?

CM: It does, yeah.

SB: So, that would appear to a patient perhaps, to be a retrograde sign.

CM: They probably get that on a daily basis anyway, don't they? So, they're managing pain on a daily basis and they get inflammation. So, let's say they go out on the weekend and they want to walk with their family, and their five mile walk, and they come back and at the end of day the knee's ballooned up.

So, we're not doing anything that exceeds what they would normally do in terms of volume, but what it does do, that inflammatory response comes down over time. So, we don't want to make them really swollen. So, we might, now if they have a particularly angry response after we've upped the ante in resistance training then we might just drop that down a little bit the next time if they've reported something the next day.

SB: How do you explain squats to an elderly person? It seems fairly straightforward.

CM: Yeah sitting on a chair. It's a sit to stand isn't it? That's all they're doing.

SB: And ooh, this is complicated. What modifications would you make if flex extend exacerbates retro patella OA?

CM: When their symptoms are elicited, so I'd experiment with joint positioning, I'd experiment with open kinetic chain, I'd experiment with foot positioning.

SB: Explain what open kinetic chain means.

CM: So, open kinetic chain of course, kinetic chain ... Are you okay with that? By the way, you're feeling quite comfortable?

DH: Yeah, it's very comfortable. I might drink it.

CM: So, closed kinetic chain is exercise where the foot's in contact with something. So, this here was a closed kinetic chain exercise. A squat is a closed kinetic chain exercise, and a leg press is a closed kinetic chain exercise. An open kinetic chain exercise, is where the foot is not in contact with something. So, that would be your leg extensions and hamstring curls. So, what we can do here is maybe get a slightly higher chair, you're actually quite a tall chap. And if you stay seated it's fine, but if we got a slightly higher chair which meant the knees were less flexed we'd be able to tie a TheraBand to the back of the chair and wrap that round the ankle, or at the foot, and they'd be able to perform a resistance exercise by extending the knee.

So, I'd experiment with that, experiment with range, experiment with the foot positioning.

SB: Okay.

CM: Because every symptom is different.

SB: So, now what comes next?

CM: So, we've got a chair as a piece of kit, but most people also have stairs or at least a step in their house. And that can be a progression or another exercise we can do to help build strength. So, do you want to pop that on your back if you wouldn't mind.

SB: I'll get this out of the way and we'll-

CM: Now, we're going to move this down here.

SB: I'm just going to bring this over here. Okay. Purely for aesthetics, nothing else.

CM: So, we can use this exercise as a stability exercise that's unloaded, which is probably what you prescribe already. Which is stepping up onto the step, making sure that the knee is over the toe and then lifting the body weight up. But we can then also, once we've got that control, and that balance. We can then start to load that up in much the same way.

So, imagine that that four kilos is quite challenging for you, make sure there's a handrail or a wall or something just that they can stabilize themselves if need be.

SB: It's likely to be a banister if they're just using their stairs, isn't it?

CM: Yeah, likely, yup.

So, what I want you to do is place your foot on top of the step, push through your heels, or your heel, up onto the step and then back down. So, by placing the weight on the back there we've increased the load. They need to be able to lift a lot more than their body weight to improve strength. So, that's one way in which we can do it.

SB: Just to clarify, that doesn't mean you're adding more than their body weight to the band, it just means adding weight-

CM: No, so, we are carrying our body weight around with us routinely to improve strength. Again, it's that five repetition maximum range. So, if that was particularly symptomatic we could lower the step. If it's quite easy then we can increase the height of the step. So, maybe they go two steps up.

SB: In one go?

CM: In one go.

SB: Yeah.

CM: Yeah, as a progression.

Another exercise if you wouldn't mind starting on the step is a step down. So, this is using the musculature in a ecentric way. So, concentrically pushing up onto the step the muscle shortens to develop force. Here this is ecentric where it's lengthening whilst developing force.

So, what I'd like you to do there is keep one foot on the step.

SB: The good one or the bad one?

CM: Your bad one. Keep your bad one on the step, and then with your good leg, I'd like you to just go down and place it onto the floor. Don't put your weight through it, and then come all the way back up.

DH: Okay.

CM: And then back up.

SB: That was tough that one, isn't it?

DH: Yeah, it is on my bad leg.

CM: Try it on your good leg then. We don't want you to-

SB: Well I didn't mean necessarily your bad leg. What would you say to the patient? For the patient it's going to be their bad leg that they keep their weight on?

CM: It's going to be both, it's going to be both. We would do it bilaterally. Oh, so we know what we're going to do with you, don't we? And then back up.

So, that would be performed first of all, as we said, with a step up, do it so you get the control, and then load it up so that then that can be a strength exercise too.

SB: Would you move on to that exercise, or then do both step up and step down?

CM: Wherever the deficiency is, so you'd assess them first. Whether or not they've got the control coming down, of which I think there's-

SB: Some evidence.

CM: It's good, it's good. There's something we can work on there, you'd assess that as whether or not they've got the control to load up. So, that's again, another bit of kit you've got in your house.

SB: Yeah, absolutely.

CM: Step down.

SB: And again, in terms of, it's very easy for us to say, "Go away and do step ups on a step." But what you've really gone through here is the fault finding, isn't it? What should we look for to make sure they're doing it properly to look for the things that we've got to tell him how to correct. If he's all wobbly when he's coming down, we've got to correct that somehow.

CM: Yeah, so what's happened is, we've gone from a double leg, quite stable position, so then a single leg position controlling the deceleration of body weight under gravity, plus a bit more. That's a slightly more challenging exercise than one leg which is more challenging than a double leg. So those are all progressions.

SB: Good. Now, Dave has actually brought his shopping in with him as well. So what are we going to do with this?

CM: So another exercise we can use, or that we can develop using things that we've got at home is, I call it a shopping bag dead lift. Do you want to take the backpack off? And what we can do here ... So are we bringing those over here?

SB: Where would you like them? If he stays there?

CM: Yeah.

SB: Yeah. I'll get this step out the way so that it's not interfering.

CM: So what we'll do is just pop these, our weights into a shopping bag, so we've got two in each. Again, you can put more in if needed.

SB: JR, sound technician is really loving us for all the rattly shopping bags.

CM: Oh dear. Okay.

SB: But bags for life.

CM: Shall we just put them on the floor by your side? Great. Okay. So a dead lift, we did one didn't we, last time? Do you remember?

SB: We did, yeah. I did it. Yeah.

CM: Yeah. You did one. Yeah. So a deadlift involves picking a weight off the floor, usually it's front of you but you can do it from the side. And it involves your hips, knees and ankles, which are important in lower limb stability, lower limb strength. So if you haven't got a plate set and an Olympic bar at home, what can you use? Well, we can use shopping bags. These bags for life, and the ones that are crinkly and crackly are very capable of holding a lot of weight.

So again, chuck in a load of weight, which you can use bottles of water. Incidentally, if you're not wanting to keep buying loads and loads of bottles, once you've ... drink the water, drink the orangeade, fill them with sand which makes them even heavier. So set up a couple of bags by your side, and then all you're going to do is squat into a squat position, with your chest pointing forward, stand up and lift the bags, and then back down. And then back up, and then back down. So you can see, just do a few for us, you can see that there's not a tremendous amount of knee bend or flexion, and hip flexion. If you've got long handles and big bags that would be a good starting point because again, it's close kinetic chain but we're not in deep knee flexion where that might be painful. Thank you very much.

If we get better at that you can increase the weight, and also you can increase the range, so you could use that same step and go down a little bit further.

SB: Yes. Difficult on your steps at home isn't it, if you don't have a purpose built step?

CM: Yeah. It would be. It would be a little bit more difficult.

SB: But you know, you can use common sense, you can work something out can't you, to make the handles closer to the ground just to make the extra flexion. Some questions. Any considerations for those with osteoporosis, says Hannah, again?

CM: Considerations?

SB: Would you modify any of this? Would you be more concerned about these exercises for osteoporosis?

CM: Again, seek clinical guidance, but there's fantastic evidence that's showing that with osteoporosis resistance training has got tremendous benefits for bone mineral density, spine curvature. So there's a video that I show that Jay would have seen in my courses that's ... they do an interview with the research team and their participants at the gym. So they have a load of women who are osteoporotic and they're doing dead lifts, doing squats, doing military press and all of their outcomes have improved, as I said bone mineral density and spine curvature and stability.

SB: So we don't need to worry about advising people with osteoporosis?

CM: I wouldn't want to say that personally because I'm not a clinician, but I that would be my approach. Yeah. It's beneficial.

SB: The research shows it's beneficial, does it?

CM: Yes, absolutely it does. Yeah.

SB: Could Claire talk about ... Hannah. I'm presuming it's the same Hannah. Could Claire talk about points to be aware of and her approach to rehab strengthening airway, knees and people with osteoporosis? We've just done that one, it's the same question I've just asked. Somebody is giving me the same questions twice. How many reps? I'm going to come back to those questions. In terms of squats, have you got any opinion on those people that can squat bum to heels? Is squatting below 90 degrees of use or is that detrimental?

CM: Again, there's a big debate about this, isn't there? For me, it comes back to function. What does that person need to be able to do? So do they need to be able to do that? In which case, yes. If they don't need to be able to do that then it's fairly redundant, I'd be preferring to load them up in a range of motion that was functional for them.

SB: Okay. Are you going to give any more exercises today? Shall we go and sit down.

CM: We can do. Let's go and sit down.

SB: Yeah. Come on. Come and join us then, because we're going to talk some more about your specific condition in a minute, so after you. Dave, you have that side of the sofa.

CM: Thank you for you demonstrations.

DH: You're welcome.

SB: Now, one of the reasons we've got Dave here is because as he demonstrated earlier on he does have a problem, so we will be talking about him specifically. Which means this also becomes a case based discussion which is great for the osteopaths because we're required to things like that. But let me deal with a few of these first of all. A lot of people asking about number of repetitions, and you talked about five reps earlier on, and people are saying how many do you make people do? So what's the importance of five reps, and how many sets if you're going to do five reps, says somebody?

CM: Okay. It is a magic number. So what's the goal? Is it strength, is it power, is it endurance?

SB: Or is it function?

CM: Or is it function? Yeah. Just put that to the side for one minute, because that's more like sensory motor performance and control which is slightly different to what we were talking about from a muscle development perspective. So for me, when I'm looking at those OA patients in particular, and any actually person that we're doing rehab with, I always think about muscle strength first and foremost. And that's what I teach in my courses because it's so often forgotten. We go endurance first, and then we look at maybe strength and balance and it's all a bit of a hodgepodge, but we always look at endurance first.

Now endurance will come, but strength won't, you need to be very, very specific about what you do with developing strength. And we lose muscle strength after the age of about 50 somewhere between 1 to 3% of muscle mass, strength and quality is lost per year, unless we do something about it, depending on which research paper you read. So it becomes exceptionally important for older populations as well. So that's first and foremost in my mind.

And then, how do we optimally develop strength, how many reps, and what's the dose that we give. And again, I teach that in the courses. To develop muscle strength you want to be working between three to five repetitions maximum, which means that after five repetitions, let's say five repetitions maximum, you can't do a six with proper form because it's just too heavy. And that's a very different feeling to having done repetitions where you're doing like 12 and you get that burning feeling and it's really uncomfortable. It

doesn't feel like that at all, it feels like the muscles are empty, literally got nothing left in there.

You do any exercise you'll get some adaptation, if you've never done resistance training before and you start to lift a weight, you'll probably get some development in strength, you'll probably get some development in balance, you'll probably get some development endurance. But after that very, very short time period you need to get then specific, and have the specificity of you intervention to address those outcomes. So if it's strength, optimal strength gains three to five repetitions maximum, which is as I said lifting very heavy weights for very few repetitions. And the important thing is to go to failure. And why I like that principle is because you can tell that to a patient very easily.

So maybe some of your viewers are aware of being able to calculate a percentage of a repetition maximum and do X number of repetitions at that load, or there are other particular ways of doing it. But, it's then reliant on you being around and/or instructing your patient to go away and do this in a particular way, and then make this calculation, then make this load adjustment. It's quite a lot to undertake. So if you go and do that exercise, so let's say you're going to do a leg press, I want you to go onto that leg press machine, trial and error to start with, but find a weight that you can press five times only and you just can't do that sixth one. And that becomes a very easy instruction to give to that person.

SB: The reason the question was asked, I suspect, is because lots of us have all been schooled that you always do three sets, whatever the number of reps it's always got to be three sets. So you're going to go away and have a drink of water or wander around for a couple of minutes, then go back and do another five reps or four reps or three reps or whatever it is. Is that what you would recommend?

CM: No. Yes and no. It depends what the volume is that you accrue over your week. So I've done a very systematic and scientific review of the quality literature available, and I'm quite confident in being able to give a dose to elicit a particular response. And that, again we teach this in the course, but it's somewhere between 25 to 45 repetitions per muscle group per week at-

SB: Per week?

CM: ... at that intensity.

SB: Wow.

CM: You say wow, so let's say you're a novice trainer, you've never done it before, we'll probably say give you a week or two to embed the habit and to do some maximal exercise so you don't get that really horrible sore feeling the next day, and you just hate me and I'll never see you again. But after that time we

then start to load you up, and that's a progressive way that we manage the OA patients as well who have never done any resistance work before.

Then that next session when you come in, when we're really going to start working properly on strength, we might do three sets of knee extensions, so that's 15, five, five, five. And then, we might do three sets of leg press, which is another five, five, five. So that's already 30 repetitions. So if I'm saying I'd like you to come twice a week, then you can see ... well, firstly you've already got that dose, so it might be for a couple of weeks you're doing that as a dose then you increase the volume progressively as you go.

SB: So you're not just exercising the same muscle using different machines or different-

CM: Yeah. There's different ways of ... those exercises we did there were three, four different ways of exercising the quadriceps, plus, minus other musculature as well.

SB: Right. Okay. This ones been flagged up for me, squatting below 90 degrees can put more pressure under the patella where there is often damage. My background is in personal training, I usually stick to 90 or just under for this reason. Interesting observation, obviously you're quite experienced as a personal trainer as well.

CM: Yeah. He's well within his ... I suppose it's a good point to make, and yeah, if you've got a symptomatic knee then, as I said, it's pointless. What's the goal of that individual? I know many people that squat way below 90 degrees, and for power lifting you have to squat, you have to achieve 90 degrees, so you have to. But those are athletes, so they are typically asymptomatic. And then, there's the debate about if you've got a slightly longer muscle length in terms of depth of squat, in terms of strength development, you don't need necessarily to unless there's a reason for it.

SB: Interestingly, the whole business of how many exercises I think is ... You must find this on your course, is really exercising people, because I've got another one, it says, "Would you start your strength training with only five reps, or would you start with typical three sets of 10 to 15 until they can tolerate more and then-

CM: No. That's a really good question. It's a progressive resistance training program. So whether you've got a patient with symptoms, or whether you've got somebody who just wants to get fitter, you start with a progressive approach. So if they're a novice to the gym you wouldn't suddenly load them up in a way that's just going to evoke such a DOMS response that is going to be so unpleasant. Likewise, if they're wanting to be cardiovascular fit, you wouldn't chuck them on a treadmill and get them running at a speed that they're unable to maintain for a long period of time.

SB: And I'm sure most people know, but DOMS is the delayed onset muscle soreness that you get after doing serious exercise.

CM: Yeah.

SB: I've got a whole list of other questions here which I might well put to you after this show because I would like before we go on to put some questions directly to Dave in relation to his own particular knee condition. Somebody asked me to describe my own problem with my knee, but actually I can put that up on the website. But let's talk about you, Dave, what's wrong with you? Well, knee, let's stick to that.

DH: Let's stick to the knee, shall we?

CM: Yes.

SB: So gives us the history, what's-

DH: Well, the latest round of knee problems for me is I had really tight quads and hamstrings, and it irritated the knee bursa, so it swelled up and flooded the joint.

SB: So that's the supposition, that it was tight quads that caused that problem?

DH: Well, the actual situation, of course, it's slightly embarrassing which involved a lot of alcohol, a hotel room and a hotel mirror. But, because I was so tight it obviously irritated it, I woke up the next morning and it was all swollen. So it's not actually a sporting injury as such. So I had been working an awful lot on flexibility, rolling, stretching, and in the last couple of weeks most of the swelling goes down. And after ... interested what you said earlier about strength training, that may irritate it and make it swell, that's the kind of cycle I go through weekly, and each week it doesn't swell up quite so much. And that's what I'm working on to try and get rid of this swollen bursa, so I can get back to running.

SB: You've got what I call a healthy approach to it, a very healthy approach to exercise, in that you won't be put off by a little thing like that. But that's probably an important lesson to take away from any patients who will think, "Oh my God. It's swollen up, I've got to stop." What about running through? Is running bad for knees? OA knees?

CM: There's no evidence that shows a cause and an effect relationship between running and osteoarthritis, for example.

SB: Right. So if you've got an OA knee and it's a sore knee, would you advise people not to do-

CM: I never tell people to stop running. I never do. I know what it's like for me having played sport, it's been a part of my life since I can remember, and I've played at very high levels. I don't compete anymore, but if somebody told me, "You can't do that anymore." I know what that feels like, and if it makes up a part of you ... If somebody said to you, "You can't ever run again," it's a whole part of you that's been taken away, and you can't underestimate the effects that has on a person cognitively, or psychologically. Then that might inform an increased pain response, you might ... depression. So I never start with any negative language and say that you can't do that. It's always a possibility.

So for example, there's a chap who's gone through the 12 week program, and he's staying with us. He's quite overweight, he couldn't walk for longer than 20 minutes when we saw him because of joint pain, but he wanted to get back playing tennis. And he was quite good at tennis, but he's not played for so long because it's so painful. We're like, "Well, let's see if we can do it." And sure enough, he got back playing tennis. After 12 weeks he was running about the court playing tennis.

Now granted, it wasn't at his young, fit, trim self, but he was still doing that. He felt amazing for that. His knee was quite sore afterwards, but that's what he wanted to do, and for me that's important for them. So I wouldn't ever say, "Don't ever do those things." Unless there was a very good clinical reason for it, obviously.

SB: So can you take us through what you've been told to do to rehab or improve the situation with your own knee? And then we'll get Claire's opinion on whether it's the right thing, the wrong thing.

DH: Mostly it was to try and relieve the tension and to get the flexibility back. So a lot of stretching, I was told to take up rolling for an Olympic sport literally. But, I was told not to discontinue any type of exercise as such, including running, but find the exercises that irritated it the most and perhaps cut back on those. So I now have PTs, I do strength training, I don't do so much running. Well hardly any running, which is why I think I might have had a problem stepping off, because I seem to have lost other benefits. I've gained strength, massive amounts of strength, but my balance on certain exercises just isn't there any more.

If I try and run on a treadmill before I've warmed up it's like I've never run before. Now, if I go and do a HIT class and get on a treadmill, it's like I've never been away from running. So it would be interesting to see if I could do exercise when I was fulling warmed up and not have a problem with it. I don't know if it's mind over matter, but I'm scared of it, or it just doesn't work.

CM: How long of a period of time did you have after the incident with a mirror and-

DH: The swelling?

CM: ... and then did you stop training for a while or was there a break?

DH: Not this time. But to paint a bigger picture which you won't be aware of, but I've literally had knee issues because I had a swollen bone marrow in the other knee because of a serious injury. It's literally two years since I've done any serious amounts of running. So it's been a long period of time before I've done more than two or three weeks of running before something else has come up. So it's just a bit of back luck this time.

SB: And serious running for you means, what, marathons?

DH: Yeah. I was an ultra runner at stage, but yeah marathons. But yeah, I'd run easily 60, 70 miles a week. I could do that in one go at one stage.

CM: Yeah. So your habitual activity if you look back is quite voluminous. So there's a couple of things. Obviously I'm not taking a detailed history right now. But one thing that's common to a lot of people is, when they disengage from exercise then that exercise that they've been doing that's been maintaining a particular level of physical conditioning can be lost. And then, when you try and go back to that then what was there, like for example the muscle strength, the balance, reaction to perturbations might have dissipated such that it's actually a challenge for you now. Unfortunately, you don't feel like, or you don't feel when you lose strength or you lose something which is really quite annoying, but it's what happens.

And then the other thing is looking at the acute chronic work rate, or the volume of training that you're doing. So Tim Gabbatt it somebody to read if any of the viewers are interested in looking at that, that training volume and the risk of injury. So we know that there's an increased risk of injury generally through a sudden spike in training. And also he speaks about looking at what volume of training you did over the past two weeks and how that compares to what you did now. There's a particular ratio that he posits that would be a risk of injury or breakdown. So there's a couple of things that you could look at there.

Then the other thing that we've seen, your balance and proprioception is limited, isn't it? So when we got you to try and step down off that step then it was a bit of a challenge for you, wasn't it? I think that's a good thing because that's something you could work on. And when you're doing the strength training what kind of loading are you doing? What kind of exercise?

DH: Hacky squats, foot press, leg extensions, hamstring curls. Everything you could think that you would associate with trying to strengthen your hamstrings, quads, hips, and gluts. So I have personal training to do that.

CM: What number of reps, for example, are you doing, and sets?

DH: It varies because I feel like I was beginning it through this injury cycle, but we changed to maintaining strength in the legs to allow me perhaps to not tighten up quite so much so I can start running a bit more loosely. Where before it was heavy, heavy loads, and it was maybe three of four sets of heavy stuff. Sometimes it's now more volume light weights and then back to heavy weights and then de-loading to get the volume through.

SB: But based on what you were saying earlier on, it actually doesn't matter whether you call it a heavy weight or a light weight, it's how many reps can you do. So in your heavy weights, how many reps were you doing with the heavy weights?

DH: Well, I could typically ... because I weight 69 kilograms, I could typically, on a good day, on the third or fourth set sometimes, it might only be eight sometimes but sometimes I would get up to as many as 12 reps of 250 kilograms and digress.

SB: So what's your thoughts on that then?

CM: Sometimes problems can flare-up, or your problem can flare-up, anybody's can, through volume versus sometimes load. So if we want to really get the most bang for our buck, so we can get strength gains for doing 12 rep max, but if you look at the studies it might on a leg press for example, a study was published this year, about 26% improvement doing 12, 8 to 12 rep max.

SB: Can I just interrupt, because just for those people who aren't familiar with gym terminology, and some of our viewers might not be. 12 rep max means?

CM: 12 repetitions to failure.

SB: Yeah. You could not do any more than 12.

CM: Yeah. So when I talked before about five rep max, that's five repetitions to failure. It's just that dead simple principle, work to failure and you just give them a number. So three to five repetitions maximum, you're doing a lot less volume but you're doing a lot greater weight. So the strength gains that you can potentially get from that, if we compare equivalent doses, it might be that you get, over an eight week period, 69% improvement in leg strength versus a 26% increase in leg strength with the 12.

So I would suggest, again we haven't a detailed chat about exactly what it is, but an approach to consider would be maybe if you're maintaining strength do a high load low repetition session a week, once per week. And that would be your three to five rep max, and somewhere between your 25 to 45 repetitions per muscle group per week. That should be enough to maintain the strength gains that you've got already, and also that you wouldn't be doing as many repetitions and potentially wouldn't have such an angry response from the knee.

DH: So in terms of optimum strength, me being a runner, to wanting to be a rugby player, at what point do I consider myself strong enough for my sport for my weight?

CM: Yeah. That's a really good question, and I don't think we really know that. But, it is likely that you would have lost some strength through the injury, and then loads of studies that show that strength training in runners ... massive fear wasn't there, I'm going to get massive, I'm going to get slow. It actually enhances running performances.

DH: Yeah. I appreciate that. Yeah.

SB: But isn't the answer also, that actually when you get to the point where you're asymptomatic you don't need to continue to increase your strength beyond that point?

CM: You can make that decision at that point. Yeah. You can definitely make that decision at that point, and just make sure you maintain it. So chuck that into your routine as a maintenance session. Then, one thing to do would be look at the total volume of training you're doing in a week, so the gym work, the running work, any rehab work, and monitor that over a daily basis over a period of weeks. And when you go then back, what you want to be trying to do is increase your mileage, because that your goal right, to get back running?

DH: Yeah.

CM: Don't have a sudden spike increase in mileage, or that total volume of training has gone up by 10%, more than 10% then that would be slightly risky. Although there are different ... you're probably quite a robust chap.

DH: I do recall everything daily.

CM: Yeah. I can imagine.

SB: Claire, Dave, it's that time. Again, we always run out of time, and I have got lots of questions. I've got a few on my ask now list, and I hope they're all yes/no answers because we haven't got much time left. Does there come a point, this is a really good one I suppose. Does there come a point were the patient's knee degeneration is to bone on bone, and the high loading of these exercises will not be beneficial? In other words it's time for a TKR?

CM: They will tell, won't they? They will tell you. So you adapt the exercises as much as you possibly can and open less load through the joint. And then yes, there will come a point where they need a joint replacement, for sure.

SB: Are you concerned about people who have back problems or shoulder problems when they're doing some of the exercises you demonstrated?

CM: Potentially, yeah, depending on what it is. Yeah.

SB: But some of the ones you mentioned too, if you go to a gym and you're doing leg presses you can do those in a reclined position, can't you, so you can take the load off the back.

CM: Yeah.

SB: I like this, Robin's asked if we still get strength gains in sarcopenic patients?

CM: Definitely.

SB: We should have talked about sarcopenia, shouldn't we?

CM: Definitely. Definitely. Sarcopenia, absolutely. There's loads of studies of women in their 90s that have done strength training and got strength gains.

SB: Yeah. Brilliant. Okay. Good. Could you improve chondromalacia patellae with knee loading exercises, like the step down exercise?

CM: Pass. I don't know. I'll have to double check that. I don't want to comment. Potentially.

SB: Potentially. Yeah. We were talking about not whether you can change the degeneration, but whether get the symptoms. Does strength training cause blood pressure to spike, and therefore is it contraindicated with patient's with cardiac problems?

CM: That needs to be considered, it does. So lifting over head for example, is something that potentially ... and not holding breath.

SB: And do you ever recommend using an exercise bike, says Sharon?

CM: Definitely.

SB: Okay. But that would seem to me to be not what you were saying there?

CM: Yeah.

SB: That's endurance training.

CM: Yeah. It is endurance training, but if you're only going to get your patient to do one thing, and they have an exercise bike at home, that's probably one of the best exercises for joint health. If you've got a sore knee, they can get the range, they can crank up the resistance to get some element of muscle contraction that's over and above what they'd need for their body weight. It's not ideal, but it's better than nothing. And you can play around with the resistance and joint positioning.

SB: Okay. Claire, I've got at least a dozen questions which I haven't even had time to read, let alone ask you. Can I send them to you afterwards for me to get some feedback on that?

CM: Of course. I'd be happy to. Yes.

SB: Thank you very much for that. Dave, thank you for sharing your history, and the struggles with your knee, and I hope that we've got some beneficial stuff for you there. And if there's more I'm sure Claire's got a few minutes before we take her down the pub afterwards. It's been great to have you with us again. You put yourself down saying you're not a clinician, but my God, you know your stuff. You really know your stuff. And, Dave, thank you for coming in as well.

DH: You're welcome.