

Strength, Conditioning & Rehab

With Dr Claire Minshull PhD

24th April 2020

TRANSCRIPT

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Steven:

What we've got for you today is 45 minutes on strength conditioning and rehab and we've brought back in for the third time Claire Minshull. Now, if you've looked at my emails and the slide behind me, you'll see that Claire has a PhD, not one of those Mickey Mouse PhDs if there is such a thing, but her PhD is neuromuscular performance and exercise stress associated with stabilization of sinovial joints, which is a hell of a mouthful, but it means that she really understands her stuff. She's been published many times in serious peer-review journals. She reviews for those journals. She lectures around the world in exercise strength and conditioning and yeah, this is Claire Minshull. Claire, welcome again.

Claire:

Oh, thank you. I was wondering who you were talking about then. I thought it was a different Claire Minshull. I'm stepping in, stepping in for the best they couldn't make it. I love the backdrop and I think you're gonna talk to us obviously about nutrition this time. What's... been happening in my house, since lock-down with culinary experiments.

Steven:

Okay, I forgot to mention also that you were the British powerlifting champion in 2010 in your weight group, which is, I mean, it's no mean feat is it?

Claire:

Yeah.

Steven:

Then you blew an intervertebral disc. So you understand...

Claire:

Ah, I see, you know my background better than I do!

Steven:

The thing today is what we would like to discuss is how we deal with strength conditioning, rehab in a time when people can't get to the gym and might not be as well motivated as they would be at other times. How are you, in your own business, how are you finding, doing those things with your clients?

Claire:

Yeah, well obviously cancelled all in-person work. So the majority of my business right now is running courses and teaching professionals many of your listeners and viewers and members who have attended my courses as well.

Steven:

...And We've had very good feedback from them.

Claire:

Which I'm delighted to report. So, obviously all of those, um, courses are postponed or cancelled I run online courses, which I'm thankful to have already initiated before this COVID situation, which means is there's a great deal that we can do online. It's just that the practical elements become a little bit more challenging because we, like you just said, we have very limited access if at all, any, depending on where you are in the world to gym facilities and not, everybody is less than having a superbly kitted functional, you know, gym in their home. So we have to become a little bit more creative. And so in terms of why I do personally it's more of the teaching some remote stuff for support online. But yeah, mainly focusing on the thinking about how we can accommodate or try, you know, from a rehabilitation perspective, thinking about our patients potentially as well, how we can deal with the situation and try and minimize the impact that's going to have on musculoskeletal health for when hopefully we come out and emerge from this and we can do some more in-person work and seek to get that loading or those loading strategies more optimal. Mmm. When we've got more access to facilities

Steven:

Is the bulk of your work strength and conditioning as opposed to rehab?

Claire:

It's incorporating strength and conditioning into rehabilitation. Because with the best will in the world it's, it's, it's still lacking. So how, what we understand by for example, muscle strength typically on mass in the rehabilitation world is probably not what it actually is. And so doing these three sets of 10 with a TheraBand and an exercise sheet, we've spoken about this before, haven't we, is not going to give you the optimal adaptation in strength and strength being superbly important for joint function, joint health, you take that forward many, many years. It's got, you know, correlations with all cause mortality. So strength is really, really superbly important and there's a need I think to just step back a little bit in, in busy therapy practices where we're overwhelmed typically before this is COVID situation. Certainly in NHS practice or in private practice, you're overwhelmed with the volume of patients coming through with high expectations, often with limited time.

Claire:

Um how can you start to look at your rehabilitation intervention to make sure that you're optimizing what you're doing, what your patient's doing in terms of the outcomes that you want to get. So in terms of strength and conditioning, it's applying those principles of specificity, overload, progression into a rehabilitation program to make sure that you're doing or your're, getting the most bang for your buck, whether that be your buck or whether it be your patient's buck. And often by doing that, it might seem like you, you can't afford to do that for time reasons. You've got very limited time, but it saves you time, oodles of time in the long run. So you'd be able, if you're, let's say exact for example, you wanted your patients increase their strength by 20%, you could probably achieve that in half the time. If you apply these principles, then if you send them away with, or don't think too much about the loading strategies,

Steven:

I guess a lot of the people watching and you know, there will be physios, chiro's and, and osteopaths watching and lots of them will not be particularly concerned about a percentage increase in strength. There'll be, they'll be concerned primarily about pain relief through quite probably stabilizing synovial joints, which of course was the topic of your PhD.

Steven:

So you probably know a bit about that. What's the, what's the key factor or the key factors in?

Claire:

Yeah. Okay. So absolutely patients present to us majority of the time because they're in pain, there's, there's been some inciting event that's caused them to come to you and usually it's pain, it's discomfort. And under many circumstances, if that's not an acute injury or you're not dealing with necessarily a postoperative

rehabilitation, albeit these principles are still really important, then we're trying to figure out what that pain is driven by and to what extent this dis-function is informing the pain. So there's a whole psychological component to that. And I'm very fortunate to work with a psychologist as well. So a lot of that feeds into my practice and no, I've got the expertise to draw from, from others. But the other part of that is how that joint functions mechanically and what the strength of the tissues are around that.

Claire:

So if we think about a joint being stable, it is dependent upon once we become dynamic standing still, you know, there's not much that we need to do really. But as we start to move the musculature around, the joint needs to be optimally performing, meaning that it needs to deliver sufficient amount of force in the quickest time or in a timely manner to stabilize the joints, attenuate the forces going through the the, the non-contractile tissue ligaments, and the rest of the joints. So as we become more dynamic so from a sporting perspective, maybe suddenly decelerating from a sprint and changing direction and in an older population, getting up out of a chair and needing to right their posture quickly cause they've tripped over the edge of the carpet. That requires a timely production of a large amount of force and that will help stabilize the joint.

Claire:

So that's looking at power. But first and foremost we need to look at strength because strength is like the capacity, the fuel tank from which we draw from. Now if we're very weak, it's really a moot point about how quickly we can produce for us because there isn't enough in the tank to deliver. So that's why [inaudible] excuse me. That's why strength is really important from a joint stabilization perspective. And then there's all the research that shows well for example, I work a lot with knee OA and by increasing the strength around that joint increases the capacity, the fuel tank. There's a nice correlation with pain perception and the increase in muscle strength, so decreasing pain, increasing in muscle strength, and there's a whole volume of research on, on pain and strength as well. So it's, it's important and something that I highlight a lot because it's, it's missed a lot.

Steven:

What particularly has led you down the route of knee OA?

Claire:

Um because I think we can do so much for people with symptoms of osteoarthritis and hip as well with some very, very simple changes to practice. So I was all about the elite athlete when I first started my career and I personally was reasonable level of, of performance. So it all kind of married up and I was all about the ACL and then I ruptured my ACL just to feel what it was like. You know, it was all about that kind of rehabilitation. And as I progressed through my career, particularly actually they, the period of time was when I went up to Edinburgh and led a collaboration there at the

[inaudible] trauma and orthopaedic department of the Royal Infirmary of Edinburgh Hospital and two universities in, in Mmm, Edinburgh. And just saw first-hand how knee osteoarthritis was managed in, in the community, in the hospital, and just seeing with some very small changes to practice the tremendous effect that can have on their symptoms.

Claire:

So looking at the types of, of therapy that were available to these people on the NHS really made me question and hip fracture as well. All these tremendously life changing, life altering conditions that in my view, were, not to lay blame or discredit any, any practice at all or any individuals, but I could just see there was a real potential to draw from the strength and conditioning performance type literature and just simply pull some of those simple concepts through into rehabilitation. So if you're going to be spending 20 minutes with a patient and you're just going to give them, let's take this a, I don't know, green TheraBand off the wall and then type [inaudible] type something, get them to move the leg. What is that? What is the real aim of doing that exercise? What are you doing it for?

Steven:

Did you find, were you finding that the guidance was that vague with other people coming back from NHS?

Claire:

Not, I wouldn't say necessarily just from Edinburgh. What I then did was just look more widely, and I conducted a systematic review on the management of knee osteoarthritis, which was published in osteoarthritis and Cartilage I think. Oh, sorry. Yeah. and looked at the rehabilitation interventions and evaluate whether or not these rehabilitation interventions were considering some of these principles that I've said before. When we exercise, we have a goal in mind. Do we want to get fitter, do we want to get stronger? Ideally by how much do you want to become more flexible? And then you develop in the performance literature, your intervention to achieve that. Now in the rehab literature, these principles were missing. So on the hundreds of thousands of studies that we reviewed, I think only like 34 met the inclusion criteria of decent quality. And of those 34 each one of them said that they employed a strength training program to try and well, evaluate the effects on the symptoms of knee OA.

Claire:

Yet, when we looked in detail, every single one of those 34 interventions, not one of them had designed it optimally to achieve a strength gain. And they, just to give you an example, probably the best illustration of a strength training intervention was a group that, conducted some strengthening on isokinetic dynamometer. So something that's not available to most clinics, but that was classified in the same methodological way as a group that looked at strengthening, using a rolled up

towel underneath of the back of the knee and getting people to extend the knee. So the intensity relative intensity of that vs that are just so far apart that at that stage we couldn't say, you know, there was a, there was a, question mark about why are we bothering resistance training or strength training cause it doesn't have an effect on symptoms. But if you look at the methodologies of those papers that are writing about strength training, it's not strength training.

Steven:

This isn't, this isn't, I'm really germane to what you're talking about today, but just tell us what an ISO kinetic dynamometer is so that we know how far apart those,

Claire:

Yeah. So an isokinetic dynamometer, if you, if you imagine I'm sure money, most of your listeners are familiar with like a leg extension machine in the gym. We sit on the machine, plug the pin in and for whatever weight it is, you then extend your knee and then flex it and lower the weights on an isokinetic dynamometer, it's the same configuration except the speed at which the lever arm moves is maintained at the same speed. So that's ISO kinetic and it measures how much force you produce throughout that range. I'm in black. Okay. So we're able to monitor in real time if you're like how much force has been produced at different ranges. Mmm. So, yeah. But you don't need an isokinetic dynamometer to be effective with, with strength interventions. You can, you can do it in a multitude of different ways.

Steven:

Well, the obvious question then is what are you doing for people who need knee rehab? And I've had a question from somebody already asking. How do you get people doing knee exercises safely if you're having to talk to them online?

Claire:

Yeah, it's, it's difficult as a really difficult one. It becomes an issue of creativity, logistics what you've got to hand especially this, there's not a dissimilar question to one that I get often asked when we do have access to gyms because there was a portion of the population that no matter how much you talk to them, they're never going to go to a gym. So there's, there's only so far you can, you can take them. But it becomes a home-based rehab. So in terms of what you can do in terms of exercise at home is you think about the activities that they are able to do. First of all, it's, it's what the baseline capability and capacity is right now. So is standing up out of a chair too painful for them to do on repeated those or, or repetitions.

Claire:

Is that something that's, that's too painful? Is that because it's, the depth of the seats means that the great, there's a greater degree of knee flexion. So you think about the ways in which you can adapt. The exercise of types of things you can use are modified squats, which basically the sit to stand step ups again. And we can do like

modify, deadlift type exercises with shocking bugs. I think about what is it that's restricting them. So if the pain is too much for them and what you judges too much, then you adapt the exercise, not the load. If you want to maintain some of that specificity so they don't need to squat down to 90 degrees or touch the bottom onto the chair, make it slightly higher. Likewise on a step up, is it that they can step up two steps and they're stable and it's safe to do that?

Claire:

Or is it one because of just limiting that amount of compression throughout the full range of motion. And then again, we've spoken about this before, haven't we, dependent upon their capacity. It might be that if you take a backpack and took a couple of liters of water him in the back in a, in a bottle, I suggest you just pour it in. Then that might be sufficient to get the, the overload that's needed. And a blog that I've just written and published yesterday actually is it's considering what can we do to modify exercise to limit these strength losses when we don't have access to overload. So to give you an idea to optimize strength gains, we want to be working the musculature three to five repetitions maximum. So that's lifting something, whatever it is upper body, lower body up to five times, and you physically can't do the six because it's too heavy, you've got nothing left to give and with proper form, et cetera.

Steven:

We've said before that that probably comes as a surprise to many people who've grown up with the three sets of 10 mantra I certainly grew up with as a, as a younger chap. Yeah, that's right. So I've got nothing against three sets of 10 and I often use it right at the beginning of my exercise prescription for knee OA because it's easy to remember and I honestly don't care what they do in the first session because I want them to come back for the second session and I want them to come back to a third session. And when you're dealing with populations that aren't used to, habitually training in a resistance manner, and you've got perhaps a population certainly with OA who've been dealing with pain for probably a long period of time. So there's a lot of fear. And if they've never been to a gym before, all this can be superbly intimidating.

Claire:

So three sets of 10 is fine as a familiarization type of exercise. But we need to get more specific very quickly thereafter because we're wasting people's time probably after a week or maximum two. And the thing that's missing from the three sets of 10 often is that intensity. Why people stopping at 10 reps. Is it because you've told them to, is it because you've given them a Thera-Band that's, that's actually that sufficiently providing that much resistance that they can't do it 11 times? Or are they bored? You know, what is the reason? Unless she's where we're saying about these principles in strength and conditioning, that that of specificity forces you to think about what you want them to achieve. So if you want them to get stronger, they

need to lift heavy things very few times in a safe manner. If we can't do that because of lockdown, then we need to think creatively about exercise adaptation.

Claire:

And then as I said recently, I've just published a a two series blog on my, on my sites about what types and extents of losses could we expect to see over a period of, of lockdown and de-training or complete checkout of exercise. And then how can we attenuate those losses. And what, I would say is that when we can't generate that overload, so whether that's that person who is definitely 100% never ever, ever going to go to the gym, but you can design an exercise that's challenging so much that the kind of failing at 12 repetitions do that. So the message is, is work to failure. So failure being, you know, three to five rep max failure is basically five reps. So I saying 12 rep max failure is basically 12 reps. So trying to generate the overload through creative means, but work until, until you can't do anymore.

Steven:

It's really quite hard. Isn't it? Because no matter what you specify, if we're using, if our patients at home are using whatever they have to hand in order to achieve failure at a given number of reps, they're either going to have to be able to lighten that load as they've done another set or, or increase the load as they get stronger. Which if you're using TheraBands and things is not easy. If you're using body weight is not easy. Well actually I find putting on body weight quite easy.

Claire:

Yeah. Maybe eat some more [inaudible] yeah, exactly. That's, that's, that's a strategy I advocate all the time. Yeah, it is. It becomes a an exercise in creativity and then understanding what the limitations are. So if you're dealing with people who are symptomatic, we need to factor that into your rehab. If you're dealing with people that are asymptomatic and healthy, then you've got possibly a little bit more leeway in that you can maybe do things that are single limb that you can manipulate more the body position to work to make the effects of gravity harder so simple example, is that like a press-up versus lifting your feet up, you know, to take my weight through the upper body. Or squats for example, a single leg squat with your back against the wall with like if you've got a gym ball that can make it easy. So two leg to one leg and that can be quite a stable position. And even with somebody with 'em, with a symptomatic knee in deep flexion, you don't have to go all the way down to that point of discomfort. You can still work in the ranges that are less symptomatic.

Steven:

You were probably going to go into this anyway, but a number of people have asked for clarification over the number of sets and one person has asked, Josephine has asked whether you're describing a what she tells me is a five by five regime that James McAvoy used to train.

Claire:

So the, there's no, we don't understand yet definitively what the optimal minimal dose is to achieve strength gain. Mmm. The optimal, so to give you an idea of intensity, the higher the intensity, the greater the gains. So if you're working at five rep max, you'll get a greater gain than if you're working on a 12 rep max. 12 rep max is more of a hypertrophic stimulus. That said, very recent papers have illustrated if you match the two for volume, you will get the same adaptation in muscle growth. It'll just be that the strength is greater in that higher resistance component, if that makes sense.

Steven:

A lot of people would assume that hypertrophy is actually directly equivalent to strength gain. Big muscle, big strength.

Claire:

No, it's, it is. It's related. So if you take a a muscle with a large cross cross sectional area and compare it to a muscle with a small cross sectional area, clearly you've got more musculature there more a multi-unit or a fascicules and fibres to activate, to produce force, possibly changing the pronation angle as well, such that a larger muscle generally produces more force than the smaller muscle. But in the initial stages of a strength training program, the adaptation is neural. So that means that increase in central drive to the musculature. So signalling going in a recruitment of fast twitch motor units. So those motor units that are muscle fibres, which are the strongest, the most powerful, the largest ones, often those ones that are inhibited by a fusion and pain and improvement in synchrony of firing. So all the motor units firing together would clearly generate more force than sporadic inputs from certain places.

Claire:

So that's why if you do a strength training program versus a hypertrophic program, you won't see the same morphological change in a strength training program or rehab program as you will in a hypertrophy program. Because the specificities such to increase strength activation of, of motor units and the volume of of training's often different compared to a hypertrophy program, which is a lower weight and an increased number of repetitions in terms of the optimal dose. I've said this before and I teach this in my courses taking the best available evidence we have, which is limited in quality or the quality papers are limited. There's not hundreds and hundreds of them because also as well people have employed different methodologies and often this research is in young athletic or university age males. Although there's a nicer volume of research coming out now in, in older populations, probably the optimal dose is around about 25 to 45 repetitions per muscle group per week to optimize strength gain at that five repetition maximum intensity.

Steven:

So in each session, let's say each day you'd probably be doing five reps and no more of that specific exercise?

Claire:

So you'd top that up over of a, a session or two sessions depending on who you are, how much you've done resistance training before, and if you've never done it before, you all your patients ever done it before. It'd be a progressive introduction to lifting heavy loads else they'll be ringing you up, swearing down the phone because they're so sore the next day. But it'd be a progressive approach to that if people more resistance trained. It's probably more like over 15. Anecdotally, I'd definitely say it's, it's, it's over 50 repetitions per muscle group per week to generate those, those strength gains, but importantly at that intensity, so you're five times five as fine, you know, if you want to do that in a, in a session, you can split your wanting to increase volume, then you can split that over a couple of sessions.

Claire:

And in all honesty, if you're gonna do any of this it's probably going to be so much better than what's being done currently en masse anyway. So if you're able to load the musculature up and get some really decent quality, intense efforts and it doesn't quite match the five reps, maybe they're doing seven and you don't quite get to this number of repetitions. It's not an exact prescription, but it's so much better than arbitrarily moving the limb against an arbitrary resistance without a real knowledge of what you want to achieve or marrying up the specificity of your intervention to what you want to achieve.

Steven:

So I guess one of the questions running through my mind is, let's say we're going to do five times, five repetitions. How long do you leave between those sets? How long and how much recovery do you need? Or if you're going to spread it out during the week, do you do the sort of three times in the gym per week prescription, which used to be quite commonly thought to be beneficial.

Claire:

So if we, if we're assuming we can do five reps and we've got the facilities to do that in this, this situation. Now I'd say give around about a minute and a half to two minutes between sets. Now there is some suggestion that if you leave it a little bit longer, you get a little bit more recovery. So you're weighing that up against how much time that patient is prepared to do in terms of the exercise prescription. So certainly two minutes is adequate between sets and what you can also do as well if she, if you're working single limb, you can and you're isolating the limb you can work the other limb in the rest period. So it becomes a very, in my view, a much easier sell. So you're only going to spend 20 minutes doing this resistance exercise versus you know, a 45 minute session and it becomes mentally something a bit more manageable for some people.

Steven:

Well that's psychology has actually been raised, I'm glad to say, you know, you work closely with someone whose expertise is psychology. First of all, Robin, I think you might've answered Robin's question cause he says, do we expect to see DOMS as a result of this? And therefore, do you employ a graded approach, which I guess you kind of said you do, but Jonathan's asked about people who've got knee OA for example, and who've never been near a gym in their life but aren't necessarily opposed to it. What strategies are there? We could talk about exercising at home instead, but what strategies are there to motivate them to actually do the rehab exercises?

Claire:

Yeah, so I run a 12 week program when, when we're not in lockdown for knee OA remote, yeah. Face to face and I collaborate with a gym and have designed that program such that they're achieving 25 to 45 repetitions per muscle group per week. And what we do is we evaluate them on a few functional tests. So I see what's pragmatically doable in a, in a gym environment that's not going to take you know, forever to do. So we do sit to stand in 30 seconds. And we also just monitor number and look at the quality as well. We do a five rep max test on any extension. So all my parameters in terms of strength are on quads on the symptomatic knee. And I do a VAS visual analog scale of pain average over the previous week. And then also there's, I'm thinking this is quite important as well for the individual on a, a nominated activity for, for them.

Claire:

So what is it that they do? Mmm, often on a daily basis that they're really notice the pain. And for most OA patients, probably reality is walking downstairs and coming back up in the morning and making that first coffee, isn't it on a cup of tea in the morning? So we take those parameters. So number one, that can be a nice illustration to individuals as we assess them halfway through the program to show that they're improving, which they absolutely do. The other thing before we even get there is to understand what their why is. So why are they literally sat in front of you right now, why have they come to see you? What is it about their condition and this goes for anybody really that has caused them to seek a solution? So for many people it's been able to run around and play football with the grandkids.

Claire:

Maybe it's been able to walk for four miles on unstable ground go up to for cross country walks with the dog. So if you understand what their why is and their reasoning can then start to frame that discussion around that rather than I'm going to tell you do to do this because you make your knee pain, get better. The don't really feel a part of that conversation as much as, okay, I really get that. And what do you think would be, you know, how would you feel if this was the case or what do you think you should be doing? Okay, that's fine. The more you can make them a

part of that conversation, the more empowered they feel and part of that decision making process as well. And that I'm very fortunate to work with, with patients that privately or private in a private situation. So the probably a little bit more possibly motivated them en masse and NHS population who have been chucked into a knee class. And it's quite difficult to get that individual discussion going on, but certainly...

Steven:

No, this is say, but also possibly you have patients coming to you as a strength and conditioning coach expecting to go to the gym. Many of our physios, chiros and osteos have patients coming to them who want to be quick fixed in the clinic, they don't want to do anything themselves. You must've seen a fair amount of that as well, that people expect it to be done for them rather than have to put in any effort.

Speaker 3:

Yeah, definitely. Yeah. And to be honest I was gonna say I'm not equipped, but I'm also not motivated enough to try and change the mind of people whose mind is never going to change. And, and everybody listening will have examples of those patients no mater, no matter what you say and how you phrase it, they've always got an answer. And a lot of people through my learnings of psychology. I'm seeing so many different types of patients actually. They hold onto their problem because it defines them and they've got something to talk about. It gives them the attention and that's, that's not a musculoskeletal problem. That's, that's a psychological issue that needs some packing. If they're willing to go down that route.

Steven:

Possibly they even enjoy being able to say to people, well, the doctor and the physio and the osteopath couldn't affect me. Kendall's asked a very interesting question here, which I have a personal interest in. He says, for prosthetic, for prosthetic knee owners, at what point does your three to five rep max exceed the failure of the joint complex?

Claire:

So I'm assuming with a joint replacement he's, he's talking about there. I'm not sure. I'm not sure that it does. I'm not aware of any one fact the way to test that would be to, to research the, the overloads against the, the prosthetic, but I don't know. I really don't know. It's not being done, but what it does, if you think about the joint and its integrity, you'reu working on the structures around that joints, you're not necessarily, so you're going to be applying force to it, but you're also applying, working on forces that keep it together. So, It's about quality of life, of the individual weighing up against perhaps the quantity of life of the prosthetic, if it indeed is even threatened by that. And I'm not sure it is.

Steven:

Well, I hadn't thought about this coin that clearly until I had a knee replaced, which I had to do because I can no longer ride my bike because I couldn't bend my knee. But of course it's, it's impact, which is probably the worst thing for a knee replacement. But strength training doesn't really affect the joint. It's the, the joint replacement itself because the joint is moving against the the other surface. But you're not actually putting too much stress on it. It's the musculature around it, which is working. So personally, I'd have no problem whatsoever doing your overload exercises. There are OA number of people, by the way, commenting on how beneficial strength and conditioning has been for their OA patients. And I don't know that they're just people who have been on your course, but one person said, In pain you can't believe you can do squats. But starting up and down from a chair, you can progress very quickly. It's very nice to hear. And I'll have to get through some of the other questions. Robin's asked about pain limitations. He's saying that people who are, who come to us are generally in pain for some reason. And at what point in an injury process would you start introducing your exercises?

Claire:

It depends on what, what it is that their restriction is, what the, you know, that, where they are in that injury / rehabilitation journey. So clearly you wouldn't overload you know, a naive tissue that's still remodelling and very acute in terms of the injury process. You're not going to put a huge three rep marks eccentric learning through that, but when clinically advocated and it's maybe discomfort that's the problem or pain that's the problem, you can work around those joint positions or as muscle lengths, you can work isometrically to start to introduce that loading into the tissue. Also, there's some evidence that isometrics can get downgrade the unhelpful pain response as well. So you've got a bit more of a window of opportunity to do some more strength work in there without that unhelpful a pain response. It really depends on what the, what the issue is, so for example, on an ACL reconstruction we'll go straight away on three to five rep max on the opposite side, the cross education effect. Um and it will be a graded process to build them back up into that for an OA knee. It's again, a graded process depending on the exercise history. And, you know, from the question before about the DOMS response there's this, let me be clear, there's no reason why you shouldn't overload old, older people. You know, there's, there's oodles and researchers show that one, it's beneficial, two, people can still get stronger in the seventies or eighties and nineties. Amazing isn't it? But that's why we've got such a potential to be so effective do more for patients because not only we're not giving them strength and exercise and the competing against effects of sarcopenia as well. Yeah. but your graded approach can help mitigate that. DOMS response and actually some submaximal resistance exercise can protect against that DOMS response in the next session. So it's also a nice way to introduce it. And then what we asked. So if you did do that and there were already sore, you know, this is not catastrophic, it's just an uncomfortable feeling. That's all.

Steven:

It's not going to do them any harm, is it, we had a specific personal question from Peter, but it would apply to a lot of our patients as well. He tells us that he's had MS for over 40 years and his right quads are wasted and weak despite trying to strengthen them. There's no pain, but his knee is now starting to hurt and weight-bearing puts it into hyper extension mainly because there's much less muscular support. Any thoughts on particular exercises that might help him?

Claire:

Okay, so that's, that's difficult because it's, it's a neural issue. So if you, so some strategies, depending on the, the limitation of where it's come from. So you might, if you're able to do eccentric work, that means if you're sat in a leg extension machine, it's the lowering part of, of the work. If you're able to do that and you're able to go to a gym, Mmm. That can brief eccentric high-intensity muscle contractions can preferentially recruit those fast-twitch motor units that you're really struggling to do. So if you lift the weight with two legs, removed the leg, that's not atrophied and then try as hard as you can to decelerate the fall of, of the remaining weight. It'll take a while to get used to that. And when, again, if you're able to give me, I don't know if you are, but if you can do this and you can build that weight up or make it really challenging and actually the, the contraction might only last a second, it may be even less but what you're doing is putting them really quick stimulus, powerful stimulus into the musculature to try and recruit preferentially from that pool that's inhibited. The other avenues that you've got open to you are things like potentially excuse me. Sorry, whole body vibration therapy coupled with muscular activation on top. And I'm doing a bit of work with Galileo right now, which is a side oscillating plate which enables that recruitment of motor units through the stretch reflex in the muscle. So you can almost take you out of the equation and the stretch of the muscle spindles means that then the muscle is recruited without you asking it to be. So that potentially could be another Avenue. If you've got, yeah, I don't know where about he is, but if, if, if he wants to email me or pass on my details there's a couple of other suggestions I might have as well. If I can put him in touch with somebody who are not, there's these things, then I'd be happy to.

Steven:

Brilliant. Thank you, Claire. We're nearly out of time, unless of course you're kind enough to be willing to continue for a few extra minutes.

Claire:

Oh, of course. Yeah, it's delight. It's a delight.

Steven:

Well, you know, it's funny, we, we usually schedule these for 45 minutes and we, when we get people who've got this detailed anatomical physiological knowledge on, invariably the questions pour in and rather than have some people disappointed, It'd be nice if we can ask...

Steven:

Holly has asked, what do you think of the NHS ESCAPE-pain program?

Claire:

Okay, so Escape-pain. I know this very well. I think it's a good starting point. I think that it provides, I suppose at least some focus on to let's do something about knee OA without jumping in and replacing their joints. So I've done a whole load of work on knee OA. I'm trying to work with the CCGs to put in a similar set strength focus to program as a path of, of managing knee OA. Now Escape-pain, if you imagine like a pyramid of, of people with knee osteoarthritis, escape pain in my view covers the very top if I'm able to do sign language, a small proportion. So if you think about, you're obviously familiar with it, the exercises that are prescribed are not challenging from a strength perspective to many people. So standing, holding the back of a chair, bending a knee is maybe stressful for some people who are exceptionally deconditioned, but it's not targeting those people who are early stage OA, maybe kind of medium stage OA, maybe it's their real end stage and the next thing is a joint replacement. The other thing that goes with Escape-pain is some kind of talking therapy as well, which is, as I said before, exceptionally important. So you need, in my view, which is a part of our program as well, a psychologically focused patient education program, which focuses on the forward and progression, not the woe betide, my knees knackered, it's is never going to get better type thing. It's a forward focused approach. So those two things together, I think make, for a very effective, potentially very effective program, but we need to get the intensity right of the exercise and unfortunately the Escape-pain is not strength focused. I like the idea because it's a type of solution and it's been taken en masse, but I think I know we can do better. We can absolutely do better and I've had meetings with many, many commissioners, many CCGs and unfortunately getting them to change practice is just tremendously difficult. Even when everything marries up and it's a seamless integration. Changing minds in the NHS unfortunately is, is really, really difficult to do. So obviously the, the well with, Escape-pain and I've got it, endorsed, but, I think we can do better again for our patients.

Steven:

Susan asked whether muscle overload improves tensile strength as well as muscles?

Claire:

Yes.

Steven:

Okay. Good answers on that.

Steven:

It's a latent effect. So it will happen roundabout three months after a strength training program. You can expect to see the changes in tendon properties. But yes, it's again, another good reason for doing strength training. Heavy loading can improve the quality of the tenderness tissue too. So that's why it's a good strategy to have in tendinopathy rehab.

Steven:

Right. But there's no danger to the tendon while you're overloading it. Before that latent effect kicks in?

Claire:

Uh in a healthy person, sorry.

Steven:

Well you're rehabbing somebody, you're giving them overload exercises but their tendon hasn't kept up, it's delayed in its response.

Claire:

No, typically you're, you're fine with that. As long as you grading that, that exposure, you're not suddenly doing gone from zero to I don't know, five sessions a week of, you know...

Steven:

We had a question about fibromyalgia and whether strength training aggravates or otherwise.

Claire:

I'm going to have to say I'm afraid that's beyond my area of expertise. I'm aware of some research on that and I think has potentially a good effect, but I don't want to comment beyond that. As in I don't want to give you the or give an opinion that's not properly informed.

Steven:

I have to say that in my own experience, and I'm not saying this to be dismissive or facetious, but actually getting fibromyalgia patients to do things like go to the gym is actually quite hard because they tend to be quite depressed and low motivational. In my experience. Nathan's asked whether eccentric training is better at recruiting muscle fibres than concentric?

Claire:

Yes, if you load. So if you make comparisons of concentrate training to their training matched at their respective overloads. So if, let's say you're going to do a five rep max concentric, if you are on a program doing that, if you do a five rep max that's

matched for the eccentrics or how many times you know the, the weight that you can only lower with control five times, then that you get a greater strength gain in the eccentric program compared to the concentrate program. So it has a beneficial effect because basically you're able to accommodate more load during a lengthening contraction, then you can do through a shortening contraction concentrically that said, typically a, a resistance training involves both, but during a rehab program, you might want to, or have to separate the two out so you can get some work done. So through eccentric contractions there is a preferential recruitment fast-twitch.

Steven:

Okay. This isn't a question, it's coming from the audience, but I'm reminded by what you said earlier on of a discussion we had with Matt Walden, who's an osteopath who was only on the show a month or so ago. And he was talking about the importance of a balance between the quads and the hamstrings in terms of protecting the ACL because actually between them they can, if they are unbalanced, they can actually aggravate ACL injuries. So would you, if you're giving quad exercises also say to somebody, you need to do hamstring exercises as well, so you haven't just got...

Claire:

Yeah, there's a couple of things in, in there. One is yeah, let's think about the agonist antagonist pair. So in a rehab program, we're typically rehabbing individual, aren't we? So we think about the mind and the body. And then if you're doing rehab on one muscle group, presumably I'm sure most people would think about doing the opposite muscle group as well. You would hope...

Steven:

It's a lot easier to do quad extensions than it is to do hamstrings...

Claire:

People hate doing the, it's like a mirror athlete. I'll do what's in front of the mirror. I'm going to ignore the back. Hamstring pain's awful isn't it? But so yes do the antagonistic muscle group as well in terms of an ACL population. It's, we haven't again got that definitive evidence to say that the quadriceps hamstring imbalance is causative of ACL injuries. It might have some relationship to but there's a whole heap of other factors as well. And I think the danger, well when you're looking at ratio data, which is another concern I highlighted in the paper that we just finished writing the cross education effect. If we look at ratio data, we miss the absolute levels of performance. So for example, the study we've just completed, we took two, took a group of ACL patients and randomly allocated them into one standard care, which is a super base rehab program.

Claire:

I'm another group that went, did the same thing and then this group did some placebo, upper body flexibility exercises. This group, hammered limb strength training on the non-operative limb and they both started that two weeks post surgery and did it for eight weeks. And then we followed them up til six months. Now, what we saw was, well the cross education effect had a fantastic effect on attenuating losses in quadriceps strength. But what my point was, if you look at the end stage when you're looking at that return to play we've got this now data that says or that thought within the literature that we want to aim for a no greater difference than 10% of the interim symmetry. So from left to right, you don't want that difference to be more than 10%. So they have a non-injured quad to be less than or more than 10% weaker than the injured quad all the way around.

Claire:

Other way around, I'm sorry. Anyway, yeah, so that ratio data would then, if we look at, look to our ratio data, and we can look at hamstring quads as well, shows the actually most people achieved that. So therefore that's an indication we can return to play, right? Well, no, because when you look at the absolute levels of force, it's used to calculate those data. It's not the same as the preoperative level. It still is lower. So we're sending people, you know, if we were just to use ratio data to help guide return to play or return to activities we're missing a lot of information so they might be a greater risk even though the ratio is fine, the strength is, is maybe 30% lower than what it was before surgery. So we just need to be a little bit more careful when we're thinking about using ratio data or it's not bad, it's just don't rely on it 100%.

Steven:

Josephine, if you're doing squats with a heavy load, is there any danger of damage to the posterior horn of the meniscus?

Claire:

Um not for doing, you know, I'm not seeing anything. Mmm. Unless you've already got some damage there. I've not seen any data that illustrate that. And if you've got a concern, you can limit the depth. You can do box squats a change your foot position, do front squats, ways in which you can change that exercise too. We've got some specific concerns to mentioned box squats, box squats. So typically on a, on a squat, you're asking people to go down to go. And some people say go below go and some people say, Oh no, it's so dangerous don't go there. Uif you want people to avoid deeper levels, you can put like a, a box or a chair or something behind them that when their bum touches that, it's just a stimulus for them to go back. So they've reached a level. So you might want them to do 80 degrees, not, not 90, so they can use a sharp stick instead of, well, it's funny I, describe this on a another webinar that I was doing the other day and that people, Oh, it's when we were talking, wasn't it? You can bail out then can't you, if you've got a worry in all of that when you're teaching squatting, if they touch the box and they can't get back up, we can just sit down. It's like, yeah.

Steven:

Ian's asked if you've ever had a patient rupture a muscle doing overload exercises like this?

Claire:

No, I haven't fortunately. Mmm, no, no. It's not a risk over and above...if you've got a progressive approach I'm yet to see any research or anecdotally from me. No. If you've got a progressive approach, I'm not seeing anything in the literature that has shown that.

Claire:

And you've got strategies to try and attenuate that risk. Ideally what you're doing is you're making that unit into a more robust unit to be able to accommodate those stresses and strains such that they don't rupture in the future. So if it does, rupture it's really weak, right? So an and also think about as well, there's loadings that you putting through the tissue is relative to what they're able to achieve themselves, not relative to what somebody else is able to achieve. Sort of a progressive approach. They've never done resistance training before. Just get them into the pattern of doing it, get that load going through at different ranges of motion, progressively increase the load. And then on the first session, that's three to five rep max. Maybe just do one set per exercise at that intensity and then progressive book. Mmm. But yeah, what you're building is a remote, more robust tissue.

Steven:

Keith's asked about how often people work out in training to failure. How long does it take the body to recover? Is his point. And if you start with someone with a muscle strain or tear does recovery time change?

Claire:

So recovery from resistance exercise, it depends again on the volume and the type of loading that you're doing. So if you think that fatigue and muscle damage are two very different things, Mmm. Acute muscle fatigue is something that kind of happens right now and you fail. So basically what you've got when you're failing is acute muscle fatigue, 12 rep max, five rep marks, acute muscle fatigue gives sufficient recovery between sets and everything will recover. So a three rep max give two minutes rest the energy systems will recover such that you can go again at the same level. Now over volume of work that includes a big eccentric component. Then there's a carry over effect, which somebody mentioned before that one of the symptoms is DOMS, which is exercise induced muscle damage that dependant on how much you do can peak in the quadriceps around about 24 hours after the first or the inciting exercise. Hamstrings, it's a little bit later and you probably recognize Sthis if you're sat there going yup, I can get out of bed when I did my first Joe Wicks whenever I'm in lockdown. Mmm. Or you can recognize that in your hamstrings a little the second day

Steven:

We had our first Joe Wicks casualty in the clinic the other day.

Claire:

Oh, did you? Oh yeah. Well this is, it isn't it? People are taking on a different exercise, different types of loading and if you're doing that every day, having never done it before, then there's a bit of a risk there, isn't there? So in terms of recovery from exercise induced muscle damage a day to two days.

Steven:

Is there any danger in working through DOMS? I know it's painful, but if you carried on training through, are you going to do any damage?

Claire:

Dependent on generally for the most, probably not. That said, if you're going to go out and do stuff that is unpredictable, dynamically challenging, I'd advise against it because what you do is you preferentially damage the fast-twitch motor units and your power and strength is attenuated for depending on, you know, you might not have any symptoms, but if you do a an increase increase, you load or you increase the volume or you do something different. Yeah. That makes you, you know, judging on the DOMS response, then throughout that Dom's period, you might have reduced capacity. So if you go out and play football, were you suddenly required to stop change direction? You want a fast, strong response to stabilize the knee joints. If that's compromised, then there might be an increased risk of injury. Again, it's really difficult near on impossible to measure the causality of that. But if you're just training or you know, you've got Dom's and you jump on the spin bike or you do another resistance training session, Mmm. Once you get into, actually it feels a little bit better desensitize whether or not you get the same adaptation. Don't know, possibly a little bit less. But

Steven:

Couple of quick ones before we finish. John's a rock climber and he says, a muscle endurance is very, very important. How, what's the difference in principle for muscle endurance as opposed to strength?

Claire:

Okay, so strength training, three to five rep max hypertrophy, we can still go three to five, rep max, but we need to match the volume. So actually you're doing the same number of repetitions if you want, you can go to eight to 12 rep marks. Anything above 12 repetitions, maximum is muscle endurance. So failing at 12 research shows is that actually that can improve high-intensity muscle endurance. So keeping a high level of false output over a longer period of time, probably after doing 20 repetitions, the beneficial effects might be lost. So somewhere in between that.

Steven:

Okay. And the last one Jen says, what's your thoughts on working through pain? For some exercises, pain will definitely mean one has done too much, whereas with some, there may be discomfort at the beginning of work. But this will ease as blood flow increases, et cetera. Your thoughts how you manage it.

Claire:

Well, certainly with, let's just go with the OA group. They're in pain all the bloody time generally, aren't they? So they're going to come with pain. So it's about these senses and that pain doesn't mean that damage is happening. It's, it's there for a number of reasons, none of which are going to make, I mean, they're damaging the joint. So typically what we do, we go through a more lengthy warmup process with them. To downgrade that sensitization, which includes a, a bike session of maybe five minutes if they are able to get the knee around the crank cycle. And then we do a submaximal loading of the excise that they're going to do. So they'll sit in the knee extension machine and do a lighter load for a few repetitions and then a number again, rest a little bit more. And that can downgrade that, that sensation of, of discomfort such that after maybe maybe three goes, you know, you're into that, the heavier loading,

Steven:

Right. End of questions. But we did have some people asking about the references that you called up earlier on, where can they find those? We can get those on your website...

Claire:

Yeah. So if you go to getbacktosport.com and you click on the S&C blog that you'll see 45 posts that I've written on strength and conditioning on how to integrate that into rehabilitation. The last two are on strength and [inaudible] the training on retraining and what to do in lockdown so that though you'll find those references and links if I have them to them. To that also if you sign up to the at the end of that, there's a, a free download, 14 page strength and conditioning guide designed for therapists on how to integrate these principles into rehabilitation. So if you download that, you'll have all the information I've just talked about and plus you'll get those blogs sent to your inbox every week.

Steven:

And in terms of the research papers themselves, are the references up there.

Claire:

Yeah. Yeah. Anything that I've used is the, the, all the citations are there.

Steven:

And last one obviously you run courses in this, particularly once we're not all locked down and Imogen has asked where, where she can find courses to learn more about this. What are you putting on later this year?

Claire:

Super. So again, on the website there's a courses tab. So if you click on that, you'll see the either in-person courses and online courses. So we're just coming to the end of the second cohort through on the online core strength and conditioning for re for therapists. If you want to know more about that, you can click on to read about that and you can sign up to see that information as soon as it's available. So we'll have another intake later in the year. I also run in-person courses and they are all listed on the in person courses tab and as a member of the APM you get a 20% discount as well. So if you're a member, you get a a with a discount code, you get that 20% off the in-person courses. If you've got any questions at all? Just get in touch with me. Really happy to do exchange emails and, and communicate.

Steven:

And in the unlikely event, Claire, that anyone doubts your credentials or your credibility or the or the value of those courses, or they get in touch with me, I can find any number of people who will speak for them because they've gone down very, very well.