Academy of PHYSICAL MEDICINE

Transcript

Exercise-Focussed Rehab/ Conditioning for the Restoration of Function

With Claire Minshull

APM: The last two broadcasts have not been particularly clinically relevant. We've talked about ethical marketing to new patients and to build on existing patient base. We've looked at human resources. Today we are going to return to a much more clinically focused topic. I have got quite an accomplished guest in the studio, someone who's got an expertise very relevant to what we osteopaths, chiropractors and physios do in our clinics. She has a PhD in neuromuscular performance and exercise stress associated with stabilization of synovial joints. I'll bet she didn't think I'd remember that.

She supervises PhD research students. She has been a senior lecturer at Nottingham Trent University. She was the British power lifting champion in 2010, and she has an interest now in things like underwater hockey. Who would've guessed? Who even knew there was such a thing as underwater hockey? As you can tell from her research, she is ideally suited to give us advice on the sort of things which are relevant to in the clinic. She's a reviewer for various peer-reviewed journals. For the Journal of Sports Science, for the European Journal of Sports Science, amongst many others. Her name is Claire Minshull:. Claire, great to have you with us.

Claire Minshull: Quite an introduction.

APM: Well you haven't got much to live up to you've been just about everywhere and done it all, you know.

Claire Minshull: The internet has a lot to answer for.

APM: We will of course put up the images and slides that we're going to use on the website after we post the recording of tonight's interview, but also you might be interested to look at Claire's websites. One is getbacktosport.com, the other is claireminshull.com, where there's a lot about her and a lot about rehabilitation. What we really want to get from this evening's broadcast is information that you can use in-clinic to help you structure rehabilitation programs for patients of all types, not just athletes but the aging population, those in between. And also give you somewhere where you can go to get more information yourself. So there are courses that Claire runs which may be of interest to some of you and we'll post the links to those, and I'm pretty sure Claire told me there's a discount on one of those courses available to people watching the broadcast. But we'll come back to that a bit later on.

Right, so Claire, before we get into the meat of all this rehabilitation stuff, I noticed doing my research on you that you make a lot of...you talk a lot about women in sport, women in exercise, as though there is a problem for women in exercise.

Claire Minshull: I wouldn't say that there's a problem but...my area of research and expertise and interest all focuses around, as you say, neuromuscular performance, of which, by the way, I've forgot my PhD title so congratulations on that, it's a lengthy one. But underpinning all that is muscle strength and, as we'll get into later, we need to really overload the muscular to develop strength which means, often, we have to visit a gym. So unless you're really quite low in terms of your functional capabilities, or you've undergone some surgical procedures, or you've been out of training for a long while, then we need to go to a gym. When we're in the gym, we need to lift weights that are heavy for very few repetitions, and I think now, over the past couple of years, the myths around why women shouldn't lift weights are beginning to be dispelled, which is great. But, still, there is a common misconception that heavy weights will generate massive muscles and all the, I suppose, non-feminine physical traits, which is completely untrue.

APM: There's a popular impression too, isn't there, that gyms are full of big men in ripped T-shirts, with baseball hats on backwards, and that would be, for a lot of women, not people who are competing for the British power lifting champion title or such things, but for normal women hoping to do some exercise, that would be very intimidating.

Claire Minshull: Yeah, and the same applies for all populations that don't routinely exercise, who have never even walked in to a leisure center, for example. It can be an intimidating environment. So, yeah, you do get those facilities, but likewise you get a lot more facilities, and again, we've seen over the past few years, the boom in provision of gyms. You've got 24 hour gyms, you've got low-cost gyms, no frills gyms, loads of frills gyms, all at different price points. So I think the industry's doing a lot more now to try and accommodate those people that are less familiar with training, working out, bodybuilding, whatever you want to label it as. I suppose really as well from a commercial perspective there's a lot of people that may want to pay that money, so they need to do more to attract those people.

APM: As you heard me say, our last broadcast was about, effectively, it was about sales, it was about ethically selling what we do, and I don't need to go into that. But actually there are people who will buy a product simply because it's the most expensive, aren't there? So there are lots of gyms around who rely on that, and make themselves look glamorous and gorgeous, whereas there are some very functional gyms which are perfectly suited to the purpose, even council gyms. There's a very good local authority gym in this town, here, which has been recently refurbished and has got all the machines and weights that you'd fine in any other gym, it just doesn't have the pretty pictures and the coffee bar and all that sort of thing.

Claire Minshull: Yeah, and I think that can be quite intimidating as well, all the gear. Maybe some idea, in types of people that can visit those higher profile gyms. There's a gym that I go to when I go back to see my parents, and there's a gym that I go to in Nottingham, and other gyms which are independent gyms that have that provision for really heavy lifting. But, in the morning, to late morning, to just approaching the afternoon, it's populated by older people. And older people, I'm talking 60s into 70s and they're doing strength training and they're doing normal exercise, and it's a real community feel, and I love it. They're not spick and span, and really shiny, and chrome, they're, as you said, they're functional gyms. They've got equipment that you need to, I don't know, treadmills and bikes, through to the weights and machines, and things that you need to improve your fitness or strength, but in an environment that's really actually quite welcoming, and it's quite a community environment.

APM: Interesting you say that because the gym that I go to, they apparently, I was told, they did a survey not long ago and they found that the main reason that, I think it might have been the women, go, is for social reasons, not necessarily to...well they're not into bodybuilding but they obviously want to get healthy, but they find it's a social occasion as much as anything else.

Claire Minshull: Yeah, I've seen it many, many times. Some of the council facilities, that tend to be run by the larger leisure management providers, are also catching on to this a little bit now and reserving those times, or promoting those times, which are off-peak to those people that might have, maybe, retired.So then you've got that group, that cohesion, that social interaction before and after, maybe they do a class together in a setting which promotes health and fitness and wellbeing. So that's perfect.

APM: So, actually there's some mileage, isn't there, in the practitioners who are watching this, if they don't already know, if they don't go to the gym, just finding out where the local gyms are, get a feel for what sort of gyms they are and their costs, and whether they have those sessions which might be more appealing to different parts of our patient population.

Claire Minshull: Absolutely. Something that we do at Get Back To Sport is we provide the industry's only, really, certification in injury management for fitness professionals. Which up-skills those people in gyms that, at least, a level three personal trainer and above, to accommodate people who aren't the mold of health and fit...you know they're healthy, they're fit, there's no

problems with them, or no joint aches and pains, they're under 50 years old, which is just, you know, that's basically what they're taught in the personal training qualifications. To then accommodate those people that are slightly different, may have issues and problems, adapt exercise accordingly, but importantly we teach them and encourage them to forge links with clinical professionals. So, like your view is now. Such that then you've got that referral process, so that person is looked after if they have an injury, or if they're being rehabilitated and they've got a facility that they can go to, and somebody that will welcome them and know what they're doing, and you've got that dialogue between the two professions.

APM: Yeah. We actually, we did a short lunchtime broadcast, possibly a year ago now, with one of the chaps that runs the gym that I go to, and he's a champion, he's a European, World champion, veteran bodybuilder. So he can't fit through a door normally, he has to go sideways to get through. But he is just the nicest guy and I think that relationship, that personal relationship with someone running a gym is probably very important to a lot of people, because I suspect you don't get it at Virgin, or you know, any other big gyms. Somebody will welcome you in, but after that you're on your own. But, actually when you go to the sm-

APM: Big gyms, somebody will welcome you in, but after that you're on your own. But actually when you go to the smaller gyms you meet the person who probably inducted you and has convinced you to ...

Claire Minshull: Yeah. I think there's more freedom and opportunity for that to happen, and you may well get it in the bigger gyms like Virgin and David Lloyd, but they are operating a model and that model is replicated throughout the country and internationally, whereas there's maybe just the opportunity for more touch points and communication and a personal relationship in those smaller gyms or the community gyms, which makes up for those people who aren't necessarily comfortable in going the first time feel more welcome.

APM: Yeah. When you spoke a moment ago, you mentioned level three personal trainers. Is that the top level or the first level?

Claire Minshull: So in the fitness profession you've got a fitness instructor, so somebody who ... That's a level two. Somebody who will be in the gym who can basically induct you into the gym. Then the level three is taking a qualification that enables you to instruct exercise, to build programs that should, in theory, enable you to accommodate or work towards a person's goal. So whether it that they want to be generally healthier, whether they want to lose weight, whether they want to improve their muscle strength or appearance, the general health and fitness desires, if you like. And then level four, then that's when you can start to be a little bit more specialized and look at GP referral.

So what we do is provide the CPD at the level three plus to provide that knowledge and expertise that makes people aware. So it's not qualifying people to treat and diagnose and become clinicians, but by the same token, in any field really, I'm a great believer of we shouldn't withhold knowledge, we shouldn't withhold information, which is unfortunately what's done at

present. By giving those people information, it empowers them, helps them understand people better and even if it's just a positive conversation with somebody, that can make them feel so much better, so much more relaxed, or if they recovering from an injury it sets them off on a positive rehabilitation journey regardless of whether or not you're the first port of call. Or you say, "Actually, no. I think probably the best thing to do is go see their clinician link first and then we'll come back and do your program."

APM: And I think, I won't say there's a danger, but there are certainly those around you perhaps try to do too much. I certainly don't regard myself as in the least bit expert in prescribing exercises to patients beyond the very basic stuff like go for a walk and do sit to stand stuff, things of that sort. And I can tell them that going to a gym is going to be good for them because all the research shows that doing some exercise will be good for you no matter what, pretty much no matter what's going on. But it's well worth, perhaps again, finding the level four practitioner, physical trainers, personal trainers, who you can build a relationship with. Not just because there's any commercial interest in it, but 'cause you're getting the best for patients.

Claire Minshull: Yeah.

APM: And one of the requirements that we have as osteopaths as part of our professional standards, and chiropractors as part of the chiropractic code, is that we have to be able to deliver information to patients in the way that they need to receive it, in an appropriate manner, and we have to refer to other healthcare professionals. There's, I don't think, any question that if you're at a level four in personal training, you are a healthcare professional. Not in the same sense, as you just said, but you are dealing with people's health in a very expert way.

I was going to mention at the outset, but I forgot, that actually you went the extra mile in terms of researching rehabilitation, didn't you? 'Cause you had two spinal surgeries in, was it 2013?

Claire Minshull: Yes.

APM: Which was very noble of you to do that.

Claire Minshull: Yeah.

APM: Now, so that begs one question, was that because of being in the gym? Is that the danger of being in the gym?

Claire Minshull: I wondered if you would ask me this. No, it was an altercation with a vintage filing cabinet that set it off. So I didn't have power lifting accomplishments then, which incidentally just kind of appeared because I quite like strength training. But no, it was something that was misdiagnosed to start with and, had I known at the time what it was, I wouldn't have continued to train. So it ended up being really quite a large prolapsed disc that needed some surgical attention and I couldn't overcome that conservatively by the time we knew really what it was.

APM: And what did they do?

Claire Minshull: So yeah. They took away the prolapse basically.

APM: Right.

Claire Minshull: And a discectomy L5/S1, which was fine. I walked out of hospital the same day, much to their astonishment. But yeah. Six days later I was in a car accident, which meant I had to go back into surgery. And this time I was immobilized counting ceiling tiles. So I've got a real empathy as well. I mean, I've had ACL reconstruction as well, but by far this was the more challenging surgery to get over.

APM: Out of curiosity then, I mean we're not quite yet on the subject of rehabilitation, what were your initial symptoms? What did you have in the outset that should have been better diagnosed?

Claire Minshull: So it was ... The first thing was the day after ... Stupidly I was trying to ... Don't listen to this. Stupidly I was trying to assist lifting a filing cabinet into the attic of a terraced house with a circular staircase. And I don't know if you've ever lifted a vintage filing cabinet, they are heavy and obviously they're not equally weighted. So it was after a dead lift session as well, so it was just a combination of stupid things and inappropriate loading. The next day I was okay, but after the ... I was at work and I unusually went home that next day, I could barely walk and I had the pain actually at the L5 level, which was strange, I put it down to muscular spasm. That subsided, then it became, I want to say SI joint, is it piriformis, and just that referred pain. Then I got the neural symptoms and the numb foot and the severe pain right from the buttock right the way through to hamstring down to the toes. Yeah. So it wasn't very pleasant.

APM: But you said that was misdiagnosed at first?

Claire Minshull: Yeah. Yeah, yeah. And probably I didn't take it seriously enough actually at the start.

APM: How old were you at the time?

Claire Minshull: That's a very good question. So probably mid to late 30s. Yeah, yeah.

APM: Okay. So you were old enough to know better?

Claire Minshull: Definitely.

APM: Yeah.

Claire Minshull: Yeah. Definitely old enough to know better. But I was still invincible. No, it was ... I didn't receive the information that I should really stop. And actually doing loaded training, so things like squats and deadlifts, actually made it feel better, which again on reflection I know why that is. But in the moment,

it's like, "Okay. This maybe isn't a bad thing to do." But no, it didn't, obviously it didn't get better.

APM: Okay. So how long were you in hospital counting ceiling tiles, the second time?

Claire Minshull: So the car accident happened about six days later and I tried to let that settle, but I had this almighty local swelling on my back every time I stood up, and headaches. So they thought I was leaking CSF. So after about five days of this I went back into hospital and I was probably immobilized for another four days to see if it resolved, and then into surgery and then a few more days. So it was probably, a good at least a week and a half.

APM: And at the second surgery what did they do? They fuse it?

Claire Minshull: Well, no, they didn't. After the investigations ... They were trying to determine whether or not it was cerebrospinal fluid or it was a massive hematoma. And again, it couldn't be determined, so they went in to see basically what it was. And unfortunately it was a hematoma, so they just aspirated that, sewed me back up and yeah.

APM: Okay. Which leads us on then to how did you rehab yourself? Presumably was ... How good were your rehab skills at this stage? Or was this the starting point?

Claire Minshull: Yeah, reasonably good. Yeah, yeah. I mean, so I've been studying and researching with a clinical emphasis since I started basically, my academic career. And I'd say really focused that in at the start of the PhD. But I am so fortunate to have a brilliant clinical network, such that where I've got knowledge gaps they fill them in. And that feeds into all the education and training we do as well. So a great friend and colleague of mine, an excellent physiotherapist, I supervised her PhD, she was able to help me as well. The orthopedic surgeons ...

Claire Minshull: ... helped me, as well. The orthopedic surgeons were, again, former colleagues, superb at what they did, so I had the best care possible.

The acute rehab I was doing was, as you well know, was just get out and start to be mobile. Then, came the focused ... more focused control and stability exercises. Through then, to custom ... obviously, I'd been immobilized, as well. Through, then, to improving the strength.

I sought counsel from other experts, or experts ... well, not that I'm an expert.

APM: In terms ... obviously, there are different reasons why we might want to send people to a gym. We're going to talk mainly, I imagine, about rehab, during this broadcast.

So let's start with, what are the principles of rehabilitating someone after surgery?

Claire Minshull: So, the things that ... depending on what kind of surgery, and how long people have been immobilized, or the extent of the injury, and the extent of the rehab program, I like to look at it as a phased approach. The length of those phases will be determined by the level of function that that person has, and where they want to get to. Thus, this would apply to any other person who maybe just wants to walk around the supermarket and push their trolley with no problems and walk back with bags of shopping, through to the elite athlete who's got much more physical demands on the body.

Apart from the mobility in the really acute phase, if we move past the acute phase, and the treatment, which is not my bag, through, then, to the phase approach of generating that neuromuscular and strengthening conditioning. The first thing, once we've got that movement back, is start to think ... for me, to start think about muscle strength, which is possibly contrary to what people may practice.

So, what may occur is, in common practice we start to do body weight exercises to 30 reps, or banded exercises to 30 reps, and then start to build up to be able to do strengthening exercises. Which, incidentally, are typically very well prescribed.

APM: Are not-

Claire Minshull: Are not typically well prescribed.

But, if we look at that, as long as it's clinically safe to do so, and also we would provide a structured and progressive approach, there's no reason why we can't look at muscle strength. Muscle strength underpins all manner of other functions and capabilities: it's the foundation on which everything else is built. So it makes sense to put your solid foundations in, and then build on top of that.

Muscle strength is developed by lifting weights, very few times, but it's a heavy load. And if we're looking at a prescription, it's three to five repetitions maximum. So that means lifting a weight with correct form, and I'm assuming here we've got other clinical ticks that we can do that, and we've built up to that progressively. Being able to work up to that-

APM: Well, I think you might be expecting a lot, there, because there are a lot of practitioners, I can think of several practitioners who, they understand what a curl is, and they might understand what a deadlift is, but they wouldn't know what the correct form for those exercises are, because there are just subtle changes which make quite big differences aren't there? And we'll come onto demonstration some of those, a bit later on, I'm sure.

So, I'm assuming that we know what the correct form for an exercise is.

Claire Minshull: If we take ... for example, if we take a knee, and it's ... maybe you've had a partial meniscectomy, or some sort of ... maybe just an arthroscopy. But anything like that where, at that point they've been ... it's clinically okay, there's no contraindications to doing that particular exercise. So, an open

leg ... open chain knee extension. That exercise where you sit on the machine at the gym and, kind of, extend your legs out: that's a good example to illustrate this. So, we're okay to do that. The progressive bit would be, if that person done that exercise before, then there'll be a period of becoming familiar with that exercise, a period of their muscles accommodating that type of load in that way, which may last two to three weeks depending on how experienced, and the age of that person, et cetera, and their level of functioning.

Beyond that, then we can start to build up to this three to five repetitions maximum, which means lifting that weight up to five times, but not six. And you don't do six because you physically can't lift it. It's a very, very different feeling to lifting a weight, and you start to feel that burn, and it's aching. You will get that around about the seven, eight, beyond, repetitions, and then you're out of the strength training zone. So strength training optimally occurs in that three to five repetitions maximum, where you're failing at five, literally, and, as I said, the load is such that it makes it that difficult. Progression of that doesn't mean that we're progressing the number of repetitions: we progress the load.

So using that example, where you're extending your knees ... not extending your knees, so the legs come out in front of you. You pick a weight. Through trial and error, "Okay. I can do that five times, but really struggling on six." Take a rest for two minutes, and then do it again. And you might do three sets of that.

APM: So, in your subsequent sets, in your second and third set, you're not still expecting to do six repetitions? Or, five repetitions?

Claire Minshull: Five ... You might do. So, this is when your muscles adapt, and the neuromuscular system adapts to accommodate that load and be able to lift it: you become stronger. So, your first go at that exercise might be, you do five; four and a three, or you do five, three, and a three. Then the next week might be a five, a five, and a four.

When you start, then, to be doing your six and sevens, then that's the cue for you then to increase the weight.

APM: So the first time, the first set can be done to six. Then you put the weight up a bit so that you can't do that?

Claire Minshull: So, the first ... it'll be in a session, so the first set, you will have discerned whatever weight that is. You lift it, and if you find that next time you're lifting it more, so you're going into the sixes regularly, or the sevens regularly, within that repetition range, that's the cue then for you to increase the rate ... increase the weight, rather than increase the repetitions. Because if you then start to be able to do seven, eight, nine, 10; three sets of 10 is typically what we prescribe; but I'm afraid it's not optimal for strength training, then you're losing that stimulus and you're efforts become redundant.

APM: Two thing occur to me, in this. One is, that I suspect that an awful lot of people, post, let's say knee surgery, are being sent away with a rubber band, and being told just to do, "As many reps as they can." And it'll be 20, 30, whatever it might be. And, of course, it will be ... the weight will not ... resistance won't be constant, because the angle of the band will change as the leg moves. And you're saying, "That doesn't work." What's the process behind it? Why isn't that effective when three to five reps is?

Claire Minshull: So, just a caveat with that. The exercises that are given to people, in the initial stages, are likely to have some benefit on strength, but that would be lost very quickly. So, if it's a Theraband exercise, then you can do it five times, fine, or, you can do it 10 times in the first instance. It kind of 'kick starts' the neuromuscular system, and you will have some adaptation in strength. But that adaption, or the stimulus, will be lost very quickly, and you start, then, to really need to look as muscle strengthening.

What we're doing by loading up the musculature, three to five repetitions maximum, is we're recruiting from this fast twitch muscle capacity. So, broadly speaking, you've got ... very broadly speaking you've got slow twitch muscle fibers and multi-units, and you've got fast twitch muscle fibers and multi-units. If you think about them in, I suppose, sporting capability, your slow twitch ones are the ones that enable you to do the marathon, or indeed, just walk ... we're using them all the time as we're being mobile.

APM: So, more postural muscles? The ones that are stabilizing the rubber band.

Claire Minshull: Yeah. Yep. And also the activities of the ... like, on a repetitious basis.

The faster twitch multi-units are the ones that activate more quickly. They produce more strength, or they're stronger, and they're able to produce force more quickly. Which is the power, or the rate of force development, which we can come onto later.

So, by loading the musculature in that heavy, intense way, focuses the stimulus on those fast twitch capacity, and that fast twitch capacity, which is what we need to develop strength.

APM: Okay.

The next question, and that comes in ... leads into that quite nicely, is there that aren't ... particularly your female clients, are they not concerned that, if I sit here doing three to five repetitions, I'm going to end up looking like Arnold Schwarzenegger. I'm going to have enormous muscles, and I don't want to have enormous muscles. I just want to be a normal ... a normal shape for whatever their aspirations are?

Claire Minshull: And, actually, strength training for women is so important as we age, and we've got not just sarcopenia, but a problem in sarcopenia, et cetera ...

APM: It's really hard to look like Arnold Schwarzenegger, not that you possibly want to look like him, but to generate the hypertrophic response, which is

what you're talking about, the larger muscles. It takes a lot of time and effort to do that. So all the time I'm speaking to women who've got that preconceived idea in their mind, then I will challenge them to be able to do that because it takes a lot. Also, you focus your training slightly differently if you want to generate a hypertrophic response. So if you're looking at a body builder, a body builder is very different to a strength athlete. So a strength athlete, If you think about, I suppose at the Olympics, Olympic lifting, so they clean and jerk and snatch deadlifts, power lifting similar, bench press, their physiques aren't like that of a body builder. A body builder would be much larger in terms of their musculature and the volume of training that they do to generate that is slightly larger and maybe the repetition range is ever so slightly higher.

Claire Minshull: It's somewhat baffling that you're building that bulk of muscle but you're not as powerful as an Olympic power lifter, dead lifter or whatever else, because you kind of expect that you would be with that huge volume of muscle-

APM: You've got a hypertrophic response and the muscle fibers grow and that is not just focused on the fast twitch, if you like-

Claire Minshull: Okay, yeah.

APM: ... there's, I suppose, a shared growth, but their training doesn't ... If you look at a body builder, they typically don't train three to five repetitions maximum, you'll see them go to failure, up to maybe eight to 10, 12, and then they'll do another set on top with a different body part, or the same body part but slightly different exercise that works the muscle in a different way. So it's a very different way of training and it's for growth. Their focus is on size, not on strength.

Claire Minshull: Right and your knee patient that we talked about a minute ago, you said, "Okay, we're going to go to the gym, we're going to do three sets of three to five repetitions," and so on. How often has this patient got to go to the gym to do that?

APM: I get asked this a lot and we cover this in the courses that I run for healthcare professionals, rehab professionals. Everybody wants to know the magic number, what's the dose? So the research amalgamated ... basically if we boil that down, it's around about 25 to 45 repetitions per week to generate a strengthening response. And that 25 repetitions per week will be looking at the novice trainer or the-

Claire Minshull: And we're doing 15 in a session here because we're doing three sets of three to five?

APM: Well, so if you need to generate 25, do 25 repetitions, then you've got five in each set that you're doing, so you do three sets, so that's 15, so then you could do another exercise to take it to 30, so you could do a leg press and then you go another day to generate ... certainly in the early stages of a training program. When you're in the 45 plus, for those more experienced in

strength training, then you'd be looking at ... the volume within any given day would be greater. So they would be easily able to accommodate three different exercises, three to five repetitions, three sets. But with a caveat that again, if we're looking at the research, which is basically where we're getting this evidence, on balance, most research as you probably well know is conducted on healthy young males-

Claire Minshull: Very often soldiers, because they're a nice easy population to get hold of-

APM: And students are great as well, yes. So there's quite a bit of research actually in the older populations, but when we're really trying to get down to what the number of repetitions is, that's why it's fairly broad. So when I've boiled it down, 25 to 45, likely much more than 45 for the really accomplished athletes.

Claire Minshull: Yeah. Had a great question come in actually and it's great, not least for the way it's phrased, because sadly this person hasn't told us who he or she is, which it'd be great if you would tell us because it gives us a little bit more color and flavor to these questions. "How long do you expect rehab to go on for? You clearly like to train, but for someone who would rather collect stamps," and in brackets, " ... and loves it, do you have a goal for them for post-surgery?" Presumably you do, you talk a lot about goals in the gym on your website don't you?

APM: Yeah. So how long does rehab go on for?

Claire Minshull: Yeah.

APM: Well it depends what the problem is doesn't it? For example, an ACL reconstruction, you're looking six to nine to maybe even 12 months of rehab, and different for different conditions which may or may not have clinical restraints that might limit what you're able to do for fear of overloading the tissue.

Claire Minshull: Well let's say you've got a 35 year old mother of two who just wants to get back to shopping. She's not a sporting person, she didn't do this by playing lacrosse or whatever else, it just happened somehow. She's had a ... not a knee reconstruction, a medial meniscectomy, she's been in, she's had her surgery, her goal is to get back to those normal daily activities. At what point do you say, "Okay, you're fit to go now?"

APM: That's the good question isn't it?

Claire Minshull: Well it is, isn't it?

APM: Well it's a moot point actually and it's debated in sport. How do you determine return to play? So I can't give an answer to that but what I can say is, number one, we want to be looking at increasing the level of capability she had from where it happened, obviously we're unlikely to have that data, but that's an aim to get to because we don't know whether or not that injury happened because of the lack of support around the knee and

that support, or any synovial joint, that's generated by the performance of the musculature around it, it's your biological scaffolding. So if that functions properly, then you've got the greater protective capability. So if you're de-conditioned, then it's likely that that might convey a threat to injury.

So in terms of adaptation, to give you some idea, probably around about ... if we're just looking again at strength, because that's where most of the data is but you can, I suppose make inference about cardiovascular fitness as well as flexibility and tissue compliance, 12 ... well let's say eight weeks can generate a significant change in muscle strength. You probably would see it earlier than that, but certainly a minimum dose of eight weeks. More likely 12, so if you see all these exercise referral schemes, they're 12 weeks, twice a week for kind of a good reason, although I think you can probably, if you play around with how things are dosed, you can change that.

Claire Minshull: Well part of the good reason will be our desire for a fixed recipe-

APM: It is, but-

Claire Minshull: ... for rehabbing people won't it?

APM: ... again, a lot of what I talk about when I'm working with the NHS is it's about behavior change. So we need to look at incorporating exercise into our daily lives. So yes, there might be a bolus or a concerted effort at the beginning and rightly so, where we're focusing on development of strength, so training maybe two, three times a week to bring those levels up, but thereafter, a maintenance session of once a week could be sufficient to maintain that level that you've developed and have that part of your habitual practice, if you like, and part of your life.

Claire Minshull: I'm interested, you mentioned a moment ago, compliance, or something along those lines and you and I talked about this beforehand. One of the questions that come in here, I think it's from Sarah, who says she's currently in Spain, the lucky devil. Says that her big problem is she finds that patients don't make or have the time to do the exercises we recommend. Have you got some sort of motivational speech that you would use [inaudible 00:08:23]?

APM: Yeah, it's really different isn't it because in this position, you need to be all things. You need to be ... that you have the expertise and knowledge of the musculoskeletal system, the treatments, the prescribed exercise, and then you need to be a psychologist and tap into what that person's barriers and motivations are, and perhaps-

Claire Minshull: Didn't you say you've got some sort of program which helps to develop ... is it for the patient or is it for the practitioner?

APM: So two things. One, we run a course called the Psychology Of Patient Buy In. I don't run that, I work very closely with it. A thoroughly excellent consultant psychologist whose focus is on motivation and barriers and the like, so

everybody's different, that's why one blanket approach does not fit all. We need to communicate with people and find out what their barriers are. So that's one thing, the other thing is that we're working with the NHS to develop an exercise referral scheme for management of him and knee osteoarthritis. A part of that is not just the exercise, it's about a psychology focused patient education, about goal setting, about motivations and barriers. So for that individual patient, in that individual setting, it's really tough but what I would tend to do is try and find out what are their motivations and what are their barriers.

So if, for example, they've never been to a gym before, and you give them a sheet of exercises that need to be done in a gym, they ain't going to do it. You need that buy in. So what is it that their ... it's a motivational interviewing technique

APM: What is it that they're ... ? It's a motivational interviewing technique, where your empowering them in that decision making process, and you're steering them a little bit, maybe, subversively, but into them doing what you want them to do. Or, you adapt and change it, in such a way, that means that if they're doing something and it's like this, it's better than putting that sheet of exercises in the drawer. So I don't know, it becomes a problem of logistics, of problem solving actually; logistics and problem solving.

So, finding out what the barriers are, what the motivations are, whether it's time ... everybody can find the time: it's got to be something else, isn't it? Or, what do they really want to be able to do? Okay, so be able to do this. Then break it down into short term goals. So, it might be they want to ... I don't know, do an Iron Man in a year's time. That's a great goal to aim for, but here and now, when you're in pain, you know that's so far off it's unattainable.

So, what can you do to scaffold that, to get to that goal? Which means that you kind of do these exercises, now.

Claire Minshull: I'm being prompted, possibly by one of our viewers, I'm not sure, but somebody here says that "They've seen the weights on the sets, and am I going to challenge you to some sort of competition this evening?" To which I've already made it quite clear, the answer is "No. I'm not going to have press-up conversation with you," or anything like that.

But I think people clearly want to see what the weights are for. Is it worth us looking at sort simple routines that people could use; either in a gym, or what they could do at home. Because I just have this perception that a lot of our patients don't want to go to a gym. If they're going to do anything, they're going to do it in front of neighbors, or at home out of the public eye, and maybe we should look at what we could do for simple back pain, or perhaps knee ...? You choose. You ... give us an idea?

APM: So yeah, this is something that I end up doing in every one of my courses, because not everybody's patient goes to the gym. And I would argue, at some point, we do need to generate that overload. So, to get a five

repetition maximum exercise, we need to find that load from somewhere, and at some point that will probably mean going to the gym. But, that said, there's a lot you can do to scaffold that approach to the gym.

So, if we thought about, maybe, looking at a continuum of very low function, through to a higher level of function, what could possibly be done at home?

Claire Minshull: Yeah. Well we've got Ruth to demonstrate this, because she wanted to compete with you. Ruth, can you come and join us please?

And Ruth, you haven't got any particular physical healthcare problems at the moment, have you?

Ruth: None that I'm aware of.

Claire Minshull: So, we can do what we like with you!

Ruth, I should mention, is an osteopath from my own clinic, and is also a horse rider of some capability. And she fits saddles as well, so she has an awful lot of stuff around the-

Ruth: Trying to get him to pay for it, now!

Claire Minshull: So, there we are, we've got some motivation for Ruth: it's to get her back into horse riding, probably, if she's injured.

APM: Okay. Right.

So, I think if we go from ... obviously, you're very fit, and capable, but if we try and envisage somebody who's isn't. Maybe, that older person, who ... in fact a good example might be a knee replacement patient, actually. An older person, slightly sarco-

Claire Minshull: Has somebody briefed you that I've had a knee replacement?

APM: No!

Contending with sarcopenia, as well as the insult of the operation. So, we need to start, really, on a low level. So, the first thing would probably be a sit-to-stand exercise.

So, if we've got a chair ... do we?

Ruth: Let me grab a chair.

APM: Pull that chair in.

Claire Minshull: And a chair, because it's a nice functional exercise, which is-

APM: Is that okay? So.

Ruth: Is that okay?

APM: Are we in shot?

Claire Minshull: Okay for cameras? Yeah. Good.

APM: Right. Okay.

So the first thing would be, if we're aiming for strength, which is what we're talking about now, it would be a sit-to-stand. And is this challenging, five repetitions? So, the first thing, maybe, holding on the sides. So, a little bit of a push up, and stand up. And then, back down, controlled. And back up again.

So if we that ... that person can do that five times, and you see at the end that they're struggling on the fifth one, that's probably about right, in terms of the dose.

Claire Minshull: Now, if Ruth's had a knee replacement, I suspect she's going to be putting all the weight on one leg and not on the other one. Are you looking for cheats?

APM: So, that's when you start to cue. If that's too difficult then what we can is increase the height of the seat.

If you come and have a sit on this one. So you're not going into as much knee flexion, and there's less loading upon the joint. So, from there, if you had the handles, you could still use the handles, but that would be a regression, so, making it slightly easier. And, like you said, you want to try and cue them to use both legs equally.

Claire Minshull: And, at home, they could just put an extra cushion on the seat, couldn't they?

APM: Exactly. They could.

So, if we go back to the really hard chair. So, hands, kind of, on the side. Then hands off. And maybe, even, out in front of you. And that'll be ever so slightly harder, because you don't have the assistance with the hands pushing off the side.

Claire Minshull: I think Ruth's struggling, actually!

APM: So, then, it becomes, "Okay, so we can do that. Then, how do we progress a strength exercise?" We've got, now, going to six, to seven. How do you then cue them to make that harder? As we said, we increase the load not the repetitions. So, one thing I say is "Find a backpack." Of which, I didn't one today, but if you put a backpack on, and then put in a liter bottle of water. So that's a 'known' weight, or a known volume. And then you can increase that by one, by two, by three. So, you can do that.

Swap the backpack to the front, then you're loading up the quadriceps more than you are the glutes.

Ruth: I have a question?

APM: Yes.

Ruth: I'm just thinking, if I've got a backpack on, my instant reaction is going to be to lean forward first. Does that matter?

APM: You want them ... Yes, it does. So, firstly, you don't want to topple over and all the water comes out! But, no, to take again, repetitions with good form. So they need to, kind of, stand straight up. So, it'll be the cue-ing. Do the same as you've done before. And it might be that you get them to do it in front of a mirror: that's always a good feedback tool for what you're doing.

So, yeah that, that would be a bit of a cheat there. And a push off like that. So, with good form, so that you're loading up the musculature. As I say, if you put the backpack on the front, so it becomes a front-pack, holding it like that, then that's loading up the quadriceps a bit more.

From there, then we can go to, kind of, squatting. So we've got some weights here. If we push the chair back. If you stand with your feet around there, what I want you to do: squat down, and with a good form, pull the weight and stand back up. And back down. So that involves a bit more knee flexion.

If that's too hard, if that's too much in terms of knee flexion, you put the weight on a platform, or on your step, or on the bottom step at home; kind of using the tools that you've got. And then that becomes another strength exercise.

Ruth: That's surprisingly harder than just standing up.

APM: Yep.

Claire Minshull: Taking Ruth's question ... sorry, can I ...?

APM: Yeah. Of course.

Claire Minshull: Taking Ruth's question there, if you put that on a step, automatically it's now gone forward six inches, because she can't step on the same step. Is that going to have a serious effect on the quadricep ...?

APM: It might ... yeah-

Claire Minshull: ... challenge?

APM: The quadricep challenge! Yeah, it might cue you to lean forward a little bit more so, if possible, maybe a set of books. So you want to be taking it from between your feet really. And then the cue-ing is "Chest up." "Look

forward." "Shoulders back." And then you're driving through your heels. So, for any kind of squatting maneuver you want people to drive through the heels, otherwise if they're pushing through their toes ... that's what you were saying before, they've got a tendency to lean forward. If you cue them to push through their heels, then they automatically-

Ruth: Straight up.

APM: Yeah, straight up. Put their chest back, yeah.

And then that can be ... So, how do you find a weight? Whether you have a weight or not, you can substitute a weight for your backpack, or big liter bottles of water. You can get five kilo with a handle on, can't you? So that becomes your ... Then, once you've surpassed the water challenge, then it'll be fill that with sand. So we're really thinking, kind of, laterally here.

So that's just a series of progressions that you could make, at home, that would progressively make those exercises more challenging, such that you're involving a ... it's a strength exercise, you're increasing the load and not increasing the repetitions.

Then, after that, then you might then think, "We can do single leg work." Single leg works involves a little bit more challenge in terms of control, so I wouldn't necessarily move straight into that. But beyond that, then we're probably looking at ...

APM: But beyond that, then we're probably looking at them needing to go to a facility, whereby we can load you up in a safe manner on some machines.

Claire Minshull: So, by single leg work, what do you mean? Do you mean lunges? Or are you doing single leg squats or?

APM: Yeah. So, the ... well, other exercises we can do, for example, are lunges with backpacks.

Claire Minshull: Yeah.

APM: So there's loads of different things we can do. But beyond that, that weight, then you're looking to isolate the muscle and make it harder. So one thing you can do ... So, if you do that, that's lifting your body weight between both limbs. If you do it with one leg, it becomes harder because you're taking the whole body weight through one leg. But, do you notice when I wobbled? It's a lot more of a neuromuscular challenge.

Claire Minshull: Yeah.

APM: So you need, as you're doing your rehab, when you're developing your proprioception and your muscular control, then that needs to be-

Claire Minshull: It's also a big leap, isn't it? Because the sort of weight that we're using here is a long way short of your body weight, or half your body weight, and you're

suddenly putting an extra half of your body weight over that muscle. So, it's quite a big leap to make if they haven't been filling bottles with sand and making that progression.

APM: Yes, yes. Exactly, yeah.

Claire Minshull: So, I have no particular interest in lunges but is there a particular value of doing this over doing a lunge? Or does the lunge have a specific role in rehab?

APM: I think ... So, both are good. If we're doing the squats, you load up, probably, more the groups a little bit. So they're kind of the hip musculature as well as the quadriceps. If you're doing a lunge, again it can be quite challenging, depending what somebody has had in terms of a surgery and depending what their functional capabilities are. The ability to do that, with control, and then back up might be more of a balance proprioception exercise than a strength exercise.

Claire Minshull: Yeah.

APM: Because then the loading becomes with a backpack on the front or the back, like that. Or holding two bottles of water, like that. Which you can make that, definitely, you can make that into a strength exercise and it might be a part of the repertoire. Or it might be a slight sideward lunge, or a backward lunge. But you've really got to make sure that you've got that neuromuscular control to be able to do that without falling.

Claire Minshull: Yeah. But as you said, once they're a little bit progressed, this is quite a good way of developing that neuromuscular control as well.

APM: Yeah. So I'd expect a home-based program to have a series of strengthening exercises which are done in a safe and controlled way. Coupled with, then, your balancing exercises, which probably start with a one-leg balance, one-leg balance eyes closed, with a cushion underneath. And then moving the, kind of the center of mass, you know, kind of building up from there.

Claire Minshull: Going back to my hypothetical patient. I've just been asked, can I just ask which 34-year-old mother of two has time to go shopping? Sexist comment. I don't know who said that, but yeah. It probably was.

All right. Someone here says, I've got a dodgy left knee after a horse accident. Did you send this in earlier?

Speaker 2: No.

Claire Minshull: I've got a dodgy left knee after a horse accident. Can no longer forward lunge but as a woman we like the benefits of a lunge. I find reverse lunge works very well.

APM: Yeah.

Claire Minshull: Okay.

APM: What you're not doing is with a forward lunge you're getting that anterior tibial translation so the tibia translating anteriorly relative to the femur. So if it's a, I don't know, tendinopathy or that type of maneuver aggravates whatever the ... whether it's a meniscal problem or whether it's a problem to the joint surface, if that maneuver is aggravating that, indeed a reverse lunge.

Claire Minshull: I want to see for a second.

APM: Yes.

Claire Minshull: You can stay with us if you like.

Speaker 2: Don't mind.

APM: Then yes, the reverse lunge is an adaptation.

Claire Minshull: Actually, I don't know if everybody knows what a reverse lung looks like as opposed to a forward lunge.

APM: It's going backwards.

Claire Minshull: So you can stand up again. You can demonstrate.

APM: Oh. Am I in shorts here? So move this out of the way. So forward, that's a forward lunge.

Claire Minshull: Yeah.

APM: So if I was going to do a backward lunge, it's that.

Claire Minshull: Right.

APM: So you're loading up the musculature in a slightly different way.

Claire Minshull: Very slight isn't it.

APM: Yes.

Claire Minshull: Because the final position is pretty much the same.

APM: It is, yeah.

Claire Minshull: It's just the pace backwards. Yeah.

APM: And incidentally you could lunge onto a step. So if that, the lady who's got the knee problem wanted to try a forward lunge, then if the step, you've got a step, it makes it slightly different in terms of the mechanics of the knee

joint. So it may, I don't know what the problem is, or her symptoms are but it might enable her to do that.

Claire Minshull: Yeah. A long question has come in and I haven't really read it. So I'm just going to go through it cold here. I don't know who it is but I know it's a chiropractor who says I go to the gym daily. I have a multidisciplinary sports clinic. I see a lot of teenager footballers who have issues with hamstrings, groin and indeed back when winter training on 3G pitches. I struggle to come up with a strength training program that doesn't interfere with their time on the pitch so as not to cause fatigue during the season. I think it's also good to note I get the broken players that tend to arrive mid season making the training difficult as they are not off season. That's sort of something you recognize.

APM: Yeah. So I've just written a chapter for a sports medicine textbook which will be published I think at the end of the year and it's called the Efficacy of Conditioning and it addresses some of this. So if you've asked that question, look out for that at the end of the year because when you're looking at sport there is a multitude of different challenges. So they need to be, the athletes need to be fit and fast and dynamically stable on top of then being skillful and they need to be able to perform repeatedly over time. So you're building up a cumulative load over a competitive season.

But as we said, we know things like muscle strength and the neuromuscular capacity is one, it's a dynamic joint stabilization. It's a dynamic joint stabilizer. That protects your inter articular structures. But two, it provides a foundation on top of what other things are built. So where do you do that? In an ideal world, what you would do is do that pre season. And dose up the players to get their baseline levels much higher. We're acknowledging that they will come down. And when I was writing this chapter, actually, I read one by Munster Rugby team and they've got a fabulous approach to this.

So if you imagine, what happens normally is that the baseline function's here, regardless of what's being done there, and then over time it will gradually start to come down. So it will come down in a game. So you will fatigue in a game. Depending on how long between the next game or the training session will determine what recovery is enabled and that will be because of acute fatigue but also muscle damage. And the muscle damage effect lasts much longer.

Incidentally we run a course on live actually for muscle damage if any of your viewers are interested. So then you've kind of got like this saw tooth effect but it's gradually going down or it could do that if it's catastrophic. So where do you intervene. So up front, a strength training program absolutely necessary and I'm a big fan of [essentric 00:28:04] work. That's where the muscle is lengthening while it's generating tension. That preferentially activates the fast twitch capacity that we're kind of looking at and also can provide a protective effect against other essentric exercise based interventions.

Claire Minshull: And to do that presumably they've got to be in a gym because they're going to need someone to help them with the exercises.

APM: Yes. But also they need that load and if you've got healthy, fit athletes then you do need that environment. You can do some rate of force or power training without necessarily all that kit, but you still need to put load into the body to fuel that adaptation and stimulate it. So do the strength training for as long as you can, a minimum of four to six weeks up front. Then as I said before, right at the start, we talked about doing a maintenance session. Can you fit in to that training routine over a week a single strength based session to try and maintain some of those gains and that will ... It will determine on what their playing schedule is. It will determine what their training schedule is. If you're talking any kind of professional level, it'll determine by what the manager's opinion is, whether or not it's informed or it's just what they think.

It's a really, really big challenge in sports to be able to deliver sports medicine.

Claire Minshull: Yeah. My only experience at a very low level of trying to deliver sports medicine as an osteopath is that all people wanted was a quick rub to get them over that niggling pain and they went back on the pitch again.

APM: Yeah.

Claire Minshull: So it wasn't proper medicine like [crosstalk 00:29:47]. So more questions for you. We've got people sending in quite a lot now.

I'm rehabbing an old knee injury, an old knee. I'm sorry.

APM: My old knee.

Claire Minshull: I'm rehabbing my old knee after a medial meniscectomy-

APM: "Possibly both, albeit badly, but I found that cycling, particularly with hill work, is very beneficial." What conditioning does this person need to do to increase power and endurance? And that's Paddy, thank you Paddy.

Claire Minshull: What does Paddy need to do to increase?

APM: What conditioning does he need to do to increase power and endurance?

Claire Minshull: In cycling, I wonder? So, cycling is probably anything, if you were to pick one exercise, it's the best exercise for joint health.

APM: Only hips and knees, surely?

Claire Minshull: Way to go Paddy. Sorry?

APM: Only hips and knees.

Claire Minshull: Yes, and especially if you don't fall off.

APM: I genuinely always worry that-,

Claire Minshull: Ankles as well.

APM: Yeah, I do always worry though when someone's doing cycling, there's an awful lot going on down here but there's not a lot of movement in the upper body.

Claire Minshull: True, for the lower limb, yeah. That said, you can do arm cranking, can't you? Upper limb cycling. Yeah, cycling is fantastic because you're able to activate the musculature quite forcefully, so if he's doing hills, or indeed a cycle ergometer, you can increase the resistance. It helps with the viscosity of the synovial fluid, and particularly in older patients where it's maybe a little bit thicker, research has shown it improves the function of joints. Also, it's not impact, if we thought impact might be not so good for joints, although joints do like impact. It's probably another discussion that, but if he wants to improve his power, then power is basically generating submaximal force very, very quickly.

Power can be developed through some strength training, so we talked about targeting those fast twitch motor units, the ones that generate high levels of force, but high levels of force very quickly. So we're thinking about the slope of that force generation curve, you want it to go right up quickly, and incidentally, that's what you need as well to protect yourself against injuries. Injuries happen so quickly, so an ACL injury, less time than it takes to blink an eye. You need a fast neuromuscular response that's very forceful. Lifting heavy weights with, importantly, this is the difference, with the intention to go fast.

It might be, when we were doing those sit to stands, if you're going to do a power exercise with somebody who is fairly functionally impaired, and I'd argue you would need to do that, so it might be that their goal is to avoid tripping over the cat when they get out of the chair, or lessen the consequences of that. They need a fast response. The intention would be get out the chair with the same form, but quickly. Now, whether the end result is a quicker result, it doesn't really matter. It's that intention to go quickly.

APM: Our motto at APM is think differently. They could just get a smaller cat.

Claire Minshull: Yeah, or a much bigger dog, then you'll fall into it, yeah. So, for power it's generation of force quickly, so again not very more repetitions than the, you know - if we've got that, is that slide available?

APM: Yeah, if you want to show this slide.

Claire Minshull: Let's show it.

APM: Because I'm conscious that we've haven't been doing anything.

Claire Minshull: That one there, that slide.

APM: What's this one telling us?

Claire Minshull: It looks like a busy slide. We've got the question mark in the middle there, that's because generally prescriptions are three sets of ten or twelve. If you look at the text, the size of text indicates the size of stimulus. On the top there, you've got muscle strength, you can see I've put that box around three to five, that's where we're working to get the most benefit to strength. If you go into the ten to twelve repetitions, where I've put that box there, it's not doing very much of anything, it's not really optimally generating strength improvements or power, not really doing much for hypertrophy, it actually, there's more research now that shows it's more of a muscle endurance exercise. The lower twitch motor units and the capability of keeping repetitious contractions actually. Three to five repetitions is where you're really honing your strength, four, five, six, up to maybe you could argue depending on what exercise you're doing, up to eight, then you're looking at power.

The important thing is with strength and power fast twitch motor units they fatigue very quickly, so you need to give appropriate rest. In between sets, you're looking at two minutes. That's a good guidance to use when you're focusing your rehab.

APM: I saw a question in here a moment ago, somebody said would you go over the three to five repetition rule again and how much load is introduced at that time?

Claire Minshull: Yes.

APM: I mean, you can do that fairly simply, can't you?

Claire Minshull: Now, yeah?

APM: Yeah.

Claire Minshull: It's literally, three to five repetitions maximum, and what that means is the maximum number of repetitions you can lift with proper form. That's it. You can't lift six because it's too heavy, or you can't lift ten because it's too heavy. Then you increase the load to make that as an [crosstalk 00:05:41].

APM: And as you're going on, you said 45 repetitions per week in total would be quite good?

Claire Minshull: Novice, 25 through to 45 as they adapt. Then when you're getting into more of the elite athletes, then it's a bit of a best guess approach because there's not that much research on it, but the papers that are published with that population in mind, it's probably over 45 in a week.

APM: Is that always done as three sets at a time?

Claire Minshull: No, it can be done four sets or five sets. It depends what exercises you do and what you're able to do. If it's quadriceps then you've got squats, you've got knee extensions, you've got lunges, maybe reverse lunges, you've got hack squats, all sorts of different things. It will be a combination of those to achieve your goal.

APM: I have had one question in here which is asking after Ruth's health actually, because they want you to demonstrate some more of these other weights, because the person who sent the questions says they do a lot more upper body, on upper extremity. What would you do, say, for biceps tendon rehab? Basically, they want to see Ruth doing curls I think.

Claire Minshull: Okay, let's get some dumbbells out. Let's have a see, shall we? The Royal 'we'. What's your capability? Four sets, actually, do you want to sit a little bit further forward so we've got a straight arm?

Ruth: Oh, yes.

Claire Minshull: So a bicep curl is basically that, okay? See how many you can do actually. What's that? That's 4 kilos, so we've got 4, does that feel really easy?

Ruth: Yeah.

Claire Minshull: How many do you reckon you can do of that? We haven't practiced this in advance.

Ruth: Is that five? That's not really feeling hard yet.

Claire Minshull: So I'm guessing here that this isn't going to do very much for the musculature. Now, if you're looking at the tendon, that's different. It might be that your rehabbing a symptomatic tendon, you've got a clinical consideration there, in which case it's your best clinical judgment, and what I say - have a rest.

Ruth: Thirteen is getting tiring.

Claire Minshull: We're definitely muscle endurance with that, aren't we? In terms of a pain response, I tend to go on a 0-10 scale. If 10 is the worse imaginable, 0 is nothing. If you have got some injury, it's likely that you're going to have some sort of adverse reaction or some discomfort, particularly as you will know, like knee replacement, I bet you had to push through a lot, didn't you?

APM: Yeah.

Claire Minshull: If you were going into the fours, maybe that's okay, anything more than that, then probably too much. Then as long as that four then comes down to three, a two, a zero when you've stopped and it's not progressing and increasing in symptoms the next day. Muscular endurance is important, we can do that quite easily as you know, but if we're rehabbing strength we're

then looking at a different weight. You've got a 4 there, we're going to jump from a 5 to a 10. What do you reckon?

Ruth: We'll give it a go.

Claire Minshull: A 10, so the thing-,

APM: The principle is [crosstalk 00:09:11].

Claire Minshull: The principle is yeah, if it's three to five repetitions maximum, but what we were saying before about talking to patients, it's telling them it's a very different feeling so that it's like the tank is empty rather than it's really hurting. Rehabbing a bicep tendon would, you've got your clinical considerations, then you're looking at the musculature, and tendon adaptation takes longer than muscular adaptation. If we're looking, there's an eminent professor, [Qubo 00:09:46], who's done loads of research on muscular tenderness adaptations and neuromuscular adaptations. The muscle strength developments might happen within eight weeks, but you're looking more like twelve weeks for a change in, for example, cross sectional area or muscle tendon stiffness. I don't know if we, do you want to?

Ruth: Yeah, I'll give it a go.

Claire Minshull: Here we go.

APM: So are we getting good form while she's doing this?

Claire Minshull: Yeah, that's really good form.

APM: What could she be doing wrong?

Claire Minshull: Sit up straight.

APM: Okay, so she could be leaning forward and using her body to jerk the weight up?

Claire Minshull: What we'd probably do is if we're doing - have we got three?

APM: She's going bright red.

Claire Minshull: Good job.

Ruth: Just. I definitely haven't got four there.

Claire Minshull: That's brilliant. What you obviously look to do is be sensibile about it, and you have a support under the arm if you're just isolating the bicep group, if you like, the elbow flexors, you do provide support there, or change the way in which the exercise is performed such that you're doing it with good form and support.

APM: Right.

Claire Minshull: But yeah, very different feeling, right?

Ruth: Very different, and actually it didn't hurt. I was expecting it to be painful, but you just don't have any energy left.

Claire Minshull: Yeah, it's literally the tank is empty versus, "Oh, it's really stinging," and that's because ...

Claire Minshull: The tank is empty, versus, "It's really stinging." That's because the byproduct of that, when you're doing an exercise to failure with greater repetitions is what people call lactic acid. The stinging feeling is actually what happens to the lactic acid, we break it down, we use the lactate for energy, and it's the hydrogens that are left over that makes an acidic environment, and that's the bit that's really uncomfortable. That's what generates that burning feeling, and that's because we're operating in an anaerobic way without oxygen, and that's the byproduct.

APM: Ruth, I'm going to shoo you away for a minute, while we, I've got a load of questions that I really would like to try and get through before we finish.

Claire Minshull: Thank you.

APM: Again, Robin asked this question, thanks Robin. "Would you calculate," he's getting all technical on us, "Would you calculate MVC before starting training for rehab. Is there a good way to do this for a patient in an injury state, or is it just an estimate?" Then he says, "Also, what percentage of MVC would you recommend to start? Can we do the same for low back pain, please, and do you have ..." there's a lot of questions here.

Claire Minshull: 100 questions.

APM: Let's start with some of those.

Claire Minshull: Okay, so MVC, Maximal Voluntary Contraction, which is basically your best estimate of muscular strength. If you've got the dynamometry to be able to measure strength, and this is the thing that we're limited with or by in practice, how do you measure strength? If you've got a handheld dynamometer you can make a rudimentary guess at what that muscle strength is. If you want to monitor progression, absolutely measure it at the start and then measure it at the end, or half way through your exercise prescription, for sure.

If you haven't got a handheld dynamometer, then if you think about the exercises that you're prescribing, you can do a version of that. Again with doing the logistics and problem solving, I was asked this question actually a few weeks ago in a seminar, and it was related to a patient with knee pain.

APM: It wasn't Robin again, was it?

Claire Minshull: I don't know, maybe we've met. A person with knee pain is unlikely to be able to do one rep max. One rep max is probably the gym equivalent of an instrumented test.

APM: Which means a single repetition of the heaviest weight that you can manage.

Claire Minshull: Yeah, so with Ruth for example, that was probably her three rep max I would say, because if we went to four you'd lose form. We'd then increase the weight a little bit more and a bit more, until we got with sufficient rest, such that we got to a level that that's her one rep max. Now, if you've got a person who has got some osteoarthritis in the knee or has had a knee replacement or something whereby that heavy loading is just too much to tolerate, what do you do? Well, three rep max, and if three rep max is too much then maybe a five rep max, because we're still in that strength zone.

That would be a way of getting some estimate - it's not the best but it's better than nothing - of what that person's strength capacity is. As then they progress through the training program, you will then repeat that at the end, and actually because they're working in that zone anyway you make a continuous measurement of that monitoring.

APM: Okay. Shall we go onto the rest of his question? What does he say? He says, "Specific patient here," Robin asks if you have any suggestions for exercise with a patient with bilateral degenerative achilles tendinopathy. She was a keen running, and is heartbroken to have been advised not to run anymore, and has also been advised never to barefoot run. That seems like the same advice twice.

Claire Minshull: Yeah, it does, doesn't it? Run on your hands.

APM: Yeah.

Claire Minshull: Again, forgive me, he probably knows all of this research, but in case people don't, tendons respond well to loading, so we unload a tendon that's symptomatic, it de-conditions much the same as the musculature will do, it will atrophy. There's no surprise then if you take a break from running with a tendinopathy and you go back to running, then you get the tendinopathy back probably more quickly, because the tendon is de-conditioned as well. Current research shows that about with a 75% response rate, heavy loading over a large range will generate a good adaptation in muscle tendons that can remedy tendon problems.

Tendons is not my bag, as in it's not my complete area of expertise, but he'll be able to find plenty in Google Scholar, that it's around about, as I said, 75% response rate doing about six repetitions, five, six repetitions maximally of eccentric or concentric plantar flexion, or they equivalent if it's eccentric, a couple of times a week. With that strength training dose, you should see in about three quarters of patients, a positive response. Whether or not that will apply to his particular patient, I'm not sure.

APM: What we haven't done, we've talked a lot about rehab, we haven't really talked about cardiovascular training. I've got several questions about that. The first one, which came in ages ago, apologies to whoever asked this question for keeping it for so long, but I wanted to get the rehab stuff done first. Whoever it is says, "Is there a safe form of strength training for a heart condition, an aneurysm or hypertension, or other conditions where, because of possible spike in blood pressure, lifting heavy weights is contraindicative?"

Claire Minshull: Yeah, so don't do anything above your head, and in actual fact, that links quite nicely to what we were talking about, the personal trainers and qualifications. There are people that have done exercise referrals for cardiac problems at level four, so I would seek out those individuals, because they have been and got the qualification to do cardiac rehabilitation. They know about the blood pressure issues, and they should know about the contraindications for medication and the things that they shouldn't do, like for example lifting heavy weights above your head. Strength training is important, but it's done in the correct way for a cardiac [crosstalk 00:17:42].

APM: So it's level four who have got that specific skill?

Claire Minshull: Yeah, look out for exercise referral for cardiac patients.

APM: I said I was actually going onto talk about cardiovascular stuff, but there's one here that's come in and I'm going to read it out, because it's another viewer in Spain who says, "It's so cool doing CPB by the pool, and thanks AMP for that as well." Very pleased by that bit of flattery. Do you use strength training for prehab, or are people using in too much pain for that?

Claire Minshull: Prehab, that's a very fashionable term.

APM: It is, isn't it?

Claire Minshull: Yeah, it is, and it can mean a lot of different things. From that, I'm guessing prehab prior to surgery. Basically yes for everything, whether it's injury prevention or whether it's in preparation for surgery, again it's about bringing that baseline level up. If you're going to go into a period of de-conditioning, enforced immobilization, and a surgical [inaudible 00:18:42], with the inflammation and pain you're going to have a massive atrophy response. Anything you can do to increase those levels, preoperative status determines postoperative outcomes, that's well known, so the better the preoperative status the better outcomes will be.

It will be a case of finding a way in which you can strength train without causing too much symptoms, and in some of the courses we do, we look at exercise adaptation. Whether it's a case of changing the range of motion, whether it's a case of changing the type of contraction. We don't have to do a concentric eccentric, we can do just purely eccentric, and we can do it fast to avoid the pain response, or we can do isometric. Maximal activation at a joint angle that's not symptomatic, and that will convey benefits either side of that joint, and research also shows that if you do it at long muscle

lengths, it's slightly better in that it conveys adaptation to the shorter muscle lengths as well.

Incidentally, I'm just running a clinical trial right now looking at the effects of cross education. If you've got a limb that's become so symptomatic, or indeed postoperatively and it's complete immobilized, is there anything you can do to attenuate that atrophy response? What we're looking at absolutely hammering the opposite side, the healthy side or the uninjured side, or less injured side, doing a strength training program of eight weeks high intensity, three to five repetitions maximum, and looking at the cross transfer effect on the operate limb. This has been done a lot, so we know about this cross education in, I suppose, sports performance situations, but it's never really been applied bizarrely in orthopedic settings, which to me just makes absolute sense.

APM: The results are quite encouraging, are they?

Claire Minshull: They are. We have almost finished recruiting, and from what I can see when I'm giving patients feedback right at the end, because they don't get any information until they're finished, it seems to be attenuating that strength that we know we get volumes of data on, on how people respond. It seems to be attenuating the strength loss actually, even just that small dose. There's lots that you can do.

APM: Your opinion please on high intensity resistance training, where the priority is time under load rather than weight.

Claire Minshull: Depends on the goal of the intervention. Set out your stall, or your intervention, to achieve the goal that you want to achieve. Is it that you want to be stronger, is it that you want to be bigger, is it that you want to have high intensity endurance, or low intensity endurance, or you just want to get your heart rate up and have a workout? There's all sorts of manipulable variables. Time under tension, that your listener was saying there, your viewer saying, load, frequency, super setting, volume, lots of different-,

Claire Minshull: Super setting, volume, lots of different things. It really depends on what you want to achieve. So there's no hard and fast answer in that context. Strength.

APM: I suspect one of the things that may concern people is that a lot of our patients maybe don't need that muscle rehab, but they'll say, "Well what's the best way to lose weight?" Or, "What do I do about my bingo wings?" Something I saw in one of your blogs actually.

Claire Minshull: That's an old one, yeah.

APM: Yeah I mean is there value in doing exercise to try to get rid of bingo wings? Let's take that one for example.

Claire Minshull: So you can't spot reduce as you well know, you can't do sit ups and make your stomach flat if you've got a large amount of subcutaneous fat. Or you can but you'd be there forever and a day and you'd probably come see you because you've got a back problem from doing it.

But that said, what-

APM: So by spot reduce, what you mean is if you do an exercise at a particular area you are not going to target the fat on that area.

Claire Minshull: You will not target the fat, but you will target the musculature, and that generates like a corset effect and tightening. So if for example you improve your lean mass particularly around your core, then you'll find that then perhaps your waistline gets smaller even though perhaps you don't look like you've got that washboard appearance. So it's much more tight, the lean muscle tissue.

So there's a benefit, yeah, absolutely. There's a health benefit for improving muscle performance, muscle tissue, the volume of lean muscle tissue, as well as an aesthetic effect. We mustn't lose sight of that and that becomes so important and even more important as we age, because beyond the age of about 50 we lose muscle strength at a rate of, depending what paper you read, 1.5 to 5 percent a year. So we need to be intervening even more so at that age and beyond as a habitual strategy, behavioral change, to try and attenuate that sarcopenic effect, which will bring with it dynamic joint stability, so you don't become as frail as quickly. And if you do fall over then the consequences of those falls will be less because the muscles act as shock absorbers as well.

So it's not just for an aesthetic effect, it's for a functional effect and a health benefit.

APM: I have got a lot of questions on here. I'm gonna ask one more from the list and then I'll ask you to demonstrate something if you would before we go. Joe Livingston has asked for your comments please on the strength benefits of well taught yoga. Is that something you have any expertise in at all?

Claire Minshull: It's not, it's not. So, if I'm being really picky, you probably unlock ... The benefits of yoga are probably not muscle strength, if you're being really really picky about what that definition is. So strength is measured as the amount of muscle force that can be produced in a single contraction. That said, yoga does generate adaptations in muscle functions, it improves muscle function, and particularly at long ranges.

So what you will be doing in yoga positions is you're increasing range of motion, but importantly you're using the musculature at that extended range, such that it's conditioned at that extended range. And that's important for health too. So if you think about doing just a normal flexibility, passive flexibility program, to try and increase joint range of motion, that's fine. But we need to have control at those end ranges, which is where a lot of injuries can occur.

APM: So the health benefit is that we avoid those injuries at the end of range.

Claire Minshull: You've got more muscle function at the end ranges, definitely. And a greater flexibility.

APM: Couple of quick observations. Jason has said, "Do you think the eccentric has better results of concentric?" And I think you said earlier on that you do favor eccentric exercises.

Claire Minshull: Yes it does, but it has to be done in the correct way. So if you're comparing concentric, isometric, and eccentric, you're training to failure at five repetitions maximum, and it has to be like for like. So concentric, that up phase, five repetitions maximum. Isometric, five repetitions maximum, although that'll be fairly self limiting. But eccentric, so [inaudible 00:26:51] five repetitions maximum of your eccentric capabilities, not your concentric. And when you do that, yes there's been sufficient meta analysis that have shown an enhanced strength adaptation by eccentric retraining to failure versus concentric.

APM: Right, the observations are that a recent paper by Harvard Health suggests that that strength training nudges the bone forming cells into action, helping to build strong bones, which is great for osteopenia and osteoporosis. And interestingly, says someone who claims that he or she is not in Spain, disappointingly, the effects of treating one side and getting results on the other have been used in traditional Chinese medicine and acupuncture for years, so it's nice to see it becoming mainstream.

Now the question I had for you is on a blog, which is now not open to the public, some time ago you said the one exercise you wouldn't do from your clinic is the dead lift. Is that still true? Is the dead lift still a particularly valuable exercise and if so can you demonstrate?

Claire Minshull: Yeah it's a really good exercise. If somebody can do it properly and there's no contraindications then it involves all lower extremities, and the core, and actually kind of upper body as well. So it's a great great exercise to do.

APM: Right, you're gonna talk me through it. You're not gonna do it because you know how to do it.

All we've got is a wriggly bar with a couple of light weights on it. So I'll be able to cope with this.

Claire Minshull: And it's quite low as well, so you're at a disadvantage there, let's move that out the way here, because we don't want-

APM: We'll be all right, put this over here. Is that the right angle for the cameras? Somebody tell me. Yeah we're okay with that are we?

Claire Minshull: Okay so what you need to do is stand really close to the bar. That's it.

APM: Is a wriggly bar okay or should it be straight?

Claire Minshull: It should be straight, should be straight, because what probably will happen is that will rotate and then you might have issues, but let's hope you don't. I'll point this down a little bit. You're probably best off grabbing it here so it doesn't do that.

So then what you want to do is squat down with almost a straight back as much as you can, looking forward, and the chest out. And then, from there, concentrate on driving through your heels, keeping your shoulders back and chest up. Stand up in a triple extension of your knees, hips, and ankles. And then back down, don't need to go all the way to the floor, and then back up.

APM: So is my form okay?

Claire Minshull: Yeah, it looks good. Maybe pull your shoulders back a little bit.

APM: Ooh god, now it's taking me back to my military days. With your shoulders back, [inaudible 00:29:22]

Claire Minshull: Try again, and drive through. That's good, really good. Straight arms, so we're not ... it's obviously too light for you.

APM: Right so five of those should be ... I was told actually you need to start with a relatively lightweight because it's easy to get that one wrong.

Claire Minshull: That's where we're talking about with correct form. So although it looks easy it's actually quite a technical thing to do, so you do need to get the form right before you then really load up, because like you said, if you're doing that with poor form then ... If you're kind of ... Yeah.

APM: Claire, you're a busy lady, you've got all these research students that you're supervising I believe, is that right? You've got all these courses that you're running. Presumably you're doing your own training as well. But really pleased that you came in to see us today, and sorry we only got through one of your slides. We didn't even get Ruth to demonstrate a correct press-up. I think you've given people a lot of food for thought and actually some material to put into their clinical prescriptions for patients, and at least some knowledge as to who to seek out to get more expert advice on training. So thank you very much for that.

Disappointed that you didn't get Ruth on the plyo box there, because we got that in specially so that you could get her jumping up and down on that.

Claire Minshull: Yes we didn't get to talk about power so much did we?

APM: No we didn't but we're prepared for it, we can do it again sometime.

Claire Minshull: I'll come back.

APM: Thank you so much for coming. Yeah well it's been a great treat having you in here, and I'm sure everybody's very grateful for that.