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Dr Chris Croly [00:00:12] Hello, ladies and gentlemen, and thanks very much for joining us for the latest Café Connect, which is a podcast brought to you by the Public Engagement with Research Unit at the University of Aberdeen. So, I'm Chris Croly. I work in public engagement with research at the University and this podcast series exists to really connect people with the latest thoughts, ideas and research that's going on at the University. Today I'm delighted to be joined by my colleague Derek Ball, who is the head of Sports Science based in the School of Medicine, Medical Sciences and Nutrition at the University. So, hello, Derek.

Dr Derek Ball [00:00:46] Hello, Chris. How are you?

Dr Chris Croly [00:00:46] I’m well. Yourself?

Dr Derek Ball [00:00:50] I'm doing well. I'm trying to do the things that you would expect a sports scientist to do, which is try and keep active, keep fit. But it's juggling all those things, Chris, as you know.

Dr Chris Croly [00:01:00] Yes, indeed.

Dr Derek Ball [00:01:01] Fitting it all in, yes.

Dr Chris Croly [00:01:02] Derek, in my head, the next question I was going to ask you was if you’re keeping active. But yes, you clearly are and that's good. And that obviously leads to what we're going to talk about today and that is your work and your research on the physiological effects of exercise and activity. And look at that within the general context of the pandemic. And I will put my hands up and see I have put on weight over the pandemic. There's absolutely no question about that. I'm annoyed about it myself. But, you know, there we are, I probably am not alone in this, actually, but I guess the pandemic affected everybody. And certainly for us, the first wave of the pandemic affected as well, we were told to stay at home, so we just weren't moving about as much as we were. And then the UK government, they made recommendations, didn't they, about the levels of activity right at the start, Derek, is that right?

Dr Derek Ball [00:02:03] They did. So, during that initial lockdown what they said was that people could go outside for around about half an hour. It doesn't sound much. I suppose the question there is what you're doing in that half an hour and does that meet what the government guidelines and the W.H.O guidelines about daily physical activity? Now those guidelines stated that you should do 150 minutes per week. Prior to the total number, the recommendation was 30 minutes of exercise 5 days a week, and it was up to really how you would try and fit that in. I think what they recognised was that sometimes people don't have 30 minutes a day to do any exercise and so therefore what would happen if people did an hour on a Saturday and an hour on a Sunday, so would have done 120 minutes. Could they then fit in 30 minutes during the week? So I think the idea of 30 minutes a day fitted their original recommendation. I think the other thing was that they recognise that people staying indoors 24 hours a day would be really restrictive. And I don't know if you remember right back at the start of April, we went into lockdown and I quite clearly remember we live just north of Aberdeen and we used to go as a family, the four of us, and walk around the village. There's a golf course here as well and go out on the golf course. And it was eerily quiet and it took around about, I would say took about three or four weeks before we noticed that when you went out for these walks, that there were more people out. I think the initial lockdown, people decided they were completely locked down. And that personal experience really fits with some of the findings that are now being published about what was the consequence on physical activity in the general population. And there's been some really nice work just coming out across a range of different populations, not only from here in the UK but also in the US. There's been work done in China and they all show the same thing, which is that compared to the pre-pandemic levels, physical activity levels dropped off by around about 25%. Now 25%. The problem that we have is that 25% isn't equal amongst the population. So when you look at the data, what it shows is the people that are older, determining on the socioeconomic scale, at the lower end of the socioeconomic scale, the chances of you doing any physical activity was reduced so that that 20% was actually for some people that did more physical activity during the pandemic. And some people it was way, way higher than a 20% reduction, it was upwards of 45% reduction. So, that is really alarming for the people that are at the far end. Because as we're coming out of the pandemic, one of the things that we're now interested in is if people have been inactive during the lockdown, have they now gone back to their pre-pandemic levels of activity or are they still remaining lower than they were originally? And the worry there is that if we look at children, what we know is that and these go up to about 15 years of age, only about 45% of children reach the recommended exercise levels that the government sets, which is based on W.H.O. So one then says, well, what's the consequence of that reduction in physical activity? And there's been some really nice work done, published around about the mid-2000s which showed that if you compare children of around about when they were studied in 2000 and compared them with children from the early 1960s, there's a reduction in their overall aerobic capacity, you might think of that as fitness, of around about 0.4% per year. Well, what does that mean? Well, what that means is that children now, on average, are about 20% less fit than the population in the 1960s. And then wonder, why is that? There's a whole range of reasons for it, depending on where you live. You may not be able to get to school on foot, whereas back in the 60s children used to walk to school. The other thing is that we know that there's a restriction on the timetable in a lot of school curricula to have a time specifically for physical education and that’s the knock on effect there. Also, there's been a change in the school timetable, where they get less time at lunch time, which is one of the periods in the day that they would actually go outside and play and increase their physical activity. So the story is if we look back to the 1960s, 1970s, we've got this slow decline in what you might call population fitness. That's something that we need to address. That's been exacerbated by the pandemic. So I think over the next 2 or 3 years, there'll be an awful lot of interest in what's happening to physical activity levels when we look at the population, have they come back to what we knew pre-pandemic and if they're not coming back, what are the things that we should do to mitigate that effect?

Dr Chris Croly [00:08:47] Yes. I mean, there's so much in what you've just said. Yes, you're right, one size does not fit all. I recall right from the start of the pandemic stories of people in Italy, of course, which had been under lockdown before us or more intensely certainly as well, you know, people running marathons and very small balconies back and forth. So obviously there are examples of people who take it in various different directions. But is there a difference in physical activity and exercise as physical activity includes everything that you move about during the day and exercise is what when you raise your heart rate and sweat? Is there a distinction there?

Dr Derek Ball [00:09:33] Well, if you look at some of the epidemiology studies, they do try and divide off physical activity as opposed to what goes on at work. So some of the studies have looked at typically an eight hour day and they've identified people that are inactive, which is that they spend most of the time sitting at a desk. Then they've got people that do heavy exercise, so that may well be things like manual labour, so builders, for example, people that work in warehouses, people that spend most of the day on the feet. So if I think about the NHS and you look at nursing staff and you look at doctors, they will spend somewhere in the region for 8 to 10 hours on the feet. Very rarely do they get a chance to sit down. So they would be categorised as vigorous activity and then in-between you've got people that are kind of in-between. And then outside of that, you've got recreational activity. Now, that recreational activity is more what you might associate with exercise, prescribed exercise, so going to the gym, going on a bike, going for a run. But included in there are also activities such as gardening because the gardening is very similar to what you might find in terms of doing manual labour. I think trying to encompass the leisure time activity is quite important as opposed to what you're doing at work. I certainly noticed that during lockdown when I was working from home, just my normal activity was much less than if I was in the office. Because in the office, if I wanted to go and see somebody more than often, I would have to go to a flight of stairs, walk down a corridor. Well, sitting here at home, I would just click on the Internet and call somebody over the Internet. So, what I'm trying to say is that we have got studies that have looked at trying to differentiate between activity related to work and activity in a recreational setting. What I would say is that if you look at some of the data, again, in general, when people went into lockdown, that increase in sitting activity went up substantially by around about 25 minutes a day. And when you look at physical activity/exercise, that went down by about 8 minutes per day. So if you total that over an entire week, then we're talking about 1 to 2 hours additional sitting time and around about 40 to 45 minutes reduced physical activity. So quite substantial changes in behaviour.

Dr Chris Croly [00:12:49] Yeah. And certainly, I definitely take your point about gardening, there's maybe a perception that it's weeding or planting things but yes, I've laid paths or built a greenhouse. There's always some element of quite hard work to be done in the garden.

Dr Derek Ball [00:13:05] Yes, there is.

Dr Chris Croly[00:13:08]And you also get that satisfaction that goes with there is something that I have done and that's maybe not something that was intended to be touched on. But, is there an interconnected nature of our bodies, you know, if you're physically active and happy and satisfied, the impact that has on your mental state as well. Often you hear, nowadays and particularly in gardeners’ world, but it's almost a regular talk about gardening as a form of therapy for people actually.

Dr Derek Ball [00:13:40] Yes. I was actually interested to read in two separate studies that not only was there a decrease in physical activity, but there are also individuals that recorded a greater decline in physical activity actually recorded a higher rate of anxiety. And so that relationship between the physical and mental aspects is something that certainly we're picking up on. I’m not a health psychologist or sports psychologist, but it is being reported quite often now that relationship between physical activity and the impact it has on certain aspects of mental health.

Dr Chris Croly [00:14:23] Yes, I think we all know, you sort of feel it in yourself, don’t you. It’s one of those things we don’t need someone to tell you. But we need someone to look at the dimensions. So that was the pandemic and you're right, it was two years ago, right at the start of it, we didn't know what was happening, it was lockdown. But now here we are two years later, I don't know if we can see that we're post-pandemic, because if the last two years has taught us anything is we never know what's around the corner. But what has changed now when society is opening back up?

Dr Derek Ball [00:14:59] Well, I think as we move forward, the driver will be to try and get people to engage in more physical activity. I think the other thing that's interesting is for those individuals that have the option to combine work with staying at home as well as going into the office, it be really interesting to understand those individuals that now work from home and so therefore don't have a commute time, what do they do with that spare time? I think we'll find some individuals actually do more physical activity than they did before because they've got more time during the day. The other thing that I've not really touched on, but it is something that I talk to our students about in terms of physical activity is a lifestyle. A lot of the time we think that physical activity really is only pertinent to children at school and as they go off from school, they might go to university, they might play sport, and then once have left university, they generally find that there's a decrease in physical activity and that may well be related to things like the responsibility of work, bringing up a family, and then when we get to about the 50s, we see that in some people there's an increase in physical activity, presumably because some of those responsibilities go down.

Dr Derek Ball [00:16:28] I think the message to our students is that physical activity is something that we should adopt and maintain throughout our entire lifestyle. And why is that? Well, one of the things that we know is that there's a gradual decline in somebody’s this fitness. There's nothing you can do to offset it. So when you are aged 20, you can go out, you can run for a bus, you can you can jog around a 10K, you can make it. By the time you get to around about 70, that 10K you might be able to walk if you get physically active. If you get really physically active, you may well be in a in a condition to actually run it. But there are some benefits to maintaining physical activity as we go through our entire lifespan. And some of those things are related to things like offsetting the onset of diabetes, so get better blood glucose control. The other thing that we know is that if you do exercise, you get a better maintenance of bone density, physical activity we think will actually aid people in terms of balance. Because one of the things that is a problem when we get to sort of 70 and beyond is that the increased number of falls that individual have goes up and a fall sometimes can result in a broken bone. Inevitably, it seems to be in the elderly more related to hip fractures. And so therefore, if you've got an increase in bone density, maybe those hip fractures won't happen as often. The other thing that we know is that you did have a an accident in which you broke a bone, the fitter you are the quicker you recover from any surgery you have to have. So I think if we are looking forwards, that message that we should have is that we should be trying to maintain that active lifestyle from when we were at school right through to old age. And by old age, I'm talking about people that are in their 80s. We should is still encouraging those individuals to remain active because in those instances, they certainly maintain their independence. So that's my message to the students, we're trying to get this idea of physical activity and exercise as an adoption of the lifestyle rather than something that you do when you're young and then you forget about it.

Dr Chris Croly [00:19:20] And then take it back up when you become middle aged. I suppose it's the joke about the Mamil - the middle-aged man in Lycra, you know, on bikes. But yes, it's a healthy habit, is an appropriate habit to adopt and keep through your lifestyle and that's the gold standard, effectively. That's what you're getting people to do. So you mentioned bone density and that occurred to me, just as you mentioned, I could be wrong here did I read somewhere that that's more associated with walking and running? Effectively, maybe a bike wouldn't give you that bone density in the same way that running would.

Dr Derek Ball [00:20:03] It depends on which bone you're looking at. So, if you're doing running or walking or you're doing resistance training and you look at the bone density around the hip because there is weight bearing, then as far as I'm aware, the bone density there is probably higher than you see when individual that undertakes cycling or swimming. However, if you look at a different bone structure, so for example, we quite often look at the heel where, yes, you still got some weight bearing activity but the picture's not so clear. So, some of it is to do with the stresses that you put through that joint, because obviously the bones themselves, which are part of the locomotory process, those bonds are the ones that are taking the stress. And as a function of that, the bone will adapt to that stress that you put through it.

Dr Chris Croly [00:21:10] Yeah. Okay, so that's the bone. I mean, I guess the ligaments, the tendons and so on, they are slight different cases as well. I mean, soft tissue is the thing that people tend to injure and that's we have to be careful with, I guess, and exercise.

Dr Derek Ball [00:21:22] It is. The other thing that we know about things like muscle and tendons is that as you get older, the ability to recover from injury is somewhat slowed down. And some of that is to do with the specialised cells that reside in skeletal muscle. So let's say that you were in your early 20s and your friend said, let's go out and do some hell walking and you've not done any hell walking before. So, you go up a munro and then you come back down. Two days later, you can hardly walk. Your quadriceps are really sore. That's called delayed onset muscle soreness and usually it reflects some remodelling in muscle. And if you were to take a biopsy, what you would see is that there is some damage, but it's being repaired. Now, in parts of that repair process. we have these specialised cells, the cold satellite cells, and they produce muscle cells, which then replace the ones that you've damaged. And we have a number of those satellite cells. As we age, though, that number of satellite cells goes down. So obviously, what it means is that the aged muscle has got somewhat of a reduced capacity in terms of regeneration. They're not completely gone, but they're not there in as abundant number. If you look at muscle mass, that goes down as well. And we're trying to understand why does muscle mass go down with age. There are two theories. One is related to that satellite cell number, the other one is related to activity. So, if you think about somebody who's early twenties, they run about and they do all sorts of things. You won't find that in an old population. And part of that problem then because those fibres are not recruited, they become smaller. And then over time, you'll get the slower fibres that replace those fast fibres. So part of it is actually a consequence of not doing activities that recruit those muscles. And that is one of the reasons why if you look at recommendations, now, not only do we recommend that people do some aerobic exercise, whether that's fast walking, whether that's jogging, but we also suggest that individuals should do some form of resistance exercise. And the reason for that is that resistance exercise recruits those muscle fibres that you wouldn't normally. And so, therefore, we've got a better maintenance of that muscle mass because we've recruited these fibres that you wouldn't normally recruit when you just go walking, etc.

Dr Chris Croly [00:24:24] Okay, so crudely put, it's much more than the less you do, the less you can do, it's the less you do, the less you will ever be able to do.

Dr Derek Ball [00:24:31] Yes. There is the old adage, which is if you don't use it, you lose it. You know, sometimes exercise is hard, but if you stick to it, you do get the benefit. That resistance exercise is certainly a message that we're giving out to the more elderly population, that it's not just enough to go out walking. What you need to think about is I'll climb some stairs, I'll go up a steep hill. My mother, bless her, is recovering from a shoulder injury and she was given a set of exercises to do on a shoulder. And she was asking me the other day about, oh, it says that I should increase the resistance and we agreed that what she should do, now that she can do the exercises without any weights is to use things like a tin of baked beans and do the exercises again. So it's nothing complicated. It's essentially, what you're trying to do is increase the load so that the muscle responds and gets stronger.

Dr Chris Croly [00:25:38] Okay. So we know what we should be doing. How do you get people to do it? What's the message? To me, I guess there's a whole bunch of stuff in that question. I mean, how do you get the message and how do you bring people along with you? How do you get people to not go ‘Oh, this is the nanny telling me what I should and shouldn't do’?

Dr Derek Ball [00:25:59] Well, one of the great things I've seen in the last, it's about the last seven years is at a series of schools in and around Stirling University. So, the researchers there wanted to know what would happen if every day we introduced in primary school children that they had to cover one mile a day while they're at school.

Dr Chris Croly[00:26:23] The Daily Mile. Yes, my daughter does that. Yes, right.

Dr Derek Ball [00:26:27] And so what they did was they got three or four schools to engage in this, and they did it for each year. So, that was from P1 through to P7. And during the day they would interrupt class and they'd go out and do one mile a day. The first thing that the teachers reported was that it was an improvement in child behaviour. So where children were messing about and stuff. What they found is that they didn't get that disruptive behaviour. The other thing is that they noticed all the time that the time required to cover the mile went down. My two daughters participated in that. And since they've gone up to high school, although they do get four lessons of PE a week, my eldest daughter did say to me, ‘You know what? I do miss that one mile a day’. Maybe we should be thinking about trying to incorporate that in the school day, even at secondary school. And you could have that right at the start of the day. So, where they've got the registration class covering a mile is going to take less than 15 minutes. So, why are we not thinking about incorporating that in the school day? The whole idea is that you get people used to the habit of doing exercise as part of normal, everyday activities. For the people that are, for example, middle aged. So, people like myself, you’ve either adopted that physical activity since you were quite young, or there’s something happening that you're trying to take up physical activity. It's very difficult to get people that don't adopt that as a lifestyle factor to actually take it up. People join the gym and then two months later they let their membership go and they don't turn up. I think for places like gyms, it's really difficult to keep your membership engaged in that process. And the ones that are successful really do focus on individual members and make them feel part of what's going on. But it's not always the case. I think that is the challenge making things available, making facilities available is also important.

Dr Chris Croly [00:29:02] Yeah, you can get the message, but people also have to have the capacity to do it, the equipment, the structure. It's more than just a message, I think, that’s been incorporated in any line so far and it shows what the benefits are. This isn't the nanny saying, it’s actually about making sure you get the best opportunity for your life for as long as is possible within that live span. Yes, and actually it's an interesting point you make about the secondary schools. Yes. So my daughter's in primary school, so they're still doing the Daily Mile and it’s made sense to reflect that it was missed in secondary school. And actually, if we go back to what we're saying about the impact of a healthy body and a healthy mind, as it were, you know, when you get the stresses and strains of doing your exams in 5th and 6th year, then maybe that Daily Mile is all the more important for a break, for something to take your mind off it, as well as keeping physically active in a different direction. Yes, I really see the benefit of what you're saying there. I guess we've covered a lot of ground. I do like a good dad joke but that one was accidental. Are there any final points that you haven't covered you want to raise?

Dr Derek Ball [00:30:17] No, I think I think we've covered everything that I was hoping to cover. I mean, you could go into an awful lot more depth. But I think we save that for another for another occasion.

Dr Chris Croly [00:30:34] Well, indeed, yes. So, I should have said at the start to all of our listeners out there, we do encourage you, if you have questions for Derek, please get in touch with [peru@abdn.ac.uk](mailto:peru@abdn.ac.uk). So, if there are any questions or any aspects that you would like us to cover in more depth, I would be more than delighted to have Derek back to have another chat. So for the listeners who would like to get in touch, please do and I will happily pass questions on to Derek. But in the meantime, I’d like to say thanks very much for a great, really stimulating chat and hopefully we can do it again soon. So, thanks very much.

Dr Derek Ball [00:31:13] Thank you very much, Chris. Thanks for the invite.

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