DANNY LENNON: Jake, welcome back to the podcast. Good to have you here again.

JAKE LINARDON: Thank you for having me, Danny. It's been over a year now, and it's great to be back to reconnect and talk about some of this stuff, so thank you.

DANNY LENNON: Yeah, I think we're going to maybe have some overlap with our last discussion, but there's plenty of new things to discuss, particularly a few of your papers that you've published over the course of this year. But maybe just for listeners who didn't catch you on the last episode that you are on, can you maybe give some context as to your background, your area of research and some other relevant things that you're currently doing.

JAKE LINARDON: So I'm a research fellow at the university based in Melbourne called Deakin University, and my area of research is on broadly defined eating disorders. But I really focus on psychological treatments for eating disorders, and also I'm moving towards psychological preventative based approaches as well. And in the past year or so, I've really taken a keen interest in how we can capitalize on digital technology to treat and prevent eating disorders, so things like smartphone apps, the internet, computers, and all that kind of stuff. And the reason for that is

we have so many people that are struggling with eating, with body image disorders, but we only have a few – we only have a limited number of available therapists, and we also have – and treatment is very expensive. So in Australia, for example, it can cost upwards of $200 per session, so people just can't afford that. So my work has really been focused on trying to leverage digital technology and come up with a low intensity cost effective way in which we can try to treat and prevent eating disorders. And in doing so, I've created an app that we've trialed and we recently published a couple of months ago now a randomized controlled trial of our app and we found it to be highly effective for people with binge eating type symptomatology. And I'm also in the process now nearly finished conducting a second trial where I've developed another internet-based program. We're looking at that as a preventative based approach.

So luckily, I was recently awarded five e-grants now through the Australian government that allows me to conduct research for the next five years full-time. So I'm really going to drill down on the specific digital intervention components and trying to use machine learning and artificial intelligence based systems to be able to predict with some accuracy who are the types of people that will benefit from digital programs versus who are the types of people that will benefit from more face to face therapy. So we can really – so the point is that we can really reduce the burden placed on the healthcare system, and that's really what I'm focusing on at the moment, keeping me very busy, and I'm loving what I do, and I get to work with amazing people. So I guess that's the real basic background of myself at the moment.

DANNY LENNON: Yeah, I'm not surprised that you describe it as busy given how prolific you are with your publications. It's kind of astounding, and I definitely do want to come back to that initial publication related to some of the machine learning and the app for sure. But maybe just to set the stage for many of the things we're going

to talk about later, I think it's good to get some clarity on some of the terms that you've just mentioned, and maybe others that we'll get to. So maybe making some distinctions and clarifications on overlap between some of the terms. So first, you mentioned eating disorders, and obviously, there's a relation there with just disordered eating patterns, for example. Can you maybe tease out the difference, if there is any, and what those are between those terms and where they should be best used in different contexts?

JAKE LINARDON: Yes, so that's a good question. And it's something that we've been tackling a little bit in the literature because there is a little bit of confusion within the scientific community as well between these two terms. But the key distinction is that there's a very specific set of criteria in order to have an eating disorder. So we have the DSM that provides a set of criteria for each of the main eating disorders, including anorexia nervosa, bulimia nervosa and binge eating disorder. So for example, if we look at bulimia nervosa, in order to receive a diagnosis of bulimia nervosa, the person has to engage in at least, on average, one episode of binge eating, in addition to one episode of inappropriate compensator behavior, so things like self-induced vomiting over a week for the past three months. In addition to that, they must also exhibit what we call an overvaluation of weight and shape or undue influence of someone's body image on their scheme of self-worth. So there's very specific criteria someone needs to meet in order to get a diagnosis of a clinically significant eating disorder. Disordered eating, on the other hand, is much more prevalent, and there are many people in society that exhibit tendencies of disordered eating, but they don't meet that specific criteria for an eating disorder.

So, for example, they may engage in episodes of binge eating, but they don't quite meet that threshold of once a week on average for the past three months. They may binge eat once every three weeks or once every four weeks. That is

what we would call more disordered eating. So they engage in patterns of disordered eating and other things as well that are not necessarily reflected in the diagnostic criteria. So things like people, for example, would take appetite suppressants or they would smoke as a mean to control their weight. We would classify that under the more disordered eating category, because it doesn't necessarily reflect behaviors that are present in the DSM. So to kind of sum up the answer to the question is, an eating disorder is something that has very specific criteria that is also linked with functional impairment. So it's really taking a toll on the person's social well-being, emotional well-being and psychological well-being, even physical health. Whereas disordered eating, on the other hand, is much more prevalent in society, it reflects a pattern of dysfunctional behaviors and thoughts around food and dieting and eating, but it doesn't necessarily translate to an eating disorder. And there are also a whole host of different psychological and behavioral characteristics of disordered eating that don't fall under the strict criteria of eating disorders. But interestingly, people who exhibit patterns of disordered eating that don't make that clinical threshold, they've actually been shown in some studies to exhibit comparable levels of functional distress, psychological impairment, and quality of life reductions to people with a clinically significant eating disorder. There's a misconception that people who don't quite meet that criteria, that specific criteria, are not as sick, for use of a better term. We've actually debunk that a little bit because we have shown similar levels of impairment across people that, let's call them, let's say that they exhibit those subthreshold variants versus someone who exhibits a strict diagnostic criteria. So I think that's the key defining features between the two terminologies, but it's very fuzzy. But there's still much more to be done, and there's still much more to know about this, but that's kind of what we've got at the moment, I think.

DANNY LENNON: Brilliant, yeah, thank you for that clarification. And one aspect you mentioned was related to patterns of disordered eating that people can exhibit. And I think it was from one of your articles that I read before, you distinguish between that we can have these behavioral patterns of disordered eating and also psychological patterns of disordered eating. And depending on which one we're talking about, and how they manifest, one is obviously more easily identified as a red flag. Can you maybe just talk through that distinction for people?

JAKE LINARDON: So, as I said, the easiest way to spot the difference between a psychological and behavioral pattern is we can actually observe behaviors. So we can pinpoint if someone's doing something. We could say, that's a disorder, if they take, for example, if they're taking excessive use of diet pills or they're going to the bathroom every time they eat, they throw up their food. That's very easily identifiable. We can spot that, which is a little bit different to the psychological characteristics. The psychological characteristics of disorder, they are incredibly complex, and the problem is the psychological characteristics are constructs. So if we go back to Psychology 101, constructs are things that we actually can't observe or we can't see. We've just given them a name to describe some phenomena that's happening in the world. So when we're talking about psychological constructs, we can talk about obsessions with food, so the amount of time someone would spend thinking about their next meal or what they ate or ruminating that they feel guilty about eating, for example, white rice instead of brown rice or something. So these patterns of thoughts or attitudes or, let's call them, emotions are very difficult to get out of a client if we're trying to treat them because, a couple of reasons, one, the therapist or the health professional can't see them, and it's very hard to spot; and two, people are generally very poor at being able to determine whether or not these thoughts are contributing negatively to their quality of life or their functional impairment.

So people generally, whereas people recognize clearly that self-induced vomiting is a bad thing. I think most people will realize, yes, I'm doing it, because it's serving me some sort of purpose, it's flushing out some calories that I've consumed because I feel guilty. People objectively, I would argue, that they recognize that that's a problem. But as someone who is thinking about food constantly throughout the day, a lot of the time, they think that's just the norm, and that's how people generally kind of operate. So they have a very hard time distinguishing between whether their psychological profile is actually disordered or whether it's actually normal, and that's a very hard thing to reconcile because as therapists or as clinicians, we're trying to get that out of them. And a lot of the time because they don't even recognize that their obsessions, their preoccupations, their dissatisfactions are negatively impacting or contributing to those behaviors, it's very difficult to treat. So there are numerous different types of psychological characteristics that we typically see, and just to run through the most common examples we see is the obsessions with food. So people would spend an enormous amount of time thinking about eating, planning what they're going to eat next, worrying about the type of calorie content or the macronutrient split in certain foods. We also have perception, distorted perceptions with body image, which is quite a little bit different to disordered eating per se, but they're highly interconnected with each other. And there are numerous other things, so these regimented diet rules people set in place. So they're more thoughts rather than behaviors. The fact that – so that's a common misconception as well is that dietary restraint is actually a cognitive process, it's not a behavioral process. Restriction is the behavior. Restraint is the cognition. So there are basically a whole – it's a nuanced discussion about the differences between psychology and behavior, but they're highly interconnected. And what we usually see is that there's a bidirectional link is that the psychology influences the behavior, the behavior then

influences the psychology. So what we try to do is we try to break that cycle a little bit.

DANNY LENNON: So given that the complexity that's at play when we have various psychological factors, and the fact that you've already said that in disordered eating we're not looking at set criteria per se, and there's a lot more of a kind of gray area that we're looking at here, that layered on top of this complexity, when it comes to psychology, would it therefore be fair to assume that, with disordered eating, it's not necessarily objective in the fact that someone could have a certain behavior around food in two different people, but that may have a different negative effect or a neutral effect on someone else, so it becomes more subjective, is that accurate or am I getting it wrong?

JAKE LINARDON: Yes, that's a 100% accurate. So what I like to kind of say is what's abnormal or disordered for one person may not necessarily be abnormal and disordered for another person. So, that is completely true in the sense that it is very subjective to the point that, as I just mentioned, someone may exhibit certain patterns that may be really taking a toll on their functional or on their on their ability to function as a person, whereas the same person may be exhibiting the same patterns, but then their quality of life or their psychological functioning or physical functioning is not affected at all. So what we usually say is the key determinant of whether something is disordered or not is whether it's having a negative impact on any aspect of your life, so whether that be your physical health, whether that be your emotions or your emotional health, whether that be your social situations or social sphere. So I will break this down into a very simple example. So a lot of the time people say that the behavior of tracking your calories through, let's say, My Fitness Pal, is disordered. So I think that's an inaccurate statement to say, because, yes, it's the sorted for some people, but it's not the sorted for another person.

So we've actually conducted some research on calorie tracking and disordered eating, and we've found that a portion of people, so I think it was around 35% of people who reported tracking their calories, felt like the calorie tracking was contributing to their disordered eating tendencies, it was contributing to binge eating, it was contributing to obsessions with food and stuff like that, where 70% of the sample stated that it had no influence, that they felt like it wasn't impacting them at all. So in that sense, someone who is tracking their calories and who feels like they're obsessively thinking about, right, I got to love my food, I got to do it as soon as I eat, I got to plan, it's just, it's taking a toll on their psyche, their emotional well-being. We would then suggest that that person, that calorie tracking for them may be disordered, it may be manifesting as some type of disordered eating behavior; whereas someone else who is very flexible in their approach and tracking, they may go the weekday by tracking their calories or their foods, and on the weekend they might be quite relaxed, they put the calorie tracker away and they just kind of allow themselves to enjoy their weekend and their social sphere with their friends, but they get back on track on Monday.

In that very broad example, it may be that that person that I just described, calorie tracking is not having any influence on their mental health or their social or emotional health. So for that person, calorie tracking may not be a disordered behavior that they should be trying to address. But for the first person I described, yes, it probably is something that we need to address, because it's contributing to the maintenance of these really negative thoughts, feelings and behaviors that the person is exhibiting. So ultimately, what we have is a situation where it really comes down to the person's perceptions of the behavior and whether or not it's disordered or not. If they can accurately determine that, then what they're doing is not having any negative impact, then what we would suggest is that, well, it's not really a problem that's worth tackling at this point in time, because there are

probably many other things that we should be focusing on instead. But the caveat to that is, people are not very good at all of being able to determine whether or not a behavior that they're doing is negatively impacting them. So someone who thinks, someone who's tracking their calories may regularly skip social situations, they may not go out for dinner in fear of not knowing what's in the food because they can't log it accurately in My Fitness Pal. Whereas to them, they may think, you know what, that's pretty okay for me, I'm happy to do that. What we're actually finding is that's having a negative impact on their social functioning, and we know social health is just as important to our well-being as psychological health as physical health. So, in that sense, people are not very good at being able to predict with accuracy whether or not their behavior is taking a toll on them, and that's part of the health professional's role is to try to uncover cover that and to try to help the person understand that so with that we can correctly identify which aspects of their behavior is contributing negatively to which aspects of their behavior is not having so much of an effect. And then we can tailor our intervention approach accordingly there.

DANNY LENNON: So just on that topic of calorie tracking and this association potentially with eating disorders, I think it was probably your paper last year, it was maybe the first one I'd read specifically on that, and maybe you can advise on how much else there is in this particular area, but I can't imagine it being a huge amount in spite of the fact that this is a topic I think most people would already have some conclusions in their mind about, and it was kind of similar to what you lead off with that. Yeah, I can see how some people it may be a problem, some people may not, and different people have different opinions, I'm sure there's people out there that will say, anyone who does this is asking for trouble, and there's other people that say no. But I think most people would admit that there's probably some people it's more maladaptive for than others. But to a large extent, we have been

making that based on our own maybe bias or kind of an intuition that this is true or maybe anecdotal experience from seeing that. And so, what is the kind of current state of the evidence beyond your paper? What do we actually know about this topic right now?

JAKE LINARDON: So the current state of the evidence is quite weak, and the paper that we published in 2019, it was a cross sectional study. So cross sectional, just for listeners who may not be aware, it's measured everything at one point in time, so it's impossible to draw conclusions about the direction of the relationship. So while we found that there was associations between calorie tracking use and eating disorder symptoms, such that the people who track their calories exhibited markedly more severe eating disorder symptoms than those who didn't track their calories, we have – the design of that study does not determine whether or not it was the calorie tracking that influenced the disordered eating or it was the disordered eating that was present to begin with, then influence someone to go and track calories. Both explanations, I feel, are equally plausible. Unfortunately, we have not yet done any – there's been no prospective studies or longitudinal studies that have, or experimental study that I'm aware of, that has tracked calorie tracking and subsequent onset of disordered eating over time.

So to broadly answer your question, the evidence on calorie tracking and disordered eating is quite weak. I know that's contrary to a lot of people's firm conclusions that they make when they talk on Facebook, Instagram, or Twitter about the dangers of calorie tracking, or safely say that we're not sure just yet. It's, like you said, it's very likely that for some people, it's problematic, and for other people, it's not problematic. Unfortunately, as of yet, we haven't been able to pinpoint moderators of the relationship between calorie tracking and eating disorder symptoms such that moderators that are essentially variables or characteristics that would change the relationship between calorie

tracking and eating disorders, such that for someone who exhibits one certain characteristic, it may be that there's no relationship between the two variables. So let's just give an example. Someone who maybe has really high self-efficacy, they've got real good confidence in their ability to maybe resist, choose or the confidence in their ability to not binge-eat, I don't know, or something like that. So maybe that's a characteristic that changes that relationship such that there's no, calorie tracking does not influence disordered eating for people who have really high confidence in their ability to push back against certain things. But whereas that relationship between calorie tracking and eating disorder usually is really amplified or exaggerated in people with real low confidence.

So we haven't yet been able to identify or even study moderating variables, and that's really important. Looking at moderators is crucial, because it gives us more detailed insights towards the types of people who may be susceptible to engage in disordered eating, potentially, as a result of calorie tracking. But, like I said, that's a crucial limitation in the literature, so we need to spend more time studying moderating variables of that relationship, and obviously, we need to devote some time towards conducting experiments on calorie tracking. So randomizing people, for example, to a calorie tracking group and randomizing them to like an attention control where they get maybe just like a mindfulness app or something like that. And if we are able to observe group differences in the sense that people who engage in My Fitness Pal showed elevated levels of disordered eating relative to the control group, then we'd be able to assert causality, we'd be able to say that the calorie tracking app is causing the eating disorder symptoms because of that randomization and experimental manipulation process. But unfortunately, we haven't done that yet, which is a really crucial limitation in my view, because

it's such a pertinent topic and maybe it's something to do in the next couple of years.

So to broadly sum up the answer, anyone that is conclusive in the sense that they say that if you calorie check, you're doomed for good, that's incorrect, it's not right. And anyone who says that there's no harm at all in calorie tracking, that's also not correct. The more, let's take a middle ground and say that, you know what, we have documented statistical associations between the two variables. We don't know yet the temporal nature of those relationships. But in my view, it has the potential to lead to these particular types of patterns. And people have even recalled, people have even stated that they felt that it has. So I think we're at a crossroads in the sense that we need to conduct more rigorous research on this topic. But the way we can sum up is saying that, yes, it's got the potential to, but we need to find out much more to do. So until we find that out, I don't think any strong conclusions could be made about the use of calorie tracking.

DANNY LENNON: Within those conclusions, and I think it's clear to most people that, at least for some people, it's certainly contraindicated, and there are definitely potential harms that come with that type of strategy, so in a position now, where we are, where we don't have solid evidence either way, in lieu of that, practitioners still need to make decisions, whether that's a personal trainer and someone comes to them, it's a nutritionist, or whether it's someone then that gets referred to a psychologist or behavioral therapist, for example. So four of those practitioners are left with some difficult questions, number one, one thing you alluded to is the fact that how do we flag who this is potentially problematic for or not. And I'm sure there are people that might have some sort of screening where, if someone comes to them for nutrition coaching, but they have a history of disordered eating or an eating disorder, they may decide that means I need to refer out and I'm not got to take them on. But in some cases

where people are working with them, deciding what interventions can be used can be a tricky business for dieticians or otherwise. So given that we don't have a consensus in this area, is there anything you think is probably best practice for practitioners to consider in terms of screening people to try and at least increase the probability that we don't use an intervention that may be problematic?

JAKE LINARDON: That's a good and tricky question at the same time. So what we can do is we can borrow from what we already know from related fields of research or related studies and apply this to the calorie tracking. So calorie tracking is essentially, it's a dieting behavior, isn't it? So it's a way for people to regulate or monitor how much food they're eating with the goal of modifying or regulating their body weight. And we know that dieting is a risk factor for eating disorders or binge eating or whatever, but we also know that many people who go on diets also don't necessarily develop them as well. So what we need to do is we need to be able to identify ways in which we could potentially mitigate the effects of weight loss diet on mental health. And there are a couple of strategies or intervention elements that we could implement in order to reduce the potential harms of calorie tracking on eating disorders. And let's be honest here, it's not feasible to stop dieting. I know as many non-diet practitioners want to, diets are here to stay, and rather than potentially fighting this off and investing so much energy towards fighting off diets, people are going to diet regardless. So instead, why don't we shift the focus towards trying to do it in a more healthy way that minimizes the effects of weight loss, because someone may come to you and be adamant that they want to diet and you may be an excellent practitioner and be like, you screened them and you found that they may exhibit some dysfunctional thoughts about their appearance or whatnot, and you say that you're not the appropriate client for me, I'm going to refer you out. Well, the chances are that that person will

go to the next PT or the next coach or someone, and then they will take them on as well.

So why don't we, like, why don't we try to shift the emphasis towards safer practices and try to, and then go from there. So if you are a nutritionist or a health professional that is working with someone who is adamant that they want to stop calorie tracking, there are a couple of things that we can do, that may minimize the effects, and one is you want to be as flexible in your approach as possible. So as soon as you started developing really stringent rules that dictate kind of what you eat, when you eat, and how much you eat to the precise detail, then you're setting yourself up for failure. We know that the types of diets that are most strongly linked to eating disorders are those that are strict and those that are extreme. So we want to minimize that effect. And there's some evidence showing that flexible dieting is actually associated with reduced disordered eating patterns, once we control for rigid dieting. So once we completely isolate flexible dieting and look at what that is, that is actually being shown to predict lower levels of these mental health problems. So if the person can take as flexible of approach as possible, that is really important to minimize the potential downfalls of dieting or calorie tracking behavior. And what that means is, I'm not entirely sure because it will totally depend on a case by case basis. So flexible dieting is a very broad term, and so one component of flexible dieting is allowing yourself to eat a variety of different foods while still paying attention to your figure or your weight or your shape.

So you're not completely excluding different food types or food groups that you kind of enjoy, but it allows that inclusion as well as some level of restraint. So being able to take that flexible approach is very important to potentially minimizing any detrimental effects of calorie tracking your diet. And the second approach is having a short time span with which you practice this calorie tracking. So a lot of the

times people who struggle with diets or they fall into the diet binge eating cycle is that they go on a diet indefinitely. So they set this really unrealistic goal of losing, let's say, 15 kilos, and they're only, let's say, they're man who's 90 kilos, and they're like, I want to get down to 75. Well, that might take a long time to lose 15 kilos. So they're going on this weight loss diet indefinitely. And it's just going – there's no end game in sight other than that really far away weight loss goal. And those types of people are the ones who fall into the trap, because there's no end game in sight. So these people generally start developing more obsessions, more preoccupations with different food types, and then that would translate towards more disordered eating patterns over time. So if you're someone who is dealing with a client who is adamant that they want to track their food, and they want to go on a diet, you want to send – you want to give them small periods with which they practice these behaviors. So periods of eight weeks, for example, and just say, right, we're only going to be doing this for eight weeks, and then the point of that is that there is an end game in sight. So they know after that eight weeks, things will, let's say, quote unquote, get back to normal a little bit, but it just provides that temporary sanity for someone to then not fall into that trap of harmful and disordered practices.

So just to summarize the answer, although it would be great to shift the focus away from weight loss diets for someone who may not necessarily need it, and does not need to practice counting their calories, sometimes that’s not possible, because people are determined to do what they want to do, and they will go on a diet if they want to go on a diet. We can educate as much as possible. If this person is there, then there are some safer alternatives you could do, and the safe alternative is, one, be as flexible and push them to be as flexible in their approach as possible. So not going crazy if they go over 100 calories a day for one day, because it's not the end of the world, it doesn't

mean much at all. And second is having a short timeframe with which they practice these behaviors. And I think those two things are important and critical elements for someone to minimize significantly the effects, the possible effects of calorie tracking on disordered eating.

DANNY LENNON: I think that's incredibly insightful, and I just want to highlight that again, because one of the points you made is so crucial in relation to flexible dietary restraint, because I think so often people have a misconception about what flexible dieting is, maybe they kind of link that with, “Oh flexible dieting is you can eat all this variety of different types of foods, there's no good or bad foods as long as you fit it into these certain calories and macronutrients,” right? And there's this kind of bastardized version of what it is, whereas, as we discussed actually on the last episode, looking at flexible dietary restraint versus rigid restraint, and you mentioned it earlier actually, that the restraint part is a cognitive thing, it's how someone is viewing things in the totality, it's not a diet strategy per se, it's a view of that diet. And so, given that, if someone is tracking their calories, that doesn't actually tell us whether or not they're doing so with a flexible restraint in mind or a rigid one. They could be the person who tracks their calories or macros, but just doesn't really worry too much if they're a bit off in a certain day or they don't track in a certain day, in a kind of flexible view of that, or they could be the person that has to hit every macronutrient to the gram in this obsessive manner and freaks out otherwise they're both tracking, but they're doing so in very different models of restraint. So I think that's very insightful that you bring that up, and I just wanted to emphasize that.

JAKE LINARDON: Yeah, absolutely. And the problem with flexible and rigid restraint is that they're highly connected to each other, so a lot of the times the people who report that they're practicing a flexible restraint are actually reporting a rigid type of restraint as well. And so flexible, whereas a lot of that, if it fits your macros, that's

something that always comes to my mind, a lot of the time people go, I'm allowed to eat whatever I want as long as I fall within that 2500-calorie mark. And so, if they go over that 2500-calorie mark, then all hell breaks loose. And even though they've allowed themselves all these different types of fatty, sugary, salty foods, as soon as they break one of those rules that they have, then that is chaos, that turns chaos to them, and all hell breaks loose.

So you're correct in the sense that flexibility is a psychological process. It's a psychological mindset, and the key is to not dwell on things that are happening. So if something happens that is unexpected, if you're on a diet or you're modifying your food intake, and flexibility is being able to embrace that and then move forward, that is still consistent with your goals. And that's a key psychological process, that's called psychological flexibility. For people who are inflexible, they counter this negative experience of just say, breaking their food rule, and then that's when all hell breaks loose. So you're correct in the sense that flexibility is a complete mindset thing, it's not a behavior. And if you're working towards flexibility, you got to work on your psyche and your psychological functioning more so than your behavior.

DANNY LENNON: And for people listening, I'll link up to some of Jake's papers related to this as well as the previous episode we did where we get into flexible and rigid dietary restraint in some detail. But I did want to pull back to one other thing you mentioned earlier, Jake, and related to disordered eating and body image and noting that there is a connection, but they are indeed, separate. Can you maybe talk about some of the overlap, but also then the distinction because oftentimes people view that they're always going along hand in hand as opposed to any disconnect?

JAKE LINARDON: So a lot of the time, a lot of the people I feel use the two terms interchangeably. So when they describe disordered eating, what they're actually

talking about is body image concerns or body image disturbances. And I like to conceptualize these two things quite separately and quite differently for a couple of reasons. But first, I'll just quickly talk about the fact that they are highly interconnected with each other, as you mentioned. So we observed very strong correlations between body image problems and eating disorder symptoms, such that people who are much more dissatisfied with their body are much more likely to engage in binge eating, restrictive diets and purging methods. So that's a high correlation that's well established in the literature. So they're related in the sense that one of them leads to the other and vice versa. So we've established through experimental research, through population based longitudinal studies, that body image problems influence the onset of disordered eating patterns, and then disordered eating patterns further influence the onset of even more body image problems, that's well established, that was established in 1970, I think.

And so they're highly related in that sense, but I think that there are critical and fundamental differences between them. So disordered eating, I think, reflects abnormal attitudes and behaviors towards eating and food and dieting, whereas body image has to do with our perceptions, our evaluations, and the behaviors that we perform towards our body image. So I think body image deserves its own discussion or its own conceptualization as a distinct construct that is separate for disordered eating, just because it's independently linked to many other different health problems as well. So we know that body image problems are linked with certain types of physical health problems, we know that it's also linked to quality of life impairment, functional impairment, social problems, sexual problems, it's just linked. That's even when we control for or partial out disordered eating behaviors as well. So it's saying that body image has an isolated effect on these negative domains of functioning. So for that reason, I think that it deserves its own

discussion in its own right, and so much so that we even have academic journals devoted specifically towards body image now. So I was lucky enough to be – I am on the editorial board for the body image journal, and that just publishes on body image, it doesn't really focus or look at disordered eating. There's some interplay between there, but all the papers on that are on body image, and it's a push for being like, this is its own distinction that we should be focusing on, because of the reasons I mentioned there with the links to all those other negative health outcomes.

But within body image is incredibly broad. So we have negative body image and within negative body image, we have attitudinal components of negative body image. So those are things like dissatisfaction or unhappiness with our body, obsessive preoccupation with what we look like and what we weigh, a fear of weight gain. We also have perceptual components of negative body image such that people literally, people with such distorted perceptions would literally see themselves as overweight or obese when, in fact, they're at normal weight, and we usually see that in people with those restrictive eating type disorders. And we also have a behavioral component of body image as well, such that people would obsessively weigh themselves or check themselves in the mirror, whereas at the opposite end of the continuum, we have body image avoidance, whereas people would completely do all they can to never expose their own body to themselves just because they feel what it would look like and all the thoughts that come up.

Then on the flip side, we also have positive body image, which is distinct from negative body image, but it also contains a variety, the new area of research, but it contains a variety of different elements as well. So things like body appreciation, functionality appreciation, body image flexibility. So to sum up, I think body image deserves its own discussion, independent

from disordered eating, because of the fact that it's independently and uniquely linked to many different health outcomes. But when we're trying to talk about body image even further, there are literally, I would say, nearly a 100 different types of body image constructs we've studied in the literature. It's a very complex discussion, although they're highly related, they're also quite distinct as well. So I think I could talk for another hour on this topic, but I think that would be the broad summary of what I would want to get out there.

DANNY LENNON: Yeah, I think, as you know, all these different areas where body image can be seen to have a role, just one example that's at the top of my mind, because I was writing and presenting about recently is when you look at some of the influences around long term weight loss maintenance, and a lot of times people ask, like, well, from like a nutritional perspective, what should that diet look like, that increases the probability. And there are some kind of factors that may play a role, fiber and protein and so on, but really they pale in significance to the psychological factors that predict someone's ability to maintain that weight loss in long term, and they tend to send around those that have high levels of positive body image, does it have self-efficacy that you mentioned earlier, people have this internal locus of control. These things are the major influencers, and then some of this dietary stuff plays some degree of role, but it just reminded me, as you mentioned, the positive body image and how that can play into some of this stuff.

JAKE LINARDON: Yeah, absolutely. And I think, as a psychologist myself, I am a bit biased in the sense that I would kind of say that our psychology is the thing that behavior therapists or behaviors would hate me for saying this, but I am a true believer that our cognitions dictate and determine our behavior, rather than vice versa. So if there's any behaviorists listening out there, I know you're going to cringe when I say that,

but that's just my school of thought. I think it's our thoughts that dictate and govern behavior.

DANNY LENNON: Amazing. With mention of body image, and actually disordered eating also plays a role here, one of the areas where people are probably most cognizant of some of those effects is in relation to social media, and that often gets a lot of attention, and quite rightly. But with social media, I think a lot of people probably are aware that there's risk and there's potential harms that it can cause. Why do you think or what maybe are the main reasons why it can be potentially so problematic?

JAKE LINARDON: There is so much literature on the potential impacts of the relationship with social media and disordered eating, body image concerns. And we've consistently shown there to be relationships such that people who generally use social media more are more dissatisfied with their image, they engage in harmful dietary practices. So that relationship is quite established. And although quite a lot of the research has been cross-sectional in nature, which I talked about earlier, there has also been some experimental research showing causal relations between social media usage and eating disorders. Again, I'm not 100% sure whether we've pinpointed specific moderating variables that makes someone more susceptible to this relationship or attenuates the relationship. I'm not well-equipped or have as much knowledge as I should in that kind of sense. But in terms of what are the reasons why we think social media leads to these potential problems, I think there are a couple of reasons. I think, one is that social media, we know social media is not necessarily an accurate portrayal of someone's daily life; when they post on Instagram, it's usually the best types of photos they've got. And the things that people seek out or see on Instagram are these society idealized different type of models; for women, it's usually these relatively thin looking models; whereas for men, it's really toned, muscular, and good physiques. So, in that sense, so people who are on social media,

they usually seek out this information first, and they see these pictures, and then they feel like, right, that is something that is getting – it's very popular, it's getting a lot of likes, shares, and followers, and that looks desirable to me, because that's kind of what we've learned through society, that those are the types of idealized bodies that we should be striving for.

So what determines whether someone goes on to develop problems later is the extent to which they internalize these beliefs. So there's a huge body of research done on what we call appearance ideals or muscular or thin ideal internalization. And that is the extent to which someone buys into the belief that if I achieve this particular physique, then that will bring forth happiness, that will make me worthy, that will make me successful, and it will just make my life all round better. So that's what we call an internalization of this appearance ideal. So someone who buys into that belief, that is kind of the first link in the chain towards later problems down the track, and there's been some really well conducted prospective research. And for anyone who's interested, I highly recommend you check out Eric Stice's work. He is almost like my idol in the sense of prevention based research, because he's shown that someone who internalizes these ideals, they then go on to develop issues with their body image, so they become dissatisfied with their body image because they feel like I don't look like those people, I'm therefore not worthy, I'm not happy, I'm not successful. So then what they do after that is when they develop this belief that they're not happy with their body, they try to fix that. And what way can we fix changing our body, and that's through restrictive diets. That's when someone would then develop a diet.

So it's actually this dual pathway model that we've described here where someone who internalizes this belief goes on to develop body image problems. And then there are two pathways that dictate whether someone will develop bulimia nervosa or binge eating

disorder type symptoms. And the first pathway is the restricted eating patterns, where they go on really rigid, restrictive diet as a way to modify their shape so they can look like what they're seeing in social media. We know that these highly rigid diets are not sustainable. So someone who refuses carbohydrates or only eats 1000 calories, whatever, per day, that's not sustainable. And any rule break is kind of set for failure, it's that catastrophic thinking where they go out to binge eat and purge. So that's one pathway. And the next pathway is body dissatisfaction also leads to mood problems directly, so it also leads to negative affect, so anxiety and depressed moods and stuff like that. And that's also a direct trigger for binge eating type symptomatology. And there's useful models that describe why that occurs, which is the escape model, where people don't like feeling these negative feelings. So one way to escape those negative feelings is to immerse themselves in all their favorite foods and binge eat and then compensate after that.

So it's a very complex explanation, but just to quickly recap, the extent to which someone internalizes or believes that they must achieve what they're looking at in social media in order to be successful, happy and worthy, that then leads to another chain of events that eventually, down the track, will lead to these types of eating disorder symptoms. So what we do in prevention based programs or social media literacy interventions or prevention programs is we try to directly tackle that internalization of those appearance ideals, and that's done by a variety of different strategies. So things like critiquing or challenging these appearance ideals; basic psychoeducation about the fact that you know what, if you achieve that, you're not necessarily going to be happy. I know, it's much easier said than done, but people don't conceptualize or understand that, so we have to really step them through it. So that's a key intervention target we're worried about, when we're dealing with social media. That's the first thing we try to do is we try to prevent those

beliefs of those, that internalization belief there and then that would hopefully have a flow-on effect towards positive psychological functioning down the track.

DANNY LENNON: Super interesting. And the role of social media, and particularly how these social media networks and their algorithms work has been something I've been quite fascinated with recently. I don't know if you saw the Netflix documentary, the social dilemma, and so I became kind of really fascinated with Tristan Harris's work. And to me, some of the things you have mentioned actually make a lot of sense in that context of, you mentioned there's this internalization of these ideals around appearance that we have; people are seeing these kind of curated feeds of people they follow that are like these amazing images. But, of course, they're not necessarily things that would have to be specific to social media, like, we can see this in celebrity magazines and marketing, and movies for longest time have bombarded us with this type of stuff. So with social media, it seems that there's this other layer of the problem, that once you start looking at those images or following the certain pages, now your feed gets curated to keep showing you that, right? Instagram notices you were looking at these certain pages, so now your whole explore page is more of these types of images, and you're surrounding yourself all the time with it. Or someone clicks on a YouTube video about rapid dieting or lose weight fast, and suddenly, they're down this rabbit hole of more and more extreme videos that people stay watching for longer; and suddenly, then everything they're seeing, they're constantly surrounded by these most extreme forms of the initial thing that hooked them in. And so, it's kind of even more damaging in that effect because of this ability for the algorithm to kind of, to track you that gives us even more unique problems with social media, I guess.

JAKE LINARDON: Yeah, it's funny, you put it that way. I've actually never thought about it in that sense. I never kind made the connection between the algorithms

and that just feeds you more of the same stuff, and that is definitely an exacerbating effect, isn't that? So that's a really unique way to put it, and it just makes sense. I've never spent the time thinking about it in that [way, because when you're watching TV, for example, although this stuff would come on like these, you could put the channel, for example, but – and then, yeah, that's a really interesting way to put it. And I think that it would be interesting to see whether the influence of social media is much more pronounced than other types of media outlets. I'm not sure if there's ever been any direct comparison between different types of content provided or different types of media outlets provided. But yeah, that makes a lot of sense. And it's a part of the problem, I guess, that they're out there to make money, social media, they're out there, and unfortunately, it may come at the cost of young girls' and young boys' mental health, because they're just bombarded with these messages that you achieve this, you will be as successful as this person here. So it's interesting, and hopefully, we've developed some prevention based programs that have shown really actually been shown to prevent the onset of clinically significant eating disorders, but they're by no means perfect, and there's still a lot more to be done in this space.

DANNY LENNON: Yeah, because, like you say, if someone watches something on TV, for example, but it, in that moment, makes them maybe feel bad or feels conscious about something, but then they stop and the next day they've forgotten about that, the TV's not waiting to show it to them again, but your YouTube feed is waiting for you and your Instagram explore pages. And I actually think, maybe in one of his talks, Tristan Harris has an example that's related to eating disorders maybe of like someone clicks on a certain video related to dieting or something and then your recommended videos and YouTube quite quickly becomes related to anorexia related videos or so on, because they're going to show you the ones that people typically spend the most time watching. And then suddenly

everything you're seeing is related to a certain topic around dieting, for example.

JAKE LINARDON: I remember him saying that as well. I think that might have been on his podcast with Rogan, he might have said that or it might have been on the Netflix documentary, one of those two, because I listen to both of them. And yeah, I remember him saying that someone who would, yeah, that they would get in a rabbit hole, and then eventually get towards pro-anorexia websites, and then that has the potential to offset symptoms of anorexia nervosa. So it's a dangerous game that we're playing with social media. That's why we usually try to advise people to limit the amount of time they spend on it, because it's actually a dose response relationship has been demonstrated such that more social media time spent is actually related to more severe symptoms. So if we're able to reduce the time spent on social media, simply the time spent, that actually has an effect on the severity of symptoms. So if anyone is struggling with this, simply trying to limit the amount of time you spend on social media may be beneficial to you towards kickstarting your, quote unquote, recovery towards more healthier eating patterns.

DANNY LENNON: But I do want to ask quickly about that paper that you referenced at the start that you published this year in relation to some of the machine learning and some of those, and at least initial findings that you can report. So can you maybe just give an overview of that, and then some of the findings that people may find interesting from there?

JAKE LINARDON: Yep. So two relevant papers, I'll try not to speak too long about this, but two relevant papers, one was we developed an app for eating disorders and we trialed the app in 400 people that exhibited threshold clinically significant and subthreshold eating disorders, and it was a transdiagnostic CBT based app. And we found the app to be very, very effective in reducing eating disorder symptoms. Only four weeks of

the app people used it for, sorry, eight weeks, but four weeks was the post test period, and we found that there was quite moderate effects without app, and suggesting that this app may serve or similar apps may serve as a palatable first step in the treatment of eating disorders. And for people who don't respond to the app, then they should kind of seek further help later on. So it's the stepped care approach in the sense that rather than going straight to a therapist, maybe if you try a digital intervention first that may be very effective for you, and you need not kind of spend $1000 on a therapist, or you need not invest so much time in taking professional psychological help when a simple low intensity smartphone app could do the trick for you. That's what we found in that one.

And the machine learning one, so machine learning basically is a complex computational approach that tries to identify patterns within datasets. So it's really data driven in the sense that you don't come in with hypotheses about what you expect to find, you just let the data take care of itself and see what patterns emerge. So what we did in the machine learning paper, we tried to predict who would develop binge eating disorder or who had binge eating disorder type symptoms, based on all these different types of eating patterns or eating styles, and that included things like intuitive eating, included rigid restraint, flexible restraint, cognitive restraint, dichotomous thinking. So all these different patterns related to eating and we use machine learning to try to identify the variables that best predicted who wouldn't have binge eating disorder versus people who would have binge eating disorder. And so what we found is the profile of people who were least likely to develop binge eating disorder were, sorry, that were most likely to develop binge eating disorder were people with below average levels of intuitive eating and above average levels of dichotomous thinking around food. So thinking that foods are either good or bad, that diets either are success or failure, there's no middle ground. So people who exhibit those two

characteristics, the interaction between those two variables predicted I think, with about 75% accuracy from memory whether someone would have a binge eating disorder classification.

So that was the main finding. There were heaps of other findings within that. But it was really cool in the sense that it was one of the first studies that used machine learning specifically to predict binge eating disorder through a variety of theoretically driven mechanisms that are that are hypothesize to influence binge eating disorder. So we kind of threw it into a computer and kind of saw what come out, and that was – they were the two characteristics that really emerged as the variables or the patterns that were most strongly related to binge eating disorder. So that was, again, low intuitive eating levels, and really high dichotomous thinking level. So flexible restraint, rigid behaviors, and some other cognitions, they were not as important as those two variables that I spoke about there. Very hypothesis generating study, so there were no firm conclusions, because what we have to do is confirm that in a subsequent follow-up study, but it was just interesting to see that these patterns existed based on the data that we had. So it sets up a lot of questions for future research about trying to confirm this later on, and that may be one more step towards more personalized interventions.

DANNY LENNON: Speaking of that, Jake, where can people find you and your work on the internet, and where can they go and follow you and keep up-to-date with what you're doing?

JAKE LINARDON: So we've created Break Binge Eating, so it's basically a website, breakbingeeating.com that just provides basically most of the information that we spoke about here today. So there's a series of articles, there's an eBook available, a self-help eBook, there's screeners for disordered eating, so it's just basically a palatable way for people to find credible information about eating disorders, because there's a lot of rubbish out there at the moment when you look online on

Google. So there's a lot of misinformation. So this is one way to do that. And if you're interested, all the stuff, highly active on Instagram too, so Break Binge Eating is the Instagram handle, check that out and give us a follower, like or whatever is done, and that's where all the information is. So yeah, check it out, and I hope you enjoyed the conversation that we had today.

DANNY LENNON: To leave people on anything even disconnected from what we've discussed today, one thing they can do each day that would have a positive impact on any area of their life, what would you recommend?

JAKE LINARDON: I'm pretty sure last time I said socializing, I said catching up with a friend for at least 15 minutes, I'm pretty sure I said that answer. So I'm going to go with something different, and something that I find, I would say, go and spend a couple of minutes petting an animal, any type of animal, a dog, a cat, or anything you can find. It just gives that sense of calmness, relief, so the reason why I say that is I just got a brand new puppy and he's turned my world upside down for the better, he's a great little dog and it's just that's what comes to mind. Go spend a little, some time with a little dog or a little cat or whatever you have, rabbit, whatever, because that has a positive impact on my mental health and well-being, so that would be my suggestion.

DANNY LENNON: Amazing. As a dog lover myself, I'm very happy with that answer, although we know when you said any animal what we really mean is like dogs preferably but...

JAKE LINARDON: Only dogs is what I was trying, but I thought I'd be...

DANNY LENNON: Be nice to people for sure. And yeah, it's probably easier one to do for anyone that is still in a lockdown like we currently are here in Ireland.

JAKE LINARDON: Yes.

DANNY LENNON: Socializing with friends, one might not be an easy one to enact at the moment, but Jake, let me say thank you so much for giving so much time today, but even more the great information and just a really good conversation which I'm delighted that we were able to make time for, so thank you.

JAKE LINARDON: Thank you, Danny, appreciate it.