Female Training, Hormones & Nutrition: Fact vs. Fiction | Dr. Lauren Colenso-Semple

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Lauren Colenso-Semple
The most important element is your training is challenging enough, meaning you can do a set of six, you can do a set of 12, you can do a set of 15, or anything in between. But when you finish your last rep, that sixth rep, or that 15th rep, you should feel like you could only do one, maybe two more. If you're not there yet, the weight isn't heavy enough and you need to increase the load.

There's no must-do exercise. There's no must-do rep range. There's no must-do length of workout or days per week. The point is that it needs to be challenging. You need to stick with it and do it consistently, and you need progression over time. So as you get stronger, we need more load.

Dr. Andy Galpin
The science and practice of enhancing human performance for sport, play, and life. Welcome to Perform. I'm Andy Galpin, I'm the executive director of the Human Performance Center at Parker University. Today I'm speaking with Dr. Lauren Colenso-Semple. Lauren has a PhD in integrative physiology, and her research focuses on questions related to female physiology, exercise, and nutrition.

She's also a tremendous scientific communicator, as well as active practitioner, having coached hundreds of people successfully to their personal fitness goals. Because of that background, in today's episode, you're going to learn a tremendous amount about the bridge and the gap between science and application as it applies specifically to females and their unique physiology.

You're going to learn what the true state of the literature actually is. And so I hope you enjoy this conversation today with my long friend, Dr. Lauren Colenso-Semple. Dr. Lauren Colenso-Semple, thank you for being here.

Lauren Colenso-Semple
Thanks for having me.

Dr. Andy Galpin
It's been a number of years since we got to hang out in person.

Lauren Colenso-Semple
It has.

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Dr. Andy Galpin
I thought it would be interesting, and I'll actually have to give you credit for this, because you brought this up this morning while we're eating breakfast, that almost 10 years ago, you and I had an idea for a lit review paper. And according to your memory, not mine, we at least mocked that thing up, got close to it, and I'm not sure where it went from there.

So my first three questions. One, walk us through what the idea of that paper was. Two, why were you even interested in it? Where did the idea come from? What was the love and support for it? And then three, which one of us screwed it up in not getting it out? Whose fault was it that paper never got published? So you can take those in whatever order you'd like.

Lauren Colenso-Semple
I think we share equal responsibility for number three.

Dr. Andy Galpin
Oh, no chance, no chance.

Lauren Colenso-Semple
I come from a background as a fitness professional. And so my interest in science was rooted in my background as a fitness professional. And at the time, looking at the literature and seeing there was an underrepresentation of female participants. And you'll hear a lot of people say that. There's no data in women, but there is data in women.

But at the time, it's true that it was very common to have at least an initial study conducted in young, college-aged men. And so I was really a proponent of, hey, let's try to replicate these studies in women. So the idea for the review was, what are these potential sex differences that maybe we have an inkling of a mechanism to generate a hypothesis to say, is it true, or could it be true that maybe women can train more frequently?

Could it be true that there's some "protective" effect of estrogen that would allow for faster recovery or less muscle damage in response to hard training? And is there something to be said for these hormones that fluctuate throughout the menstrual cycle? Because we know a ton about testosterone, we don't know much about estrogen and progesterone.

And so if it is the case that men and women are gaining muscle size and strength at similar relative rates, clearly testosterone is not the key that unlocks the strength and hypertrophy kingdom. So at the time, there was enough to say, here's the list of the could be's. Let's hash that out because the purpose of a lit review is to say, here's the state of the evidence as it stands, and here's where we need to go.

So that was the intention to lay it out there. And what we were doing together at the time was

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exploring some of the sex differences in fiber type because that was another theory that was posited of, if there are these sex differences in fiber-type distribution, could that fuel the different training recommendations or optimizations, if you will?

Dr. Andy Galpin
Why were you even interested in these questions to begin with? Why did it matter if we had data on sex-specific training and nutrition recommendations? What got you interested in that question to begin with?

Lauren Colenso-Semple
I was trying to optimize my own results, and so selfish reasons, and those of my clients. So not to say that I necessarily thought men and women should train differently, but I thought we should explore the possibility because if we don't look at these potential sex differences, and we just assume that these findings in men apply to women, then we're not doing justice to the full process.

Dr. Andy Galpin
At that time, did you have any reason, based on your experience coaching, to think that we needed separate recommendations?

Lauren Colenso-Semple
No. Practically speaking, training myself and others, I never did anything differently based on sex.

Dr. Andy Galpin
OK. So this was more of a scientific question. You weren't necessarily seeing it in the field. I don't remember at the time feeling like there was a big drive among practitioners and coaches that there needed to be differences. Do you remember differently?

Lauren Colenso-Semple
Not in the "evidence-based" coaching world. Certainly in the fitness industry, I think, historically, women have always been prescribed ineffective training. It's group fitness or it's Pilates with the promise of drastic body composition changes. But if you had somebody who was doing proper training, I don't think the differences went beyond, oh, you want more glute hypertrophy, let's do more glute-focused exercises. You want more pec hypertrophy, let's bench more.

Dr. Andy Galpin
Why do you think that from a cultural perspective women have been given that kind of advice? And secondarily, why has-- especially going back 10 years ago, why do you think the research that was available was only in those small, specific domains?

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Lauren Colenso-Semple
There's been a lot of misinformation about lifting weights. So that goes back a long time where women were discouraged to lift, or even exercise at all, for fear that their fertility would be totally destroyed. And so you weren't allowed to do physical activity at school.

And so there was a huge misunderstanding of what exercise could do and would do and the dangers of exercise for women. Women weren't even allowed to run the marathon. And so it was like women couldn't possibly physiologically run that.

Dr. Andy Galpin
Sure, dangerous. Right.

Lauren Colenso-Semple
So there's an element of that. And then I think fast forward to, oh, exercise is good, exercise is safe, the industry saw a way to really capitalize on the new and the shiny. And let's introduce a new fitness class. Let's introduce a new piece of equipment. And instead of focusing on consistency and progression and what is sort of boring, it was always about, how do we ramp it up and introduce fitness in a new way?

And women gravitated towards that, coupled with the fact that if you lifted weights, it was going to make you bulky. It's going to make you into Arnold Schwarzenegger overnight. So women shouldn't do that. And I think we've come a long way from that messaging. And we're seeing a new wave of misinformation in a different way. But the thread is there that women ultimately end up doing ineffective training or switching things up too frequently and not nailing those boring basics.

Dr. Andy Galpin
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I think it'd be very fair if you put any reasonable evidence-based practitioner or scientist in the room to say, would you agree that everyone should take their training, their nutrition, their recovery based on individual needs and goals? Everyone's going to say yes to that. That's not the confusing part. It's step two where we start to lose the plot a little bit here. So when we ask the question, well, what does individualized mean?

Lauren Colenso-Semple
Yeah.

Dr. Andy Galpin
So walk us through how you think about your initial intake of somebody. And you're starting to develop, again, a training recommendation or nutrition or anything else, what are the questions that matter? And then where does sex lie in that hierarchy?

Lauren Colenso-Semple
Well, the most important question is, why are we having the conversation? What is your goal? And the secondary questions are, what is your experience? How much time are you willing to commit to this goal? Do we need a more flexible approach? Or are you somebody who is up for some very regimented programming?

What equipment do you have access to? If we are moving forward in a progressive way, are you willing to continue to do these same exercises week in and week out, or are you going to get bored? And from a psychological perspective, do we need to mix things up?

And all of those go into creating a program that is not only goal-oriented, but also sustainable for long enough to actually see some results. And if those two pieces aren't there, then you've failed as a coach because you're guiding someone in a way that either isn't appropriate for that goal, or they're not going to do it.

Dr. Andy Galpin
So goals and timelines and practicality and personal preferences are up there, where does sex fall on that list of important variables to consider?

Lauren Colenso-Semple
Very, very far down the list. I have never sat down with someone or reviewed an intake questionnaire from someone and thought at any point, oh, I'm working with a woman and

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therefore, I'm going to adjust the type of program, or even adjust the way I approach the conversation.

Because the reality is man, woman, older, or younger, it's all about you as an individual and your background, your history, your preferences, your goals, and anything else that would go into how we can communicate effectively and work together in a way that will allow for you to make as much progress as possible.

And if we hash out some of that early on and keep an open mind to make those adjustments along the way, where we can say, you know what? This really isn't working for me. I hate Bulgarian split squats.

Dr. Andy Galpin
Yeah. Who doesn't love them?

Lauren Colenso-Semple
Or I don't want to train five days a week anymore. And you're comfortable saying that to me. And then I can say, great. Because one of the great, exciting things about training, especially resistance training, is there is a ton of flexibility. If you don't like an exercise, or you don't have access to X piece of equipment, we can always adjust.

If you have an injury, we can always adjust. And so that flexibility to me is one of the best things about resistance training because it means you aren't locked into this rigid system, either hop on board or get out.

Dr. Andy Galpin
I think it's understandable why people hear training or health or any type of advice that speaks to them for them to get more excited about it.

Lauren Colenso-Semple
Yes.

Dr. Andy Galpin
You sent me a very funny thing on Instagram about, I'll just say, a particular marketing approach. And this is really common right now where if you market to one very specific individual, your hair color, your body size, your goal, your income level, and you're just like these weird training and other programs based on all those variables, you're like, why does my income level matter to how I work out? Like what?

But it makes people feel seen, feel heard. So I think you and I would both have some sympathy for females saying, I want female advice based on female research for female goals. No one's going to argue with that. What's the problem, though, when we give female-specific training

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advice? Certainly what I'm getting at here is, in the presence or lack of evidence that that's necessary, why does that create an issue?

Lauren Colenso-Semple
Lumping all women into one bucket just--

Dr. Andy Galpin
They're not all the same?

Lauren Colenso-Semple
--throws out everything I just said. We said individualization is important. Goal-oriented programming is important. And by saying you're a woman, and therefore, let's toss that, and here's your program, that's bad coaching.

Dr. Andy Galpin
Tell me more. What do you mean?

Lauren Colenso-Semple
If I say, oh, all right, women over 40, we must do this exercise. I never asked you what your goals were. I never asked you if you enjoy running or lifting or swimming, or if you are interested in overall health. And you want to be able to play with your kids, and then play with your grandkids, or you want to compete in a powerlifting competition or run a marathon.

Obviously, it seems like a really clear example, but a powerlifter and a marathon runner and a bodybuilder are going to have drastically different training programs. And so when we think about whoever the avatar is, we first need to ask the question, who are we talking to? It's not, are you a man or are you a woman? It's are you somebody who is trying to start moving?

You really haven't exercised before. You realize it's important for your health. You want to maintain muscle, you want to maintain bone, and you want to develop a program that you will do week in and week out for months and years to come. There's your longevity guide because, who cares what you do for the next six weeks?

Dr. Andy Galpin
Yeah.

Lauren Colenso-Semple
So that's one conversation. That's one avatar, if you will. Then you could have somebody who is an elite athlete or an aspiring elite athlete who is willing to do every single thing, track every metric possible, and collect all the data, and make as many sacrifices as they need to in pursuit of a particular athletic goal.

And then we might say, OK, some of these nuances that I would say are completely irrelevant for

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person A are now worth considering for person B. And so if we think about this in the context of a female athlete, then we might consider tracking menstrual symptoms and couching that in the context of our performance data, which we are already collecting.

And say, OK, well, objectively, is there a difference? Subjectively, is there a difference? Because those are two different things. Maybe my performance feels worse, maybe it feels harder, but it's not objectively worse. We could also say, oh, you just went on this new hormonal contraceptive. How are you feeling?

And are there any downstream, even minor performance effects that you're noticing over a four-month, six-month period? Because you are someone who wants to optimize every single thing. It's important to you to focus on that and really dial everything in to the point that you would be willing to maybe switch the type of birth control that you're taking, or come off of it completely if you could add a second to your sprint, or a kilo to your lift, whatever the thing is.

And not to say that adjusting those parameters would necessarily do that. But if we are collecting all the data and leaning on all these metrics anyway in pursuit of optimization, then we are having a very different conversation that may be appropriate for this person, but is entirely inappropriate and creates a lot of barriers for this other person who is just trying to be healthy and move more and develop consistent exercise habits.

Dr. Andy Galpin
What we really don't want to do is create unnecessary problems. We also want to acknowledge the fact that some people are trying to get every ounce possible. And in that case, if you want to do higher level stuff, this is majoring in the minors versus minoring in the majors. And there's both.

Lauren Colenso-Semple
Sure.

Dr. Andy Galpin
There's the reality. Obviously, I spend most of my career on those people who are looking for every possible advantage. And then there are people that are more interested in general public messaging, which the average person pay attention to. And those are not necessarily going to be the same answer.

So why don't we start with, what do we actually know scientifically about female-specific training recommendations? What do we actually know that you feel confident in that has a strong data set that there might actually be some differences in training or recovery or any other recommendations for women specifically?

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I know you're not going to guarantee it works for every woman, but what is like, OK, in general, looks like the data suggests this may be happening or this may be thought of. Does anything fall into that category?

Lauren Colenso-Semple
Not really. Going back to your first question, when we said there might be an inkling of this or that in that decade, we've replicated a lot of those studies that were initially conducted in men.

Dr. Andy Galpin
All right, tell me more.

Lauren Colenso-Semple
Well, I think an interesting point is there will never be a paper that comes out that's going to tell you how to train because the paper, the scientific study in and of itself is designed to ignore all of that interindividual variability and preferences and goals because we're saying, no, we want to make everything as tightly controlled as possible. We want to reduce all of that variability.

And so we can never look at the results of any paper and say, and therefore, here's your training program. It gives us a basis of knowledge of what's important and what might be more important or less important. But it's not going to tell you how many sets of this exercise. And so even if we can say there are maybe individual differences, men or women, I think we can say that because we see that in the literature.

We certainly see that-- practically speaking, I've coached people, men and women, who can handle vastly more volume than others. And I don't know why, but I know that they can because we've worked together for long enough and we kept ramping it up and their recovery was fine and they kept progressing. And that's the value of working one-on-one with someone.

To come to mind, one was a man and one was a woman. So I don't know that all women can handle more volume, or all women can train more frequently. I know there are coaches out there who say, anecdotally, that's their observation. And I don't negate that, your observation is your observation. Can we say it's because of estrogen, or it's because of fiber-type differences? No.

Dr. Andy Galpin
What is the state of that literature, specifically the volume/recovery? Do we have any quality papers at all, I'll even take, again, mechanism or preclinical stuff, to suggest there might be a signal there? Because there's a difference, of course, between their data that have been really well controlled studies and show it doesn't matter versus, hey, those studies haven't been done yet.

So what is the lay of the land for that specific question? Because you're right. I've said this for

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years with that question, and many, many practitioners will say that I think women recover better. They either handle volume or actually need more volume to get the same adaptation. So I'm not asking you to comment on every coach's personal experience, but where is the state of the literature on that specific topic? Clear answer, yes, clear answer, no, or not enough research for you to feel comfortable.

Lauren Colenso-Semple
Let's start with where it comes from, what's the idea. So there's--

Dr. Andy Galpin
We're just on the podcast. You're in charge.

Lauren Colenso-Semple
There's rodent data that's really interesting that basically posits that estrogen plays a regulatory role in the satellite cell compartment. So if you remove the ovaries from the rodent, you completely shut down hormone production.

Dr. Andy Galpin
Yeah. Go from 100 to 0 tomorrow.

Lauren Colenso-Semple
Right.

Dr. Andy Galpin
Yeah.

Lauren Colenso-Semple
Which is not a physiological model. It's not even menopause. It's a very extreme model. But this is the model that is commonly used to investigate questions that, in the absence of this, then what? So in this case, it seems that when you shut down hormone production, the satellite cell pool starts to deplete. And then it seems like this can be reversed by injecting estradiol.

Dr. Andy Galpin
Makes sense.

Lauren Colenso-Semple
So we know satellite cells are involved in recovery and repair. If the absence of estrogen means down regulation of stem cell pool, could it mean that absence of estrogen means less recovery? I'm flipping the script now because taking that and then saying the presence of estrogen means better recovery is a big jump, especially when we're talking about extreme rodent model to women with hormones doing this every couple of days.

So it's a big, big leap, but that is where it comes from, that's where the idea comes from, at least

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to give it some sort of mechanistic rationale or some sort of physiological rationale to say, and this is why it might be female-specific. Now, it's also worth contemplating that if women are, on average, lifting lighter loads than perhaps the overall fatigue, even if you're not talking muscle-specific, but if I'm doing super heavy squats, it's not just my legs that are fatiguing from that.

And so is there an element of just overall load on the system that could contribute to sex differences in fatigability or recoverability? I think that's a possibility. And that's a question that would be extremely difficult to answer.

Dr. Andy Galpin
Super hard. You would see that same argument being made, though, by the way, within men.

Lauren Colenso-Semple
Yes.

Dr. Andy Galpin
If you simply look at people that are doing 95% of their 100% max as a random example, and you take somebody who's 75 kilos or somebody doing that at 175 kilos, and they're both living triple bodyweight, the same relative percentage, at the same percentage of body weight, the person doing triple the bodyweight at 175 kilos is going to experience extreme fatigue because the absolute load, independent of relative, is so much more fatiguing.

Every powerlifter or weightlifter or strongman or woman in the world will basically agree and say, it's not the same. The absolute load, the absolute fatigue matters. And we have so many data points to support that empirically. And it's plausible. It makes mechanistic sense, makes teleological sense. It makes all the other sense in the world. So agreed on that point.

So continue on with the rationale. I'm assuming that paper probably came out many, many years ago. It gave plausibility to saying, OK, in this a little bit more extreme example where we cut over his off, which, as you explained, doesn't happen in a normal physiological human. And then also, we inject back in probably a concentration and dosage that, again, is not typical.

And we also have all the other things that go on with being in a mirror and animal versus a human. So different species there. Was a study like that done? Do we have any research? Otherwise, yeah, this does transfer to humans, or it does not. What do we know about that?

Lauren Colenso-Semple
That and related research with that model also gave rise to a hypothesis that there's something anabolic about estrogen because you remove the ovaries, and the rodents ability to maintain muscle mass seems impaired. So just like we said, OK, absence of hormone means down

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regulation of satellite cell pool, now we're saying, absence of hormone means loss of muscle. Does that mean presence of hormone means muscle growth? Of course, not.

Dr. Andy Galpin
No.

Lauren Colenso-Semple
So again, we're taking a big leap here. But I think it's important to understand where it comes from because it does generate an interesting question, especially in the context of muscle loss and hormone therapy.

I think more so than cycle sinking or acute fluctuations, but I think it's closer to the model of menopause and hormone therapy than it is to just the presence of estrogen or sex differences more broadly. But we're taking a very simple model that is a rodent. And rodents don't even have a menstrual cycle.

Dr. Andy Galpin
It's not estrus.

Lauren Colenso-Semple
And we're making it estrogen. But when you remove the ovaries, you're shutting down all hormone production. You can't pinpoint to estrogen in and of itself because these hormones work together in concert physiologically. But that's where it comes from. And now we have data looking at protein synthesis differences in men and women because that was another theory that was out there that estrogen would affect protein synthesis somehow, that estrogen would affect myosin function somehow, that estrogen would affect the satellite cell pool.

But remember, we're trying to look at these really targeted pathways or mechanisms that are interesting. But now we have to extrapolate that to a human model much more complex model, much more dynamic physiology. And often, when we look at changing one thing, then there's a downstream change of many other things.

And so it's so rare that we adjust this and therefore that happens, and there's no intermediary. And I know that's really frustrating for people because we want that simple, if this, then that. And therefore, I can address it this way. And it often doesn't pan out that way.

And we've seen this time and time again, especially when we look at mechanistic stuff and road and stuff and we really try to drill down into one pathway or one trigger that is going to interfere or block or extrapolate from there. So it's not a bad thing that this doesn't necessarily pan out in humans, but we just need to be honest about where we're getting our data.

And did we replicate it, or at least explore the question appropriately in an appropriate model?

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And that's true not only when we go from rodent to human, it's also true when we go from acute to long-term adaptation. I can think of examples of looking at acute fat oxidation during exercise. Fasted cardio is a great example of that. People thought, oh, more fat oxidation. If I do this long term, I will lose more fat long term. It isn't so.

Dr. Andy Galpin
This is your area specifically of research and what you've been doing the last several years. Protein synthesis is the best example. So just because an intervention elevates protein synthesis, that doesn't necessarily promise long-term muscle growth. Highly related, of course.

But if you look at the research there, let's say, for example, numbers, if you were to do something, take a supplement, do a type of training or anything else, and you saw muscle protein synthesis, increased by 40%, that does not mean you'll have 40% bigger muscles in 8 weeks or 10 weeks or anything. In fact, it probably means you will have 2% or 3% growth, like if any.

So they are highly related and connected, but they are not exact one-to-one exchanges. So going back to your estrogen model, cutting out an ovary going to zero is not the same thing that you experience through menopause. It's not the same thing that you experience in different phases of your cycle, if that's even normal.

So I want to go back to these top in what differences we actually know, how to identify these things, but I have to take the bait here a little bit for some endocrinology. So I want to go deep into this because it's really interesting. So if you wouldn't mind, would you share with us a really quick overview of the normal estrogen, progesterone, testosterone flow throughout the menstrual cycle? And then also help me understand the functional role of these things in men versus women.

You started off earlier by saying, we know a ton about testosterone in general. So at the highest level, I'll let you generalize. I'll do the caveats for you. But just, what is the role of testosterone in men versus women? And then again, how do the hormones change throughout the cycle as a textbook? What would the textbook say? And then we'll get into reality. So start us off with what's generally supposed to happen.

Lauren Colenso-Semple
So these are all reproductive hormones. So their primary role is for reproductive function, but these hormones can act on any tissues that have those receptors, of which there are many. When we look at testosterone in men, the most impactful time is puberty. And the increase in testosterone, you got your secondary sex characteristics and you also have an increase in muscle mass.

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So if we have an untrained adult man and an untrained adult woman, the man, on average, will have more muscle and more muscle strength, if you do an acute strength test. So when we talk about relative growth being similar at the absolute level, there will still be that difference because the starting point is different.

And we can attribute those testosterone effects from puberty to that baseline difference. Testosterone in women, there are some diurnal fluctuations. But we're talking about levels that are extremely low always.

Dr. Andy Galpin
Could you give me numbers to put context here, male versus female, just random, rough average?

Lauren Colenso-Semple
We're talking at a minimum 15-fold difference. So these fluctuations are of tiny concentrations.

Dr. Andy Galpin
In women, it's very small.

Lauren Colenso-Semple
Yes. So when we look at sex hormones broadly in women, we're looking at estrogen, progesterone, luteinizing hormone to some extent. And so at the beginning of the menstrual cycle, all of these hormones are low.

Dr. Andy Galpin
I got to stop you right there. Most people are not going to even know at the beginning of the menstrual cycle means. In fact, I'm not even saying men because we get this a lot from women, what is officially the start of the cycle? Is that your first day of bleeding? Is it ovulation? What is considered day one? And then you can keep going.

Lauren Colenso-Semple
Day one is the first day of bleeding. So that's your period. And some people will refer to the menstrual cycle as their period.

Dr. Andy Galpin
Exactly.

Lauren Colenso-Semple
The menstrual cycle is the whole thing from day one of your period to day one of your next period.

Dr. Andy Galpin
Thank you. Extremely common confusion there. So keep going. So day one when--

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Lauren Colenso-Semple
So your menstruation day one, you get your period. That's the first day. And all of the hormones are low, but estradiol starts to increase throughout this first phase. So when we talk about menstrual phases, we can divide it up into more than two. But let's, for the sake of simplicity, we'll keep it at two.

Dr. Andy Galpin
We'll get to complicated later, let's start with the simple.

Lauren Colenso-Semple
OK. So in a textbook menstrual cycle, let's say it's 28 days. And ovulation is in the middle and divides the cycle into two phases, the follicular phase and the luteal phase. So at the beginning of the cycle, day one of bleeding, all the hormones are low. Estradiol starts to increase and then peaks just before ovulation.

Ovulation, so now we're mid-cycle, is characterized by this spike in luteinizing hormone. This is short. This can be a few hours, maybe a day, maybe two days. And that ends the follicular phase. And now we're into the luteal phase. During the luteal phase, we have a secondary peak in estradiol that is moderate. So if we say our first peak is as high as it's going to get right before ovulation, so that's late follicular phase.

Now we have this secondary moderate peak in the middle of the luteal phase coupled with an increase in progesterone that peaks mid luteal phase, and then both hormones begin to decline. And we start the cycle again.

Dr. Andy Galpin
Yeah. What's the point of progesterone peaking at that time? And what's the point of estrogen having that bicycle rotation?

Lauren Colenso-Semple
So all of this is preparing for the release of an egg and implantation. And this is all reproductive function. So this cycle is the ovarian cycle. And we are preparing for pregnancy. We are ovulating, and then hopefully, implanting or not. And if the egg is fertilized, then we experience a whole other set of downstream hormone effects. Otherwise, we shed the lining and rinse and repeat.

Dr. Andy Galpin
Yeah, progestation. That's progesterone. We're trying to promote gestation is the idea. What's the role of testosterone across the month?

Lauren Colenso-Semple
The role of testosterone acutely throughout the day, really not doing anything. But it's supporting

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the release of the egg, so it's supporting the fertility functions post-ovulation. So you'll see, maybe depending on how we're measuring it, some phase-based differences in testosterone where it would be slightly higher in the luteal phase.

Again, trying to support, as you say, the gestation. That is why you'll start to see a decline in testosterone levels throughout the adult lifespan. Again, we're going from a low to a lower. But in adult women, your highest testosterone will be 18 to 25. And then it will decrease in each decade of life.

Dr. Andy Galpin
And that drop of testosterone through age, is it fair to say that's probably more impactful for men than it is for women? So they're both going to see so much of a drop. But if you were to have a 25% or 50% drop over a decade in a male, and you have that in a female, is it fair or not fair to say, symptomology wise, the man would probably feel that difference more than the female, outside of libido and things like that? Or am I wrong in suggesting that?

Lauren Colenso-Semple
Yeah. Absolutely. And that's also why we really don't have any evidence to suggest that testosterone levels in that quote, "normal range" in women have anything to do with exercise performance because they are so low. They are just supporting reproductive function. And there's some chatter about testosterone therapy for menopause, but testosterone doesn't actually decrease during the menopause transition.

So we're talking about just overall age-related decline at a small level. And yes, it is approved under certain circumstances for low libido, but that's really it. And so the contribution of testosterone to muscle growth or muscle maintenance with age is really a non-factor in women. Unless, of course, we talk about testosterone at supraphysiological levels.

Dr. Andy Galpin
Yeah, of course. You're going at dosages, pharmacologically, everything changes.

Lauren Colenso-Semple
Which we would tend to avoid because of the plethora of unwanted side effects.

Dr. Andy Galpin
Today's episode is sponsored by David. David makes protein bars unlike any I have ever encountered. They have an amazing 28 grams of protein, only 150 calories, and 0 grams of sugar. That's right, 28 grams of protein, and 75% of its calories come from that protein. This is 50% higher than the next closest protein bar. Honestly, it's the best-tasting bar I've ever had in my life by a mile.

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importance of getting 1 gram of protein per pound of body weight for things like muscle health and recovery and the promotion of lean body mass and satiety, the reality of that is, for most people, getting that 1 gram of protein per pound of body weight is really challenging.

However, David makes that easy. Their bars taste incredible. The gold bar is packed with 28 grams of protein with just 150 calories, and the bronze bar has 20 grams of protein, also with just 150 calories. I eat one almost every single day, and always have two or three with me in my backpack when I'm traveling. And I literally mean always. It probably sounds funny, but I eat them as dessert all the time.

When you try them, you'll know exactly what I mean. If you're interested in trying these bars for yourself, you can go to davidprotein.com/perform. Again, that's davidprotein.com/perform. While we're here, order of magnitude difference in a normal female of estrogen versus testosterone, you don't have to give me the exact number here, but give me a rough idea. Like how much more? And then secondary question is, do men have estrogen?

Lauren Colenso-Semple
Men do have estrogen.

Dr. Andy Galpin
Not me, of course, like other men though.

Lauren Colenso-Semple
So it's not the same in everybody, the extent to which it peaks. But if we're saying textbook, then it's a big peak. We're going from 0 to 700, 800. I've even seen 1,000. And for testosterone, you're talking--

Dr. Andy Galpin
Nowhere near that kind of increase, a couple of points here and there.

Lauren Colenso-Semple
Yeah. Testosterone is so low that most of the assays available aren't even sensitive enough to detect these levels in women.

Dr. Andy Galpin
Man, there's a whole line to go down here because for a long time at vitality, we did not include testosterone in the female panel. We only recently started doing it because of so much blowback. But I actually am legitimately concerned about the accuracy of those assays because the concentration is so low and the number matters.

We were like, no, I do not trust. Even these commercially available large testing facilities, really those concentrations, depending on the technology they're using and most are not. And so we,

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by public demand, put it in there. But it was against our goodwill of being like, OK, fine, you want it. But nonetheless, OK.

So that is happening textbook wise. Now, walk me through reality of what this actually looks like. First of all, tell me that the cycle is always 28 days. Ovulation is always at day 14 and then so forth. Right?

Lauren Colenso-Semple
Not so much.

Dr. Andy Galpin
Aah, no.

Lauren Colenso-Semple
The diagram that you always see of these hormone fluctuations, I've seen it once, literally once.

Dr. Andy Galpin
You've seen it play out in real life one time?

Lauren Colenso-Semple
Correct.

Dr. Andy Galpin
Yeah.

Lauren Colenso-Semple
So you'd be astounded by the variability between women, and even in some cases within the same person, but from one cycle to the next. So we have variability all over the place, meaning you could have a 21-day cycle and that's normal for you. It's always 21 days, or you could have a 35-day cycle and that's normal for you. It's always 35 days.

Now when we talk about ovulation, which again, divides the cycle into those phases, some people are early or later ovulators, meaning you have unequal length phases. So for example, I had a participant in one of my studies who had a 30-day cycle, ovulated on day nine regularly. That was normal for her. Another person, 30-day cycle, ovulated consistently on day 19.

And you don't know any of this, unless you're actually testing. So in my case, we were doing many cycles of ovulation tracking and then hormone testing for estradiol, progesterone, luteinizing hormone. But what you learn is the patterns, the timing of these hormone fluctuations are very variable. And then when you plot the hormones, some people have these small peaks and some people have these huge peaks. So it's not only the timing of the fluctuations, it's the magnitude of the fluctuations.

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And there's no consistency. Like just because you have a smaller estradiol peak doesn't mean you have a smaller progesterone peak. So it's all over the place. And none of this is predictable. And it makes it incredibly difficult to do research. But also, when you understand that, then speaking practically and broadly to women and saying, hey, do this, you're in that phase. No, you're not. You have no idea what phase you're in.

Dr. Andy Galpin
So a couple of questions here then. One, how does somebody test their ovulation, if they want to figure out what day they're ovulating, either every month or just once in a while? Menses is obviously pretty easy to figure out.

If you have a 28-day cycle or 31-day or if you're maybe bounced between a three or four-day window, that's all common and normal. And you don't have any reason to think that's unhealthy at this point. But your ovulation, whether you're early or late ovulator or you're sporadic, is there any quick ways people can test that?

Lauren Colenso-Semple
The easiest way, and again, I'm not suggesting that everyone should be doing this for any reason, but--

Dr. Andy Galpin
Yeah. I asked the question.

Lauren Colenso-Semple
It is a urinary reactive strip that assesses luteinizing hormone. And so this predicts that ovulation will occur because luteinizing hormone spikes prior, just before ovulation. But you can get a spike in luteinizing hormone and then get what is essentially an incomplete ovulation. So to confirm that ovulation actually occurred, then you would want-- the gold standard would be an a vaginal ultrasound.

Secondary, if you can't do that, which most people can't, would be to take a progesterone value mid-luteal phase because if you don't get that progesterone peak, then at least in the science world, we would classify that as an anovulatory cycle.

Dr. Andy Galpin
As in you didn't release an egg.

Lauren Colenso-Semple
Right.

Dr. Andy Galpin
All right. So any commercial kit? Are there any other things to look for or pay attention to, or can

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I just get a luteinizing hormone strip and predict when I think-- maybe to start at day 14 and then maybe do three or four days before that, three or four days after that. And then do it that way, assuming--

Lauren Colenso-Semple
Yeah. These are available at every drugstore. People use this for fertility purposes. So this is an ovulation test kit. And typically, if I had somebody who had a shorter cycle on average, I would say start at day 10, just to be on the safe side, and then do it every day. Somebody who had a longer cycle, then maybe start a little bit later.

But, and this is the problem with all those apps that say, this is what phase you're in, or you're fertile now. They are assuming there is a relationship between cycle length and ovulation timing, meaning shorter cycle means earlier ovulation, longer cycle means later ovulation. And that's not always true.

Dr. Andy Galpin
Yeah. So we have people who have short cycles and longer cycles and that they're consistent in their timeline. You gave those examples earlier. And then you have some people who are more sporadic. Would you say like 3 to 4-day range for cycle length, past that is maybe like, hey, you actually have inconsistent, maybe something happening there?

Lauren Colenso-Semple
Yeah. I would say it's typically in that area.

Dr. Andy Galpin
Three, right?

Lauren Colenso-Semple
Yeah.

Dr. Andy Galpin
So within that, then you also have people who ovulate at the same time, either early, mid, or late consistently. And then you have also people that can have any of the combinations, consistent cycle length, but inconsistent or fluctuating ovulation day, or people with inconsistent cycle length, but consistent ovulation time frame, or any combination of any of these variables.

Lauren Colenso-Semple
Which makes this research super fun.

Dr. Andy Galpin
OK. So what I want to ask now is actually, it might be cool if you just walked us through your last paper. What I want to really get at here is why this type of research is so hard, and why there

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isn't as much research in females.

Lauren Colenso-Semple
We have research in women, but historically, people have avoided it because--

Dr. Andy Galpin
I avoided it for my entire career.

Lauren Colenso-Semple
Well, you just don't want to be around women. But other scientists have avoided it because when you go to publish, the journal says, well, you didn't "control" for the menstrual cycle. You didn't standardize for the menstrual cycle, or were these people on oral contraceptives or not? And so you get a lot of those questions.

And sometimes papers get rejected for that reason. And so in order to standardize or control for-- control is a ridiculous term, given everything that we've just been over. It's important that we track cycles and measure hormones and standardize the timing of our training or testing throughout a study, and only recruit people who have regular menstrual cycles.

Nobody is on an oral contraceptive, which is half of the premenopausal population. So if we have to do that, this creates a huge burden on what are often small labs with limited resources. So if you say to me, I want to do a study in women on vertical jump, and then I say, great. But by the way, you need to find money and the resources to bring them in for several months in advance and do a ton of ovulation tracking. And then we're going to need to take bloods throughout the cycle.

We're going to send those out and get some hormone assessments back. And then when you bring them in, make sure that they have a normal cycle that you can predict and that's consistent, then we have to schedule them. So when they come in for their assessment or their training, they're in the exact same place in their cycle every time they come to the lab. And we have to do it for everybody, but we have to individualize it to their cycle. You're going to say, maybe I'll do that study in young men.

Dr. Andy Galpin
You're going to 5x the study length, if not, 10x the cost?

Lauren Colenso-Semple
Yeah.

Dr. Andy Galpin
And there's a reality of saying, yes, we all want more research that includes women. But if you're going to put up a wall like that, you're not only incentivizing, you're almost making it impossible

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to even include women in the studies. Not only doing women-specific research, answering women's health specific questions, but just even including you in the study becomes almost impossible.

Lauren Colenso-Semple
Well, the issue is for years, it's always just been this assumption, this nebulous, well, it could matter. Right?

Dr. Andy Galpin
Yeah, for sure. The only IRBs I filled out by saying, why aren't women included? Because of menstrual cycle. Well, what's that have to do with--

Lauren Colenso-Semple
And the irony in exercise science research, where we take people who are clearly not equally trained and we accept food logs that are obviously flawed. And we say, well, yeah, there are differences between an 18-year-old and a 32-year-old, but we're going to take them all.

And we're willing to accept that because there's inherent variability in that. And that's OK. We accept that in the-- but the menstrual cycle, it's like, no, I couldn't possibly fall into that category of things that we accept. When we look at what I did, I actually wanted to answer the question, does it matter?

I didn't want to try to answer some other question about exercise in general and slot in the control of the cycle because to your point, if we need to standardize testing and training around cycle phase, if we need to separate the naturally cycling people from the hormonal contraceptive users, if we need to standardize by oral contraceptive generation or IUD versus patch versus copper, all of it, we're not just assuming that maybe it could matter and therefore we must.

We're saying, hey, let's investigate this question. Let's see, are there differences in phase on pill or off pill? And if not, then it reduces the barrier for so many labs to say, oh, I don't need to worry about bringing them in during that cycle phase. I don't need to take bloods. I don't need to track ovulation. I can just do the science.

And so from my perspective, it wasn't just about learning the role of these hormones and how, if at all, they affect muscle, although I think that is a really interesting question from a just a mechanistic perspective. The interesting outcome for me was, if we didn't find anything, then that's pretty exciting. That should be good news because, hey, we have more opportunities to include women or do mixed sex samples.

And all these layers of complexity that not only are challenging for the researchers, for the grad students from a financial perspective, but also if you're saying, I want to be represented as a

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woman. OK. Well, do you have a menstrual cycle, or are you on an oral contraceptive? And am I going to have to exclude you? You really want to participate in my study? Sorry, you can't. That doesn't move us forward. And we're moving at a snail's pace, if we're requiring that level of standardization.

Dr. Andy Galpin
So walk me through what you actually did for your last project rather than us just whining and complaining.

Lauren Colenso-Semple
Given all of that variability that we've discussed, the idea was, let's compare one woman to herself by conducting a series of tests in that late follicular phase with peak estrogen, and then repeating that in the mid-luteal phase where we have that peak progesterone and that secondary estrogen peak, which some people often forget about.

But we're basically looking at these two distinct hormone profiles. And if there's the hypothesis that estrogen is anabolic for muscle and progesterone is catabolic, then we should see differences in the protein synthesis response to exercise. So what we did was look at a week of integrated muscle protein synthesis using tracers.

So meaning there are typically two ways that you can measure muscle protein synthesis. One is through an infusion. So you're going to come to the lab. And I'm going to hook you up to an IV. And we're going to infuse a tracer that's labeled that will show up in a muscle biopsy. And then we can look at the rate at which that tracer is incorporated into the muscle. And maybe we could do some exercise with the IV. But typically, this is over a period of hours. And you're always fasted.

And so it's an important model. It's been around for a long time. But there are some limitations to it. So using more modern, orally-ingested tracers, you can drink these labeled tracers essentially and top up every day. And so when we look at that integrated or that rate of incorporation of the tracer into the muscle, it's accounting for everything you did, your meals, your sleep, your exercise, all of it.

Dr. Andy Galpin
That's more ecological validity here. Yeah. You're still taking biopsies of people's leg, directly measuring it. But you're not looking at this three or four-hour, five-hour window, which I said a little bit earlier may or may not actually represent what happened in the muscle weeks later. But when you're looking at it on an average across the week, that's far more indicative of what's going to happen in two or three months. So a much better model.

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Lauren Colenso-Semple
In months leading up to the study, I had people come in for screening, and we wanted to look at their historical cycles. Luckily, most people are tracking their cycles. So baseline, you had to have at least six months of, this is when I got my period so that I could get a sense of you are regular enough in terms of the cycle length that we can have you come in over multiple cycles and your irregularity not throw off our data collection.

Dr. Andy Galpin
So right out the gates, you're screening loads of people because you have to make sure, number one, none of them are on birth control.

Lauren Colenso-Semple
And haven't been for at least a year.

Dr. Andy Galpin
None have children.

Lauren Colenso-Semple
Yeah.

Dr. Andy Galpin
And I'm sure children or even--

Lauren Colenso-Semple
No pregnant women.

Dr. Andy Galpin
No pregnant or been pregnant ever.

Lauren Colenso-Semple
No perimenopausal.

Dr. Andy Galpin
No perimenopausal women. Why? Because you're asking a menstrual cycle question, so then you have to have a standard. So you've already cut out, I don't know, 75% of the population at that point, never had a kid, regular menstrual cycle. There's an age range. Maybe more the female population gone right out the gates, if not higher.

Lauren Colenso-Semple
And no menstrual cycle dysfunction.

Dr. Andy Galpin
No PCOS.

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Lauren Colenso-Semple
No endometriosis.

Dr. Andy Galpin
No endometriosis, no amenorrhea, none of those things. You have to have probably between a, I don't know, whatever, 27 and 32-day cycle. And it has to be consistent across six months and none of those other variables.

Lauren Colenso-Semple
And you can't be obese, and you can't have other health conditions.

Dr. Andy Galpin
No disease, perfectly healthy. And 18 to 32 years old or something like that.

Lauren Colenso-Semple
18 to 30.

Dr. Andy Galpin
18 to 30. Yeah, great. OK. All that screening done, and then what happens when they're enrolled?

Lauren Colenso-Semple
And then we track their ovulation. So I send you home with a ton of those urinary test strips that we discussed. And then they tell me when they start their next cycle, when they get their next period. And then I tell them, OK, I want you to start your testing on this day.

And you're going to pee on it and you're going to let it sit for five minutes and you're going to text me a picture of it. So there's many months of this until I know, to a degree of certainty, I can predict your ovulation because phase I of this trial starts a week before your predicted ovulation.

Dr. Andy Galpin
So are you going to do that with every participant for five or six months?

Lauren Colenso-Semple
Yes.

Dr. Andy Galpin
And then you actually get to do your study.

Lauren Colenso-Semple
And then I got to do something. And of course, they can drop out anytime.

Dr. Andy Galpin
Oh, always. Yeah.

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Lauren Colenso-Semple
And I'm harassing them to text me the pictures of their strips and all that. So when we start-- and we did this in a randomized order, meaning not everybody started with that follicular phase testing.

Dr. Andy Galpin
Oh, sure, sure.

Lauren Colenso-Semple
But ultimately, they came in and we did blood hormones. We did a resting biopsy. And then we started the ingestion of the tracer. And then we did unilateral exercise because I want to compare not only your phase to your phase, but your resting leg to your exercise leg so I can get a protein synthesis at rest. And then, what's the magnitude of the response to exercise?

Dr. Andy Galpin
Yeah.

Lauren Colenso-Semple
They did their first set of unilateral exercise on that day after ingesting the tracer. And then they were taking the top-up tracers in subsequent days. They came back for a second bout of exercise, same leg. And then they came in for ingestion of another tracer, which was used to measure protein breakdown.

And the final day, they came back. We did two biopsies. So one on the resting leg and one on the exercise leg. So now we're up to three biopsies. And also hourly blood draws for five hours to try to assess this decay curve that is reflective of whole body protein breakdown. Now, we're doing this all again in the other phase.

So one phase starts a week before your predicted ovulation to capture that estradiol peak, the other phase starts in the mid-luteal phase to capture that progesterone peak. The second time you do it, we have to take two baseline biopsies because now you've already ingested the tracers. So we need a new baseline. And then we do the exercise. You come back two more biopsies. So it's seven biopsies total.

Dr. Andy Galpin
So I imagine that as a multiple-year project.

Lauren Colenso-Semple
Yes.

Dr. Andy Galpin
Many, many years. So when the people out there are thinking about, why isn't there more

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women's research? Why isn't it more? This is the biggest reason why. When we say it's really, really, really, really hard, this is exactly what we're referring to.

Lauren Colenso-Semple
Well, if menstrual cycle is important. So my study was designed to say, are there differences? And the problem with a lot of menstrual cycle research historically was they made a lot of assumptions. They said, well, 28-day cycle ovulation in the middle.

Let's throw in a couple people on oral contraceptives because, what's the difference? And then let's make bold claims about hormones that we didn't measure. Meaning if you want to answer these questions thoroughly and rigorously, then yes, this is what is required.

Dr. Andy Galpin
And to answer, because your papers published at this point, so you can answer, no difference.

Lauren Colenso-Semple
No difference.

Dr. Andy Galpin
It did not matter. So the idea that we need to lift weights during a certain phase of our menstrual cycle or not lift or anything like that, I think we can fairly close the book and saying we just do not have any rationale physiologically, whether it makes sense for you personally because you feel better, you like it. Those are fine. Those are practical, individualized.

You said at the very beginning, menstrual cycle is one of the many, many things to pay attention to, but in and of itself is not a reason to have to standardize, to manipulate, to alter training or anything else. So I'm comfortable definitively saying that. Are you comfortable definitively saying we're done with that question?

Lauren Colenso-Semple
Not only is there no physiological rationale based on the evidence, there's also no reason to make these broad, preemptive changes based on these theoretical phases that may not even match your physiology, that end up overcomplicating your training and forcing you to drastically reduce your volume or switch up the type of exercise you're doing.

So I think by incorporating any element of this into your training, it's a bad idea. It's not only that there's no physiological rationale for it, it's potentially harmful. It's potentially holding you back. The only caveat is to say, if you experience symptoms, cool. Every good program should have an element of autoregulation. But anecdotally, I hear people say, I can't get out of bed on day one of my period. I hear someone else say, I PR on day one of my period.

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Dr. Andy Galpin
Strongest I've ever been. Yeah, for sure.

Lauren Colenso-Semple
And everything in-between.

Dr. Andy Galpin
Yeah. I've coached a lot of female professional athletes. That is exactly my experience. They all are different human beings. That's as far as you can go with it, men, women, in-between. It's one of the things you pay attention to because you're a good coach and you're paying attention to many things.

Today's episode is brought to you by Truemed. Lately, I've been thinking about what actually drives performance. It really comes down to two things, the quality of your training and how well you recover from it. And both sides of that equation matter. And the tools you use to train and the tools you use to recover, high-quality fitness equipment, sleep support recovery tools, can get expensive.

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I always thought HSA and FSA funds were only for doctor's appointments and certain medical products. What's amazing is that you can use Truemed to pay for eligible products that can improve your health as medical expenses under IRS guidelines, fitness equipment, sleep support, recovery tools, and more. Go to truemed.com/perform, and check what qualifies. It takes just a couple of minutes.

This is hands down the best way to make the most out of your health dollars. Truemed is for qualified customers, HSA, FSA tax savings vary. So maybe some quick hitters here. I know some papers have come out really recently. I actually was a part of one of them, and so make sure you don't screw this one up in your answer.

For maybe speed and power, where do the data lie, either, again, definitive, yes, definitive, no, or not comfortable between, or whatever you want to do? For speed and power, does it change on the average woman across the menstrual cycle?

Lauren Colenso-Semple
No.

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Dr. Andy Galpin
No. What about strength?

Lauren Colenso-Semple
No.

Dr. Andy Galpin
What's the level of research? Again, five out of five, one out of five, where are we at?

Lauren Colenso-Semple
We have enough for strength performance that I'm confident saying, on average, it doesn't matter.

Dr. Andy Galpin
Again, the individual woman may totally feel stronger or weaker or whatever, but I would agree with your summation of the research there. There's been enough papers in those areas.

Lauren Colenso-Semple
With speed and power, there are fewer.

Dr. Andy Galpin
Always.

Lauren Colenso-Semple
And based on the evidence in these other areas, I would, and there are some papers, essentially they're showing it probably doesn't matter as well, I would be comfortable saying I don't think it's going to matter on average. However, the data isn't as robust. And so I would be willing to change my mind in the face of new evidence.

Dr. Andy Galpin
Fine. You already answered the hypothetical question, though, your dissertation ended that story. But to be really clear, for people that don't know what muscle protein synthesis is, any reason to think your ability to grow muscle differs throughout the menstrual cycle? Again, on average.

Lauren Colenso-Semple
No.

Dr. Andy Galpin
Great. So if we don't have to figure in cycle phase date, we can now test women. We can do studies. We can train however we want, and just disregard the cycle for most questions there. What about just men versus women? So what do we know about the ability to gain speed and strength or speed and power in men versus women? Do women progress slower? Do they progress the same? Again, what's the state of the literature?

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Lauren Colenso-Semple
I'm not aware of a ton of actual head-to-head, sex-based samples answering this question. So we're left comparing different papers with different methodologies, which is a bit tougher.

But I would say, on average, men seem to be faster and more powerful, which is not that surprising given that they are also more muscular and stronger. But that shouldn't change how we would approach training because we're working on relative adaptations, regardless of goal.

Dr. Andy Galpin
I appreciate how you answered that question because we don't really have any data on that, but all the other data surrounding it suggests, OK, we'll see, but unlikely. And then the second question is, does it actually mean you should train different? And the answer is probably no. So who cares?

What about for strength specifically? So do men and women increase your strength, assuming that they're eating and sleeping and stress and blah, blah, blah? As a physiological ability, what do we know about the ability to increase strength in both men and women compared to each other?

Lauren Colenso-Semple
Relative to your starting point, which again, is different, and we can attribute a lot of that to puberty, to testosterone, the relative increase, meaning if you increase 10% and I increase 10%, maybe your 10% is larger than mine, maybe not. You're not that big.

But on a relative basis, it's the same. So at the end of the day, if you start out bigger and stronger, you will end up bigger and stronger. But you will gain at the same rate, assuming that you're training properly, of course.

Dr. Andy Galpin
And for muscle growth hypertrophy?

Lauren Colenso-Semple
Same answer.

Dr. Andy Galpin
I need you to reiterate this one. People are really surprised when we say that there's a lot of research that men and women will improve strength and grow muscle at the same relative rate, especially if you account for lean body mass. It's the same rate of progression.

The absolute load is higher, as you said, three or four times now. So what does that tell us about the role of estrogen, testosterone, progesterone, et cetera in anabolic capacity, in our ability to gain strength?

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Lauren Colenso-Semple
Probably that it's negligible.

Dr. Andy Galpin
Expound.

Lauren Colenso-Semple
Well, if there were these profound effects of these hormones, then we would see some acute effects in these performance tests. And we would also see that those people I described who have those larger peaks, they'd be more muscular. We don't see any trend like that whatsoever. And we see, even with testosterone levels, assuming they're in the normal, which is a broad normal range, that that's not predictive of your propensity to gain size or strength either.

So I think other than to say testosterone during puberty is meaningful, when we look at the effects of short-term fluctuations throughout the menstrual cycle, or even menstrual cycle irregularity during the menopause transition, or the downregulation of the hormones during post menopause, we're not seeing a drastic loss of muscle. We're not seeing an inability to gain strength in response to resistance training. So they can't be the key factor here.

Dr. Andy Galpin
So rewind. If we look at that 18 to 35 or 40-year-old population and we look at men and women, and we grant the fact that men are going to have substantially higher testosterone in those populations, but they're both going to increase muscle strength and muscle size at the same relative rate, and if we continue past that to the midlife range and we get into perimenopause and postmenopause, does the same hold true?

Do we see men and women still having the ability to gain muscle and strength, the same relative rate, even when we have, again, a clear basal hormonal change? Does the same thing hold true, or does the answer differ now?

Lauren Colenso-Semple
The same thing holds true. I think we could say, if we're getting into our 70s and 80s, that the magnitude of response is perhaps lower. But you're also talking about people who, if you have an exercise before, you're also starting to lose muscle. And so it depends on the question because on the flip side of that, when you look at masters athletes, is they're crushing in their older years. So we can't say menopause.

We can't even say aging. We can say, OK, when we look at cross-sectional studies, there's an age-related trajectory of muscle loss, if we are comparing groups of people in their 80s to groups of people in their 40s, different people, mind you, but we're not taking into account your physical activity or your nutrition.

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So this doesn't mean you are doomed and you will lose muscle and strength as you age, what it means is you should lift weights. And it's a powerful stimulus. And it's never too late to start, which I think is a really encouraging message because we do see people who have never exercised, who start lifting weights at 75, and they still gain muscle.

Dr. Andy Galpin
So to be really clear, what happens to strength through menopause?

Lauren Colenso-Semple
Nothing.

Dr. Andy Galpin
What happens to muscle size?

Lauren Colenso-Semple
Nothing.

Dr. Andy Galpin
Independent of--

Lauren Colenso-Semple
Of age-related loss.

Dr. Andy Galpin
Or independent of lifestyle changes?

Lauren Colenso-Semple
Correct.

Dr. Andy Galpin
If you don't exercise, or if you were exercising and stop exercising, you're going to lose muscle size. You're going to lose muscle strength. So the woman who says, bullshit, Lauren, when I went through menopause, I lost a ton of muscle. We will always accept and acknowledge the fact there is individual variation, totally believe your experience.

Lauren Colenso-Semple
Sure.

Dr. Andy Galpin
But most of the time, that is a result of change of lifestyle, nutrition, exercise, or other things rather than the menopause. And then probably more directly, rather than the specific change in estrogen based upon the data that is available right now. Is that fair?

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Lauren Colenso-Semple
I would add that 60% to 70% of women will gain weight during the menopause transition. And so if you've gained body fat and have not put on a similar increase in muscle mass, then your body composition has changed, which will make it appear that you have lost muscle, when in fact, it's the other lever that has been pulled.

But yeah, going back to those original hypotheses that were generated by those rodent models, we do not see that pan out in the menopause transition because you can follow people. And they did this in the SWAN study. They followed people throughout the transition. And although you can see a trend, on average, for increase in body fat, for muscle mass, at least across the transition, it's fairly stable, which is really indicative that the absence of estrogen is not the culprit.

And this is furthered by the studies that we now have on estrogen replacement therapy, and looking at people who have been on hormone therapy versus not. And there are no differences in their lean mass. So that's not the protective effect helping you maintain muscle that one would hope. Again, not accounting for exercise or nutrition.

Dr. Andy Galpin
Of course. Right. You're trying to tell me that if I take a bunch of TRT, that I'm not going to aid in my muscle growth because you said testosterone plays no role in muscle?

Lauren Colenso-Semple
I didn't say testosterone plays no role in muscle.

Dr. Andy Galpin
Oh, OK. You know what's happening in the background here when you have that. So fill in the caveats that are necessary before the internet tries to kill you on your position here.

Lauren Colenso-Semple
Well, I've said several times that the biggest boost you're getting from testosterone is during development. So that is the key here of when testosterone is really working its magic. And then there's the caveats of you are below a normal range, and could that potentially affect your ability to grow or maintain muscle? Sure.

And then we have our friends who are way above the normal range. And they're getting some help. And that can be extremely powerful. And we have data in men and in women that show, yes, when you have high levels of testosterone, exogenous, yes, it's helpful. But when we're talking about normal range for you, even if your normal is much higher than your friend's normal, that doesn't necessarily mean you are stronger and more muscular than your friend.

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Dr. Andy Galpin
The comparison here is, I think, really clean because of your estrogen and ovary example, going from a level cutting it to zero is very, very different than slightly slowing down over age. The testosterone one is the same. If you are subclinical and you go to normal, that's great. But going from normal to high normal is not the same thing as going from zero to middle.

And going from middle or high to way outside the-- those are not the same things. These things do not scale in a perfect fashion. They move independent. So it's my summary of the literature, and it sounds like you're agreeing that if you're within a normal testosterone range, just because you're a little bit higher, a little bit lower, that might change your symptomology, male or female, libido or energy recovery, but it's not necessarily going to predict who's going to grow muscle faster.

Now, if you are subclinical, you have a disease and/or you add on top of that pharmacological dosages, well then, yeah, we play a role. So if you are really, really, really low, again, probably sub 200 for men or something like that and you get back normal range, it might help you there. Certainly, feeling wise.

And then, of course, if you take exogenous testosterone past physiologic levels, you'll feel that. But what we're discussing is, within a normative range, is being a little bit higher, a little bit lower matter? And we can add on top of that the data from, the limited amount that we have, though, from what happens to muscle growth in women, especially in post-menopausal. When they take testosterone, it doesn't do much.

Lauren Colenso-Semple
No.

Dr. Andy Galpin
Are there other things? Again, for libido, yeah, potentially. But I think we have a clear enough answer because we're seeing it from multiple sides.

Lauren Colenso-Semple
And to that point, the doses that are given to postmenopausal women are by design in that really, really low, normal range because we don't want the potential side effects that come with going super high and you don't need to for low libido. So why would you?

Dr. Andy Galpin
Yeah. What I really appreciated about your explanation here is this stuff is confusing. And for the average consumer, it's like, oh, my gosh, one person's telling me this and then telling me that over there. I think it'd be helpful if you help people understand a little bit of, I'll call it scientific literacy.

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How do I be a better consumer of information so people can hopefully leave this not feeling more confused, but feeling more empowered and saying, OK, just because they disagree with Dr. Lauren, they're not all liars? They're not all wrong. But how do we think through this stuff so that we realize there's maybe certainly some disagreement with other people? But there may not be as much as we think here. It's a little bit of a balance of data quality.

Lauren Colenso-Semple
Yeah. I think as scientists and science communicators, we need to make sure that we're really transparent about the data that we're citing rather than just saying, science says, and then here's a PubMed ID. Because a PubMed ID could be associated with a narrative review, which is, as we discussed at the very beginning, a state of the literature, a summary. I can pick whatever references I want.

And the purpose is to say, and therefore, let's explore these questions. Here's some food for thought for people who are doing work in this area. And there's nothing wrong with a narrative review, but it's not new data. And so we need to be really clear about that. Then we look at something like a cross-sectional study, or we're saying, OK, there's these associations here.

And does that mean that this causes that? No. And that wasn't the purpose of the study. The purpose of the study was to look at patterns that, again, are driving future research questions. So if we're seeing, huh, there's this association between, and this is a real example, people who drink coffee and people who get lung cancer, maybe there's something up there.

Would we want to say drinking coffee causes lung cancer? No, but the media did at the time, I digress. The reason why you wouldn't want to draw broad, sweeping conclusions about causation from that type of analysis is because you could be missing something critical. And in this case, they were.

Dr. Andy Galpin
Spurious correlations.

Lauren Colenso-Semple
Yeah. So people who drink coffee were also more likely to be smokers. And it was the smoking and the lung cancer, not the coffee and the lung cancer. So not that there's anything wrong with this type of analysis. It's a great way to get a lot of data. But often you might be pulling from thousands of medical records, for example. And so health care professionals are entering codes associated with a diagnosis or a drug.

And then you don't have somebody's full health history. There's limitations across the board. Now, we look at a rodent model. The reason why rodents are used in research is because you can do crazy, invasive things that would never be possible or ethical in humans. You can remove

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organs, you can delete genes, you can breed a whole line of mice that are mutants on purpose because you wanted to overexpress this.

Dr. Andy Galpin
And you can do it in a few months, not human generations. Yeah.

Lauren Colenso-Semple
But the purpose is to answer a mechanistic question that is constrained by this model that could inform and generate hypotheses that would then go on to be tested in humans. So all of this comes together, and it's all important in order to get to the place where we have these clinical trials.

And that's true in a new drug that is initially tested in animals, and then goes on to phase I, II, and III clinical trials before it is FDA approved. And OK, now, you know this is something on the market that people can prescribe. The problem with going from potential mechanism or rodent data to, and here's the practical recommendation, that would be like this drug worked in that rat, so you should take it.

Dr. Andy Galpin
At this dosage, in this timing.

Lauren Colenso-Semple
Of course, everyone will agree that sounds nuts. But it's equally nuts to do it about training and nutrition because our metabolisms are different, our physiology is different, our lifespan is different. So it stands to reason that what you might see in this model wouldn't pan out in the human model.

So we have to go through the process, as painstaking as it can be sometimes, before we can say, I'm confident that we need to change our current practical recommendations when it comes to how you should eat or train.

Dr. Andy Galpin
So if I'm looking at research, and it was in an animal model, be it murine or rabbits or cats or dogs or anything else, I should just throw it out. I should not pay attention at all. It doesn't matter. It won't help me. It's not needed.

Lauren Colenso-Semple
The better question is, why are you looking at the paper? Because if you're looking at the paper out of interest, sure. All the rodent studies that we discussed today, I think that's really interesting stuff.

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Dr. Andy Galpin
Yeah, it's really cool.

Lauren Colenso-Semple
We can sit here and we can have a conversation about potential mechanisms and maybe this and maybe that, but what we're not doing is taking that and translating it to the public. That's the distinction. There's a scientifically-interesting conversation to be had that has no place in practical recommendation.

Dr. Andy Galpin
I'll go one step further. So if a study has been done and it's not in women, if a study has been done and it's not in powerlifters, if a study has been done and it's not in 65-year-olds, so if I'm a 65-year-old powerlifter, the only study I'm ever going to look for, as a 65-year-old female, powerlifter. You see my point here. When is it appropriate to go look?

Maybe this wasn't done in a 65-year-old, but it was done in a 45-year-old. How is that different than looking at it and saying, well, that was done in mice, therefore, it doesn't count? When does it count? When doesn't it count? How do I think through that situation?

Lauren Colenso-Semple
There are clearly drastic differences between the rodent models and rodents in general and human physiology. There are fewer differences between men and women, between older women and younger women, between older men and younger women, especially when we think about exercise-induced adaptations.

So what we see comparing everybody, old, young, men, women, your training status is important in terms of the magnitude of adaptations that we would predict. So it doesn't mean that, oh, you need a different type of training program, or you're going to adapt differently because of your sex, or because of your age. Often what it really comes down to is your training status.

Meaning if you're untrained, we're going to see a whole lot of adaptation initially. If you've been training for a long time, then we're going to see fewer adaptations just by design. There's a limited capacity. When you think about, does this study apply to me? First, remember what I said earlier that no study is designed to tell you how to train.

However, given the number of studies we have that were initially conducted in young men, replicated in older men, replicated in younger women, replicated in older women, and we're seeing all of the same patterns here, training volume is important. Training frequency, probably not that important in and of itself. It's a function of volume.

And we start to tease out some of those variables and we start to see a lot of similarities. That's

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a good indicator that when we have a question where perhaps there's not as much data, I'm comfortable saying I can lean on data in these other populations.

Dr. Andy Galpin
Today's episode is sponsored by Eight Sleep. Eight Sleep makes smart mattress covers with cooling, heating, sleep tracking, and more. I've personally been sleeping on an Eight Sleep mattress for more than three years now, and it's absolutely glorious. I love it so much that I hate traveling away from home because I can't sleep on my Eight Sleep Pod 5.

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You get 30 days to try it at home and return it if you don't love it, but I'm confident that you will. I certainly love mine and would never consider returning it. Eight Sleep currently ships to the US, Canada, the UK, and select countries in the EU, and even Australia. Again, that's eightsleep.com/perform and use the code perform to save up to $350.

So we don't have any sex-specific differences that are aware at this point, and there's been enough research to suggest it's probably not a thing. We have enough research on age. We don't really see a difference outside of pre-puberty, much of a difference. So is it fair to say just because a strength training study hasn't been done in females, or doesn't include females in the study design, that that study needs to be replicated in women?

Lauren Colenso-Semple
I think people use that argument as a rationale to spread misinformation. Because if I make a claim that, well, clearly the program for the 65-year-old female powerlifter needs to be drastically different, throw everything out the window that you know about training powerlifters.

We're not even squatting, benching, and deadlifting anymore. We're doing something else

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because you're a 65-year-old woman. And then someone comes to the comments and says, wait, what? This sounds insane. And then my response is, well, show me a study that shows that this training works.

Dr. Andy Galpin
The burden of proof has gotten flipped in that scenario. So right now, the state of the research suggests the rational reason is that the status quo has not been sufficiently challenged to the point where we need to change it. It's been challenged and it's holding strong.

So in light of new data, new evidence, research to suggest the status quo, the status quo being training philosophies, training approaches have no sex-specific bearing at this point, then we need to continue on with the normal practices that we feel like have been established for, you mentioned, volume and intensity and frequency and exercise choice and all those other things.

So we just do not have any real rationale for age, menopause, sex-specific strength training programs. And there has been research in those areas. And we feel comfortable in that answer.

Lauren Colenso-Semple
And if there were large, substantial differences, then we would have picked up at least a signal here. When we think about something that has evolved in the past 20 years, the question of the strength endurance continuum comes to mind, or concurrent training. Another example where you say, OK, well, we started here and we used to think this.

And then there were many studies over many years in different populations, and then we landed here. And I think we've gone through a similar journey, but some people aren't willing to acknowledge that we've done this work, that it does exist because there's a desire for differences.

Dr. Andy Galpin
If I were to ask you right now your specific training recommendations, regardless of anything you said, I'm a woman and I just feel more comfortable when a female scientist in this area gives me training recommendations, what would they be for the average? I want to gain some strength. I want to gain some muscle. I want to do those things.

Lauren Colenso-Semple
The most important element is your training is challenging enough, meaning you can do a set of six, you can do a set of 12, you can do a set of 15, or anything in between. But when you finish your last rep, that sixth rep, or that 15th rep, you should feel like you could only do one, maybe two more.

If you're not there yet, the weight isn't heavy enough and you need to increase the load. And

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challenging loads are going to vary from one exercise to the next. So if you're just getting started with a training program, it'll take some trial and error to find out, oh, what is a challenging load on the leg press versus the overhead press? You're going to be stronger on the leg press.

There's a lot of flexibility here. There's no must-do exercise. There's no must-do rep range. There's no must-do length of workout or days per week. The point is that it needs to be challenging, you need to stick with it and do it consistently, and you need progression over time. So as you get stronger, we need more load.

Dr. Andy Galpin
I remember last season when I had Bret Contreras in here. And I asked him a similar question, how does strength training differ between men and women? And he actually had a great answer, which is there's nothing physiological, it's just the fact that there's a preference.

Lauren Colenso-Semple
Sure.

Dr. Andy Galpin
Women generally prefer to train their lower body, their glutes, specifically, obviously for Bret, and men tend to want to train their arms and pecs more. So he's like, from a coaching perspective, I will program those things more frequently, but not physiologically, just because I know men are going to want those outcomes on average, more likely than women.

And I thought that was a really clever, insightful answer because he's actually a coach. He's been through it. And he was answering not just what the data are, but he's saying, what do I think you should do based on my experience as a practitioner? So I think that's a reasonable approach to saying at this point, the argument of sex-specific against strength training stuff, you're going to have to get to secondary considerations.

Lauren Colenso-Semple
And Bret's example is individualized, goal-oriented training.

Dr. Andy Galpin
That's all it is.

Lauren Colenso-Semple
So I'm sure if a female client went to him and said, I just really want to grow my traps.

Dr. Andy Galpin
Yeah, sure.

Lauren Colenso-Semple
We're doing shrugs.

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Dr. Andy Galpin
Sure. I realized at this point we focused almost entirely on strength training and other things, which is fine. We like lifting weights.

Lauren Colenso-Semple
We do.

Dr. Andy Galpin
This is what we do. I'm wondering, how do you feel about some of these questions if we think about other types of exercise? Endurance, if we think about fat loss, if we think about some other common goals, how much would your answers change on some of these questions? Anything that's popping to mind that you go, oh, actually, this is an instance where it does matter more that it's female versus male, or do we have anything at this point? Or am I just going to continue to get that look from you?

Lauren Colenso-Semple
No. And when it comes to fat loss, we know that nutrition is the driver of fat loss. And so we need to adjust the diet. And if we're leaning too far into exercise, we're probably going to be disappointed. So we need to adjust the diet. A calorie deficit works for men and women of all ages.

With endurance exercise, whether you're doing sprint training or longer form, whatever zone you're training in, first, only do that if it is conducive to your goals. So if you tell me, I want to run a half marathon, then depending on the coach you hired, there are different styles of programming. But let's say broadly, you'll probably be doing a fair amount of moderate intensity work and then sprinkling in maybe some tempo work, maybe some higher intensity interval type work into your overall program.

Again, that's goal-oriented training that is appropriate for men or women of any age. But we shouldn't end up saying there's a sex difference there. And there are large-scale, systematic reviews, meta-analysis at this point, grouping men and women of all ages, showing, OK, how are we adapting to lower, moderate, and higher intensity endurance exercise? The adaptations vary, again, based on training status more than anything else.

Dr. Andy Galpin
We don't have to waste too much time here because I already know the answer, and you alluded to it there, but we don't have any rationale that a certain type of endurance training works better in women than it does in men, or the opposite.

Lauren Colenso-Semple
No. And for somebody who's just trying to be generally fit and healthy, my advice is do what you

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enjoy, or at least will do consistently.

Dr. Andy Galpin
So even if there is potentially a physiological thing happening there, practicality will trump the effect. The fact that you're more frequent, you're more consistent, you do it harder, you give better effort to it was going to be more impactful than the maybe potentially moderate, if any, physiological difference exists.

Lauren Colenso-Semple
Sure. And then time efficiency is a factor. Maybe if you want to get it done quickly, then maybe higher intensity work is the thing. But we shouldn't be chasing this or that modality or intensity for health or longevity purposes or fiber-type transitions. There's a lot of messiness, I think, in some of those recommendations that totally ignore whether this is something sustainable for that person. Because I think there's a solid rationale to say you should probably do some of both.

Dr. Andy Galpin
Yeah, of course.

Lauren Colenso-Semple
But most people won't.

Dr. Andy Galpin
Fair.

Lauren Colenso-Semple
So if we're going to meet people where they are, especially if we're talking about people who aren't fitness enthusiasts, they're trying to get in and sustain an exercise program, then my message is, do what you will do consistently. And maybe that's not even structured exercise. Maybe that's hiking with friends.

Dr. Andy Galpin
Yeah. Again, we don't want to ever discourage any physical activity.

Lauren Colenso-Semple
100%.

Dr. Andy Galpin
We can be better sometimes. We can encourage more effective routines. But if that comes at the detriment of anything, then we're going backwards. Yeah, OK. Agreed. Same page on that one. If we go back to the paper 10 years ago that you never wrote.

Lauren Colenso-Semple
I have a solid outline.

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Dr. Andy Galpin
I probably paid you for it, and I probably need to recoup some salary.

Lauren Colenso-Semple
Yeah. I was so well paid while working for you.

Dr. Andy Galpin
Yeah. You had a lot of interest in these questions. And at this point, it sounds like we've got many of them answered. So while sometimes I know it's frustrating that it feels like the field is moving very slowly, lots got done in 10 years.

Lauren Colenso-Semple
Yeah. And to be clear, I would be excited either way. I'm a woman.

Dr. Andy Galpin
I know what you wanted. You wanted female-specific recommendations. That was what you took.

Lauren Colenso-Semple
I honestly didn't-- I went in totally open-minded. I just wanted the information. I'm a curious person. I wanted to do the work. I think the work was important. And the fact that we aren't finding differences isn't a failure, like the null finding isn't bad.

The fact that we've made all this progress, and we aren't seeing those differences, really simplifies things and gives us that level of flexibility that lowers the barrier for more people to start training because so few people are even meeting or close to meeting basic physical activity guidelines, period. So if we can say, hey, there's a lot of ways to do some really effective training here, then that's a win.

Dr. Andy Galpin
The fact that there are not these female-specific training recommendations, as you just said, it is a huge win for women.

Lauren Colenso-Semple
Yeah.

Dr. Andy Galpin
It's a win all the way across the board and should not be interpreted as anything besides that would be my hope. Are you still interested in this field then? Are there any questions left?

Lauren Colenso-Semple
One question that is less exercise related, but I think still relevant is the effect of body-fat redistribution, for lack of a better word, or preferential accumulation in different areas that seems

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to occur in some people across the menopause transition because that is an area where there's a lot of proposed mechanisms that are estrogen related, but we don't understand it.

And we don't understand why it's happening in some people and not others. And that's an example for everything menopause related. When you think about, OK, if we're going to say the absence of hormones does this, if it only happens in half of people who go through menopause, it can't just be the hormones because everybody's decreasing their hormone levels.

So it must be more complicated than that, which is not surprising because of course, it's more complicated than that. But I think that's a scientifically interesting question, to be clear, because the solution, if you want to lose body fat from any area, is a calorie deficit. So we already have the solution. My advice wouldn't change. But as a scientist, I'm interested in the underlying mechanism.

Dr. Andy Galpin
Yeah. We want to know physiologically what's happening. And the goal, or the hope there would be once we know what's happening, that would allow for more precision recommendations, if such things existed. And we can't necessarily blame it all on estrogen or cortisol, darn, at this point. So I can't take my cortisol blocker and just keep my belly fat away.

Lauren Colenso-Semple
Sadly, no.

Dr. Andy Galpin
Ah, rough. You know what's interesting? Many years ago, I applied for an NIH grant, and we intentionally wanted to do 35 to 53-year-olds. And we got laughed out of the building. You can imagine why.

Lauren Colenso-Semple
Yeah.

Dr. Andy Galpin
Typically, you do aging research, or you do cheap research, which means college kids. And I don't think people realize how little has been done in middle age. And why I'm bringing this up is I think there's a lot of questions there because it leads into the menopause transition.

Lauren Colenso-Semple
Sure.

Dr. Andy Galpin
And there's just almost nothing, right? If you're perimenopause or something post, there's some questions there, especially the post because it has this clear estrogen is now gone. And we have

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this link that we can do there, some stuff now in the perimenopause, but I actually think it's really interesting to capture that 5 to 10 years before.

I think that's how you're going to start to figure out, well, what's causing these? Is there anything predicting these symptoms, predicting these things? What happened? But we don't know because it's just show up to the door, already here. And now let's see what's going on. And I think that's a weaker place to be scientifically.

Lauren Colenso-Semple
I would hypothesize that the stronger you are, not even muscle strength, but the fitter you are, the more committed to a lifestyle that includes exercise when you enter the menopause transition, the better you will fare. So I want to encourage people to start being active and certainly lifting weights because if we're going to say there's this age-related trajectory for muscle loss, we know exactly what to do to combat it.

Dr. Andy Galpin
Yeah.

Lauren Colenso-Semple
We have the secret sauce, and it doesn't cost much.

Dr. Andy Galpin
Yeah, fair. I'm really surprised it hasn't come up today and you haven't been focusing on much of it, at least that I've seen the last couple of years. But low-energy availability in women, RED-S, when I think of the question of, again, female-specific, that's one of the only things that comes to mind is something that's not exclusive to women.

Men certainly can experience low energy availability, but it's certainly more pronounced, particularly in female athletes. So it'd be great to hear your thoughts right now on those categories. But in general, are there any other big things that stand out of those things, like, oh, actually, if you are working with a female, you may want to consider this.

Lauren Colenso-Semple
Yeah. I think it's important to point out that this is a real concern for the female athlete population. That often does not mean it's a concern for the general public. I think there's a bit of a misunderstanding that, if you are a woman, you are susceptible to low energy availability when you're just doing really normal fitness.

Dr. Andy Galpin
Well, if you look around the world, the vast majority of people are not suffering from too little of energy intake. It's not a general problem we're facing.

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Lauren Colenso-Semple
As defined in the literature, low energy availability is a mismatch between energy you are consuming and energy expenditure from exercise.

Dr. Andy Galpin
And we differentiate this from caloric deficit.

Lauren Colenso-Semple
Yes. Because we-- and so typically, that means there's a lot of energy expenditure. There's a lot of exercise. Maybe you're doing a couple of sessions a day and you're underfueling those sessions, and/or you're intentionally trying to maintain a low body fat, either for performance reasons or aesthetic reasons or otherwise.

And the problem with the literature on this is the equations that are used don't take into account all of the other energy expenditure. It's just exercise energy expenditure. So what are you doing for the rest of the day? And that should be in the equation. So I think as a scientific community, we'd really benefit from a better, more holistic view of that.

Because as we know, energy expenditure, like exercise energy expenditure in and of itself, it's just a small component of total energy expenditure. That said, there's also a disagreement about how to identify. Are you just looking at menstrual cycle dysfunction? Should you be doing a bunch of blood work and monitoring these physiological parameters, or should you be doing more subjective, how are you feeling? How are your energy levels? Survey type.

I think there's probably an argument for a combination, but maybe without that really strict cutoff point that we have as a number of when you're "too low" if you're just plugging in energy in and energy out through exercise because we're not getting a complete picture.

Dr. Andy Galpin
Why do I even care about low energy availability in RED-S? Why does it matter if I'm in that state? Am I supposed to be? What's the problem?

Lauren Colenso-Semple
Well, if you're in that state because it's required for your sport for a finite period of time, then the key is get in and get out as quickly as you can. And the get out part is something that we are still trying to understand. How long does it take to fully recover? And in some cases, it seems like it's a pretty long time.

So we want to avoid being there for a long period of time and certainly going back in. So you think about a high level bikini competitor who's doing multiple shows a year, probably not great.

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Dr. Andy Galpin
What's going to be the problem? What would be some examples of things that go wrong when we are in too much of a caloric deficit for too long? And I will, for you, differentiate. We're talking about caloric deficit with the addition of really high exercise output because it's not necessarily the same if I'm just in a caloric deficit, and I'm working out three or four times a week.

It's that additional, I'm probably training multiple times a day, that becomes the extra problem. So what are those problems that happen when I do that? I actually prefer if you stick almost specifically to what happens to women on this because for men, it's far easier. It can happen.

Lauren Colenso-Semple
Yeah. So again, we're talking about underfueling and doing a lot of training and doing that for an extended period of time. So this is chronically.

Dr. Andy Galpin
This is months to years probably, not weeks.

Lauren Colenso-Semple
Right. And then menstrual cycle dysfunction or loss of your menstrual period is very common. It's one of the earlier signs. But if we look underneath the hood, there are issues with the endocrine system more broadly. There can be cardiovascular issues. There can be gastrointestinal issues.

There can be downregulation of muscle protein synthesis to the point that you're probably not building any new tissue, and you might be losing some. And loss of bone mineral density is another big one. So it's bad on so many levels.

Dr. Andy Galpin
Yeah. It can be really problematic. And you said it, but when you say, coming back out of this, it takes a long time. Clarify.

Lauren Colenso-Semple
Well, you might think, OK, if I just lower my training load or start eating more, then I'm good.

Dr. Andy Galpin
Yeah. Take a week off. Have a cheat meal.

Lauren Colenso-Semple
But often, even just recovering the menstrual cycle can take months and months and months and months. And then if we think about other systems that were disrupted, then they need to recalibrate. And that doesn't happen overnight. It doesn't happen in a week. And if we have experienced loss of muscle or bone, then these are time-consuming repairs, if the damage isn't

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permanent.

And not to fear monger, but there is a scenario, especially if you're somebody who is quite young, like a teenage gymnast, for example, and you're not even at peak bone mass yet. Like this can be pretty detrimental long term. And so I think we definitely want to increase awareness, really focus on a more robust approach, not only from a research perspective necessarily, but certainly at the clinical level, at the coaching level because it will be highly individualized depending on the athlete, the sport, the performance demands, and the schedule that revolves around competition.

Dr. Andy Galpin
I would love to finish with your advice for the average woman. They're not a scientist like us, but they're trying to navigate this field. So what would you tell them? Anything you could share about, number one, how am I just consuming this information? How do I help so that it's not driving so much anxiety? At the same point, I also feel heard and acknowledged and things like that.

Lauren Colenso-Semple
I think relying too heavily on any one creator is probably a bad idea.

Dr. Andy Galpin
Excellent.

Lauren Colenso-Semple
We want a variety of perspectives, and we want to consider whether the context of that person's messaging is applicable to us. So everything I just said about low energy availability might not be applicable to you. So throw it out. So we focus on, OK, what are the basic, most important things that we need here? And let's not get distracted by anything that's going to disrupt that foundation.

And that foundation is your consistent challenging training program. And then the next layer of that might be your consistent diet. And if fat loss is a goal, then a calorie deficit will enter there. But when we disrupt the consistent, challenging, progressive training program to do a group fitness class or switch up the timing of our exercise or throw in some high intensity training that we never used to do and we don't really like.

And then therefore, our foundation is all sprawled because we thought we were supposed to do this, or we stop the diet that was working because we heard that this food was bad or supplements are catching our attention and then we're no longer getting fruits and vegetables. Whatever the thing is, we need to make sure we're coming back to that core.

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And don't change something that's working. And what works for you might not be endorsed by your favorite creator. But if you are making progress towards your goals, it's working. Stick with it.

Dr. Andy Galpin
I love that. The way that we teach students, graduate students specifically, about how to read research is you always look at it from multiple labs. That's what you're saying. Right?

Lauren Colenso-Semple
Yeah.

Dr. Andy Galpin
So one podcast, one person, make sure you're consuming information, ideally from multiple perspectives. Don't fall too much in love, unless it's, of course, falling in love with me and Perform, then follow it blindly. The second question now to this is, could you give anyone some advice here?

If they're trying to go on this self-guided journey, they're trying to learn more about how they're-- you've told me multiple times, what works for you, what does that mean? How do I figure out what works for me? As I'm navigating some basic fitness and nutrition, what should I be paying attention to? Should I be buying? Just walk me through what it means to figure out what works for me.

Lauren Colenso-Semple
So if we have something that we're already doing and we're doing it consistently, stick with it. Keep doing it. Don't change it. Now, if we want to experiment with, let's say, fasted versus fed training, nothing changes about the training. But let's do a couple of weeks of fasted training, and then let's do a couple of weeks of fed training, or even just a couple of sessions and a couple of sessions.

You can split it up however you like, but give yourself enough of an exposure to both that you feel like, OK, I have a genuine sense of what feels better for me. And again, only if this is something that you feel is important to explore for you. If sometimes you train fasted and sometimes you train fed, and you're not worried about it, which I think most people don't need to be, then that's fine.

But if you wanted to say, OK, well, I'm really curious about whether I feel better doing one thing or the other, the important key is we want to ask the right question, and we want to try to keep everything else the same. Because if we change too many things at once, we have no idea what was making the difference.

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And so that's true, if you were going to start experimenting with different rep ranges or different intensities. You need to do the thing for long enough without changing the surrounding things in order to appropriately and critically evaluate it.

Dr. Andy Galpin
Is it a month? Is it six weeks? How long should I generally hold a variable before I worry about a training program? How long do I know between whether it's not working, and I'm just not paying attention, or I haven't given it enough time to see an adaptation?

Lauren Colenso-Semple
I think most people don't give it enough time, just generally speaking.

Dr. Andy Galpin
Probably too quick on the trigger.

Lauren Colenso-Semple
Yes. And so a training program, two months minimum. I'd rather see three or four. And also remember that what worked well for you in the beginning, you're never getting results like that ever again, regardless of what program you use. And people are so quick to make mistakes like that. Like, wait, no, it must have been that one thing that I did. No.

Anything you do in the beginning is going to be effective. So try not to change too many things too quickly because we can't have progression, if we don't stick to it for long enough. And progression is key.

Dr. Andy Galpin
Fair or not fair to say we do have a strong amount of research on women and women's health. We always need more, but there's a lot where we can make conclusions. There doesn't see really any rationale at this point that we need to train differently simply because we're a man, simply because we're a woman.

We seem to progress our strength, our muscle growth, all this seems to progress at about the same rate, whether we are young, whether we are old, whether we're going through the menopause transition, whether we've completed the menopause transition. At the same point, you should always coach the individual.

So if they're having symptoms or lack of progress or simply like training in a certain way differently based upon a physiological factor, like menstrual cycle or like anything else, as long as they're then staying within the evidence-based practice, general categories, then that's absolutely fine. They're not doing anything wrong. They're not misinformed. They're not leading to bad guidance.

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They're just simply using what we've been saying for as long as I think our field has been around, which is it's always individualized, always take things into account for what they do. You're excited for more research, hopefully, in the perimenopause-menopause window. That is an area that needs more work. And finally, that I am clearly the greatest mentor you've ever had in your academic and personal career. Is this all fair summary of what we discussed today?

Lauren Colenso-Semple
Totally accurate.

Dr. Andy Galpin
Yeah. I don't know if anybody has ever, in your career, given you more unsolicited advice than me.

Lauren Colenso-Semple
Sometimes you call me and say, can I tell you something?

Dr. Andy Galpin
And then I don't let you talk.

Lauren Colenso-Semple
Correct.

Dr. Andy Galpin
Yeah. This is true, friends. This is 100% true. This happens. I think you've done a tremendous, I've told you this in person, I'll tell you this in public, you've done a tremendous job with your career. You're at the very beginning. I think what you're doing is very, very, very valuable. You're going to do more great work.

So thank you so much for coming in today. I know it was a long flight. Thank you for babysitting my daughter on several occasions, teaching my classes for me, and for just all the work that you're doing to hopefully give people that care about these topics a breath, a relax, a de-stresser, a more motivation.

And we've taken some unnecessary burdens away and given people a positive note to say, you have been heard. We're out there, and there are some interesting questions left. But a lot of the stuff that is causing some anxiety, we can probably not worry as much about and get back to things that are more interesting. Thank you so much for being here.

Lauren Colenso-Semple
Thank you.

Dr. Andy Galpin
Thank you for joining for today's episode. My goal, as always, is to share exciting scientific

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