Introduction and Harpreet Raiu2019s Background

Hi everyone. I'm Doctor Sanjeev Goyal, and you're listening to the advanced Anti-Aging and Technology Summit. Today my guest is Harpreet Rai. Harpreet Rai is the chief executive officer of Aura and a member of its board.

His purpose is to be part of a team that is committed to improving the well-being of others under his leadership. Aura has grown to a team of nearly 100 employees and has launched his generation two ring, shipping over 100,000 units to 90 different countries.

He is responsible for Aura's vision and strategy, and guides decisions that ensure the organization's financial health. Before aura, Harpreet was a portfolio manager who led a technology, media and telecom portfolio at Eminence Capital for nine years.

He began his career working in Morgan Stanley's mergers and acquisitions group. Harpreet studied electrical engineering at the University of Michigan.

I'm sure you're going to enjoy today's talk with Harpreet. How are you, Harpreet? I'm good. Sanjeev. You know, I'm probably like, you're running a score.

I want to say like 84 today. Doing pretty good. Pretty good? Yeah. How about yourself? Yeah, yeah. My ready to score is I. I track this religiously for every to the last three years or so.

81 readiness for 87 sleep. So. Okay. It started like, at about 74 in the morning, and then I went back to sleep because I wasn't happy with that, that reading.

And I got up that up. I almost did the same because I had like a 93 yesterday. So I was like, should I sleep in an extra hour? But I was like, 84 is pretty good.

I, you know, let me let me get about going. My day. So glad I did. So I was just telling you just just offline that, you know, everyone I've interviewed, all the biohackers and scientists and doctors all have offerings, so it's nothing like it's really has taken over.

I think the biohacking community and all the physicians are interested in precision medicine. They understand the value of of the technology. But maybe before we get into that, I'd love to just if you just give a bit of background on how you even got involved in this field, why is it.

Yeah, why you want dedicate your life to this, to this, you know, area? Yeah. I mean, I honestly, I think for me it is a little bit of probably, you know, an interesting health took place for me at a young age, primarily out of two reasons.

One, fear, unfortunately just saw too many loved ones and grandparents at the time just have a heart attack or stroke or pass at a young age. So all four grandparents of mine about heart attack and stroke in their 60s.

And one of my grandmothers actually was living in Windsor, Canada, not not too far from Tryon. She passed in her late 50s. And so congestive heart failure.

And, you know, I was only like ten years old, but I think it was like the first time sort of realizing, like, that shouldn't have happened. Right? I think.

Just even as a young kid, hearing, like, I was so young, so young and then, you know, like, oh, wait, how long did people live? Because you don't really think about that stuff when you're a ten year old and then like, no, 70, 80 years old and you know, she's like, you know, not even 60.

And so, and then, you know, shortly after that. So, all three other grandparents had a heart attack or a stroke, luckily. Didn't you know, they didn't pass, as quickly, but, still, and then I think from the performance side, my own personal experience was I felt like playing try to play sports.

You know, I just felt like I had to work twice as hard to be half as good as everyone else. So I felt like no matter how I trained or what I seemed to eat or thought I was eating or how I was eating, that I just, you know, couldn't couldn't perform at the same level as my teammates.

And my sport was soccer, you know, five, five, five, six with a turban, as I like to say. Yeah. And like the Indian wrestling. Yeah, exactly. I wish. But, Yeah. But.

Yeah, I think, so for me, it was like a little frustrating. And then I started to just track things religiously to a young age because, you know, I started learning about exercising calories, even just out of frustration, being forced to learn about that stuff.

And then, I think, you know, long story short, I studied electrical engineering. My dad was an electrical engineer, and my grandfather, one was an electrical engineer as well.

And, I specifically studied sensor tech, you know, mEMS, which is, you know, movement sensors, accelerometers. But but even now, lots of things like the optical sensors, along with the movement sensor and whirring is coming from mEMS technology.

And, that was really my first ideas. And like thinking of like, well, everyone's body is different. You know, my body reacts differently. Where am I in my health?

How can I improve? What what's good for me? Well, I had this idea of like, well, eventually we should all just have these sensors, and these sensors should just measure where we are.

I, you know, ended up not going directly into health and engineering when I graduated, but into investing. I worked at a year after college at investment bank at Morgan Stanley and and spent nine years the hedge fund and at the bank I gained 50 pounds.

Why Harpreet Entered Health and Biohacking

And that was probably my first time being seriously overweight. You know, it was like 190 pounds, right? Doing investment banking and then, and the preceding probably 2 or 3 years, that's when I became just a whole different level of dedication.

And then I lost about almost about 55 pounds, got down to like 135 pounds and, you know, had visible abs, like for an injured person. I feel like that doesn't happen much.

But, like, I just, you know, I started tracking every single meal I ate. I started, you know, in a spreadsheet. I used to weigh my food. I went on my first keto diet, probably in 2009, my first intermittent intermittent fasting diet, 2010.

And, you know, I'm actually not one of the founders or I'm the CEO, but I met, one of the co-founders and eventually all of them, you know, after I had just on a Kickstarter for the generation one ran.

And, I saw what they had. And even though the ring was really big and bulky, the battery life was only one night. I sort of knew the advance. And so it happened.

On the technology and power consumption side from both my investing and engineering, experiences. But even more, I think, you know, what I saw was like, how many people needed this?

Like, because once I started using the product and it's so easy to track sleep and things like nature, brain recovery, I could just start to make better day to day decisions.

And I felt like that ease of knowledge and access to the human body on a day to day basis, without having to use spreadsheets, without having to use things like, you know, even a wave which a lot of athletes used to use or just doing, you know, a chest strap measurement and heartbeat for the morning.

I just found something. This was so easy. So, so easy to stick to. It's just such an easy reminder. I could just look at my data and be like, oh, no. Yesterday I slept like crap.

That's right, because I ate like, don't do that again today. And I want to do it again today. And so I think, I, you know, the founders need some help growing the business, generating revenue.

You know, I think just understanding how to get to profitability, basic business things. But I understood all the technology, too. And so I think we just we just hit it off.

I ended up investing in the company during the board of directors. I think three months after that, I was spending probably 30 or 40 hours a week with them versus my regular job.

And, you know, they asked me to join full time, which I did. And then, you know, after a year, but the board and founders thought it made sense for me to be CEO.

So, yeah, it's been three years now a CEO, four years with a company and five years as an investor. So, but it definitely been a journey. But it's it's been a ton of fun.

I think you're right at the exact right time. I mean, this technology, you know, the ordering came, right? I think the time of technology made it possible and all the interest came in also asleep at the same time, I think we also see an understanding of the impact of sleep on our health.

And, you know, so it's it's a whole, like, perfect storm. So maybe I just loved if you could just maybe chat about one of the cool features that you think make, you know, they're ordering special.

Yeah. I think that would be really cool. Yeah. I think, look, I think sleep and tracking sleep, frankly, if you look at wearables today, even still, the Apple Watch doesn't do it.

You know, they'll track time in bed, but that doesn't really tell you much. So I think understanding sleep deep sleep, REM sleep, the different stages of sleep, even just frankly like consistency of sleep, timing and how much that makes an impact on circadian rhythm.

But, I'd say the other one is really heavy. I think so many of our users probably look at HIV as, as you know, I think the science indicates that an overall measure of stress, whether it's physical stress and recovery or, frankly, mental stress.

And so I just think, such an easy, accurate way to do it. We're the only commercial wearable. Still shock. Well, doesn't shock me. No. Why? But we're the only wearable that's showing that our data, our sleep data, you know, our heart rate and our heart rate variability, heart rate and heart rate variability.

Data during sleep is 99% and 98%. Correlating EKG and no risk based wearable has shown that. And so I think for us, it's just such an accurate measure and such an easy thing to do.

You know, you bring weighs four grams or five, you know, less than five pennies. And, you know, just sort of put it on and forget it there, it's there.

And in the last a week. So I think it's that accuracy and the data it looks at and then also the convenience, those two things together, the accuracy and the convenience I just think are are so easy to make, it so easy for the customer to use.

So maybe let's just, let's do a little bit of deep dive on, on each one of those. You mentioned the accuracy of the

sleep parameters, like I a sleep study, I guess.

Yeah. What exactly how does that compare to. I know Fitbit has sleep, you know, monitoring. Yeah. And I think I went to the World Sleep Congress. They did say that. Yeah.

It was one of the worrying was the most, accurate. But I'd love to just yet hear from you. Like how you. Yeah. How you proven that and, No. So, again, there's some good stuff coming on the way soon.

Publicly, probably in the next call in 6 to 8 weeks. That'll be out there as well. So I think, yeah. So the way you form these algorithms, essentially, and test them, you know, same way you create them is sort of the same way you test them.

You take a lot of people and you have them start to do what's known as the gold standard or referencing. In the case of sleep, it's probably scenography, like hard word to say, but it's it abbreviation is easier.

PSG, polysomnography and all that is, is if you were to go a sleep lab at University of Toronto, at NYU, wherever and what they do is they strap your head, you know, and even your nose and your mouth to probably 16 different wires.

So you have all these wires like, pasted to your head. It's really hard to sleep in a sleep lab. And, what they're looking at is, is, you know, breathing rate, heart rate, but but mainly actually, they're looking at your frequency of your brain that your brainwaves, the frequency, your brainwaves and the speed of those waves while you're sleeping.

And, they then score these, you know, sleep science is relatively new science, but they'll basically look at those different frequencies to figure out if you're in REM light and deep sleep, or if you're awake.

And so what you do to create these algorithms, as you look at all the data that's coming off your sensor, like in the case of an Or around the LEDs that move the, you know, respiratory rate, the heart rate, heart rate variability, even a temperature that we track.

And you compare it against these brainwaves and you create an algorithm. And so I think what, you know, wearables in general, I should take a step back sleep staging as a whole.

If I took that test and showed it to a sleep score at University of Toronto, where I showed it to sleep score at NYU, they'd agree on about 80% of the data.

So sleep's a pretty noisy science. They're still like, hey, were you really in REM sleep or deep sleep? Because it looks like you switch between the two, you know, three times within, you know, sort of that 30s or five minute epoch.

And you know, that five minute period in the, in the study exam.

Aurau2019s Sleep Tracking and Core Product Features

And so there's a lot of variability in how these are scored. So most people don't realize that. So the best you can sort of get even gold centered gold standard is about 80% accurate or 20% standard error.

I think wearables as a whole, you know, I think have shown sort of, you know, high 60s and I think even us that's what we've shown historically. And we were the first wearable to actually have an independent, sleep study analysis, Gen one, you know, which is a ring that came out in 2015, 2016 or Gen two just recently is starting to get some validation stuff done.

And we'll have, something updated there. But I think, you know, we sort of feel like we're in the mid 70s now, early to mid 70s. And so I think we'll have that validated pretty shortly here.

And so I think, that's going to be pretty exciting. But most other companies haven't really attempted to do much validation. I think that's like a little bit of a disappointing thing.

And I would I would point out here that what matters more here than accuracy is precision. So I think the benefit of a of a wearable as well, it may not be as accurate.

And I'll give a real life example. It can be more repeatable day to day. You don't want to go to that sleep lab with 16 wires, but you can sit in the comfort of your own home or anywhere, a hotel room, anywhere you are, and see the changes in the data.

So whether, let's say you're 40 minutes a deep sleep or 50 for 55 or even 60 minutes in deep sleep, what matters is, hey, those nights you have a lot of stress.

You drink alcohol and you, you know, eat really late, like you're up late, you know, binge watching Netflix. Right. Or whatever it may be. You're stressed out because of work or if you got in an argument with a loved one.

I think it's the change night to night. That's super important. And so we've actually focused our algorithms on that change, on our precision. Because that's sort of how the customer uses it and understands which lifestyle choices are good for them and which lifestyle choices are bad for them.

So it's not. Yeah. Forgive me. Give you an example. Like my wife regularly has a deep sleep over two hours. Wow. And if I have one too good one hour of 20 minutes, I feel that's amazing.

So you're saying it's not so important to compare it to somebody else, but rather against yourself? Completely? I can tell I want to make an hour and a half.

I'm very happy. If I'm at 45 minutes, it's a different type of sleep. Yeah, I'm not going to ever hit. Two hours is very unusual for me to hit that type of level.

Correct. And even for I think it's, you know, just like yoga, it's like, don't look at anyone else. Focus on yourself. Right. Like, you know, that's exactly right.

We've actually made our algorithms the way we calculate our scores, all based on a relative changes to you, and we'll actually rebase on you. So we have a rolling baseline, average.

But, you know, that way as you improve or if you get worse, it doesn't keep penalizing you as much and encourages you just to do a little bit better. So yeah, I think the relative change, it's trend lines, not headlines.

And that's something that Walker says often, you know, really famous sleep scientist and author, wrote Why We sleep. And so I think he's absolutely right with that statement.

It's sort of trend lines, not headlines that you want to look out for. That's really interesting. What you and I know I do noticed that, if you have a couple of good days and you can have it kind of helps.

Do you have another good day? I guess the algorithm is kind of like you build up to good days, try to jump from 60 to 90 over overnight. I mean, yes, I think partly because, you know, if you have one night of bad sleep, you can sort of like tough through it.

But it's like that repetitive, sort of like six hours, 5.5 hours, five hours in a row that sort of really wanes on you. So the way we create the writing is score.

It's specifically it actually looks at both last night of sleep and last day of activity, but it then also looks at a two week average of your sleep and activity balance, and then a bunch of physiological changes from the night before your heart rate, heart rate variability versus their normal, your respiratory rate and temperature.

And so we sort of get that long term view. And to your point, it's like, you know, you want to build a little bit of resiliency. You're not just going to go from a 60 to 90 just by one good night.

And then frankly, your body physiologically is, covered just with one, one night of recovery after a couple bad nights either. Right. Do you think that, so for example, activity part like I, you know, there's some people, perhaps are wearing it during the daytime only for the nighttime.

Like, are you seeing people get value from the daytime as much now? Yeah. No, I think 90% of our users wear it all day long. I think 10% just wear it all at night.

So yeah, we actually have now started doing a lot more activity things. So we added something called automatic activity detection recently. So that's a really new cool feature.

Yeah. You're asking about key features. So and as we call it automatic activity detection, you know, if you go skiing or snowboarding, yeah, you'll open the app and will even say, hey, where are you?

Just skiing. And, you know, you can confirm it. And by the way, it's an adaptive algorithm to you. So the more you actually confirm things or even if it's incorrect, you correct it, or if nothing comes up, just go in and add a tag.

Hit the plus button on the bottom of the right, of the app. That that algorithm actually gets personalized to you. So that's a really cool feature because most other, wearables don't personalized to the individual.

And they're slight variations in how we do these things and just how we all move. I think another really cool feature we're seeing get a lot more usage out of is, something we call moment or meditation.

So you can listen to an audio track or do an unguided meditation. And actually, after five minutes or a longer session, you can see your air ndVi and even your skin temperature change during your meditation session.

And as you continue to meditate, most people will notice trends where their heart rate variability improves more and more during the session. As a, you know, measure to sort of look at how relaxed you're getting during that session.

So I think that's really cool. And we even added something new called Sleep Sounds. So there's even a couple libraries where you can actually, if you have a hard time falling asleep or if you just like, you know, blocking up those sounds and listening to something, you can, you can actually listen to a couple of stories or soundscapes.

And we found users getting a ton of usage out of that. So I think as. Yeah, as we kept growing, you know, start from sleep, but have started to do a lot more during the day to keep engaging user and frankly, to keep them practicing healthier and healthier habits.

Right. Let's move on. Just before I move on from sleep, I know a lot of I think I may have even asked you this couple of years ago about sleep apnea, and have you been able to look at the data and, and maybe give some help to people who might be suffering from this?

Yeah. So very much a silent, kind of condition sometimes. Yeah. I think we're going to do more there. Right now, what we've seen with a lot of people that do have sleep apnea is they'll have a lot of interruptions in their data during the night, or they'll have really low stages of sleep deep or REM, and that'll be reflected in their data.

And so people start asking themselves, well, like I feel like I'm doing all the right things to go to bed, but I'm still not getting appropriate scores.

And so we've found a lot of people just noticing that and hence going and getting a sleep study done. And, and realizing they have apnea. But I do think over time we'll start to actually see what we can do as a company to do more in the app about like giving the user a little bit of a check engine light if something looks off.

The FDA is pretty particular, about sleep apnea. And so as a result, like we got to be careful and make sure we

have enough specific data on that. And probably, you know, like we've done and we did with Covid, do a large scale study, publish results.

Then when we make a feature, refer back to, hey, this look like data an X, Y and Z study. Or similar to that study, you may want to go see someone about it versus trying to, you know, what the FDA hates is if you try to diagnose or treat.

So I think let the user sort of give them enough data and enough context to make their own judgment call, and let a doctor make the diagnosis. But I think there's more we can do in the future, and I'm pretty excited for it.

So it looks like there is some type of signature, perhaps like from from the data you're collecting. Yes. I think that there should be like from heart rate or something.

You know, people, if they're going hypoxic, they should totally I think yeah. At high hypoxic you can definitely say changes proper changes in respiratory rate, heart rate and heart rate variability.

And frankly and frankly more fragmented sleep. Right. A lot more wake up, a lot more tossing and turning a lot more, you know, or more light sleep. Less romantic.

Oh, have you seen any are you collecting any way to find out the impact your, your app is having on people's health? Yeah, we so we did. I know something there a professor at UCLA, who recently did a study on behavior change in wearables.

And he recently just submitted that to a medical journal. So we're we're eagerly awaiting, I think what we have been told is that it's a cut ahead. Just because I think a little bit is focusing on sleep and recovery instead of focusing on steps.

I think most other wearables, you know, really just still focus, like Fitbit did early days of just hitting this certain activity score. And frankly, like we know the stats on activity, like most people unfortunately aren't as active as they should.

But even if they are and you eat really poorly, or if you're doing work super late at night, or if you're you know, drinking alcohol really close to bedtime, like you're never going to feel great, you know, the next day.

And so I think, I think just leading with sleep is something that is, frankly, more beneficial, lets people sort of understand those decisions outside of movement a lot better.

Like, you know, timing of food, quality of food.

Sleep Accuracy, Validation, and Personal Baselines

Right? Even just how stressful activities you want to engage in before you go to bed. So I think it just builds healthier lifestyle habits as a whole by focusing on sleep and then, as we know from the science of sleep, right, if you sleep better, you're going to have more energy, you're going to feel more productive, your hormones are going to be in the right place.

Your hunger, you know, grilling or if you're left in right, all your key hormones, your, you know, your general, you know, insulin response are going to be so much better if you're sleeping, properly.

So I think that's part of the other reason to just start with sleep. Sort of. Everything else becomes easier. Right? Let's move on to the to the heart rate part particularly.

I always look at the lowest heart rate from from my, from my sleep. I find that it's a very useful marker. I'm just wondering what why did you pick that?

I mean, that's usually always it's highlighted as one of the heart rate metrics. You're looking at average heart rate. And and you have that as well. But the lowest point seems for me to be a very good indicator of, how well I slept and distress my body's under.

Yeah, there's pretty good research out there. That sort of shows there's this concept at midnight, you know, or there used to be this concept of midnight and midnight used to be the middle of your night, right?

Classic plan where it's not that hard. And, you know, I think as the human body relaxes throughout the night, typically your lowest resting heart rate is supposed to hit midway through at that point, and then your hormones start to actually, you know, get ready to help you wake, which means, right, your cortisol level should increase, your heart rate should rise as you get ready to be, you know, awoken and attack the day.

But, I think what what looking at the resting heart rate, does the lowest resting heart rate and sort of when it happened and what the value was, it sort of lets you understand is like, how close are you to fully recovered if your heart rate actually, you know, lowered very late in the night, chances are you were doing something stimulated and had caffeine too late, had too much alcohol or stress because of work or because of, you know, some other, you know, personal reasons.

And so, it's looking at that timing sort of shows us that we have some really good, you know, literature based on hundreds of thousands of nights of data, millions of nights of data, hundreds of thousands of users on our blog about this, and then also comparing just, the sort of lowest resting point.

Yeah, that's the highest. Yeah, yeah. Versus previous things like that allows you to see like, oh, am I really well recovered today or. No, am I not. Is my resting heart rate higher today.

And I think it's hard to get a resting heart rate during the day because you're always sort of doing something. And so looking at it during sleep as a repeatable time, a repeatable pattern, it's sort of like performing the same science experiment every single night when you go to bed.

And so we look at it for sort of those two reasons, the timing and then also the absolute value. It's just a really good thing to look at physiologically and stress wise day to day.

You know, I don't want to forget asking this question that, you know, we talked a little bit about Covid. I would love to understand to see if you're seeing any data on people's health during Covid.

Like not acute infection is more about, you know, their inactivity. What impact did they have on sleep? The facts didn't really go outside as much. Things like that.

You know, people gained weight. Perhaps. I'm just wondering, is there any signs of sleep that happened during Covid time? So ironically, in the beginning of Covid.

So in the beginning of Covid, for sure, I think people were getting used to a new norm. But perhaps 3 or 4 months into it, we published this actually in our blog that, people were becoming actually and and, you know, frankly, much more creatures of habit and similar patterns.

And so overall quality of our user base actually improved and sort of call it the first half of Covid. Right. Because think about it, you're not going out.

You're not staying at work late. Right. Like you're sort of already at home. And you're, you know, not going seeing friends. There's not a lot of distractions.

So people actually became remarkably more consistent. And so that resulted in our whole database for most users seeing an improvement through data. Now, there definitely was some 10% or so of folks who whose data got a lot worse.

Probably just personal situations. Maybe their jobs are affected. Maybe they use when I was affected, maybe they personally got sick. All right. Where their data was at, it was getting worse.

We haven't published an update follow up to that. But I do think as Covid has continued on, you know, it it's probably gotten a little bit worse, right?

Where that consistency pattern is sort of like $2 for most people. And, you know, and, you know, hence leading to sort of unhealthier things that, okay, now they're starting to binge watch TV more, right?

They're really just like sort of have nothing to do, and they're eating worse and they're not exercising as much, not getting outside. But at least in the beginning of Covid, we saw some positive results.

Yeah, not for sure. I've seen from my patients they even took up more drinking at home by yourselves or with the, board and, my job, than, you know, all the gyms are coaching trial and then like that last year, but it's getting late.

Yeah, it's the heart rates have gone up a bit. So I think there's definitely something very interesting there. From personal use now going over to two summers, I've noticed that, generally my numbers improved in the summer and became worse in the winter.

So do see some type of seasonal change like that. Yeah. We do. I think we've published data on this that basically shows like summers are healthy for us, are healthier.

And to your point, you're probably getting outside more. You're exercising more, right? It's nicer outside. And, you know, frankly, as a result probably of doing those things also eating better.

And then I think the sunlight exposure, you know, I think for, you know, circadian rhythms getting enough sunlight during the day, you know, definitely triggers all the right hormonal cascade to even sleep better and feel more tired of night.

And so I think, you know, seasonal affective disorder, right. You know, as, as a thing, and, hence, I think, you know, in a, in the summers for sure. And we see better data.

We definitely even see that more pronounced in the Nordics. You know, our company started in Finland. And so there, you know, the summers are really, really short, but the days are long.

And, you know, vice versa. The winters are long and the days are really short. Not much sunlight. So I think we even see that even more pronounced. And some of those areas of the world where there's not as much sunlight all year round.

Are you having a lot of user base now? And, let's say, you know, warmer countries, let's say India, I don't know, southern Italy. Like, are you seeing places where much warmer?

I know you wonder if the same data would hold up if you're all 24 there all year in a one place would even still be like that. Yeah, I actually don't know.

I haven't looked at that. I do feel like we went and actually showed some I feel like recently or there's about to there was a study released showing different geographical talents, but it still looked like it had seasons, if I recall correctly.

So I'm sure relatively there's still some changing and better weather pattern. So enough for people to still be more active during one part of the year and less active.

And a lot of it may be cultural, right? You have so so let's move on to V. I know that is definitely one of the, aspects of the ring that you really don't find anywhere else.

And, and I use it myself as well. So can tell me about the algorithm. What makes this HR v I think more accurate than let's say, you know, people can wear band as well.

I mean, chest band and stuff like that. So I how do how is this nature recalculated? Maybe in a I know it might be difficult to explain scientifically, but if you can kind of give a little.

But sure. I mean just maybe I can explain like why what V is and you know, how we measure it and calculate it. And maybe why it's easier to do for us than a risk based device.

So HIV is heart rate variability, orders. Is the variability or variation of each heartbeat. And so I think as you know, you and I sit here, let's say our, you know, our heart rate often quoted in beats per minute BPM, let's say it's 60 beats per minute.

And so what that means is across the minute we're going to average 60 boots. Now one beat might be one second apart. The next beat might be 1.2 seconds apart.

The next beat might be 0.8 seconds. But there's some variation between each beat. It's a little counterintuitive. You actually want high variation. You want high heart rate variability versus, you know, each beat only beating one second apart or very low variation.

The way I like to think about it is, you know, the human body is sort of, if you think about it, has to adapt constantly. So if a tiger comes in this room, right, you have to jump up, you know, do the right thing, push the chair down, close the door, slam it in space and get out of the way.

Right. You have to think very fluidly.

Heart Rate Variability and Wearable Sensing

And so, you know, sort of like this race car idling and you need to go boom, go right. Versus if you're in this race car and your RPM is all the way up, right.

You're probably going to spin out. Right? And so you want that high variation keeps you sort of in that slow state. And so, you know, one, one metric that's important to notice is, is that actual space between each peak is called interval interval interval or Ivi.

And so what we do at Ora, this is really, you know, a combination of the engineering side more more so than even an algorithm measuring those algorithms is actually measuring that data is actually pretty easy.

You just got to be able to measure risk in a heartbeat. Now, the problem with wearables is, the signals on our wrist here are really weak. As we know, these signals are strong from our arteries.

These arteries carry a lot of blood. You can feel the pulse that go to the palm of your hand, and your skin is really thin. You can even sort of see your hands are red.

And so as a result, the pulse signal from that, you know, from your fingers about 100 times stronger than it is from these are veins here. You can't feel the signal right when you touch them.

It's buried below a lot of muscle tissue, you know, in my case, dark square and even, you know, hard and dark skin and even hair. And so, that pulse signal being so strong allows us to use very little power, but get sample really, really fast.

So we're able to sample our signals at 250 times a second, 250Hz, at night. And inverse based wearable. If it tried doing that, the body would probably die in an hour.

And so as a result, we can just see that pulse signal so much more clearly. Most risk based wearables because,

you know, the power usage is so high since that signal is weak, they actually turn off their heart rate sensors for a lot of the time, then turn them back on, and they sort of extrapolate.

So if you have a Fitbit or Apple Watch, sort of hard to do this on your Fitbit while you're sleeping, but like try to sleep with one eye open and you'll see that the heart rate sensor turns off and then turns on again.

And so, they, you know, really, these wrist based devices don't have, the ability to measure every single space between each beat. And so that's why we can do it all throughout the night.

That's why we share that data with researchers or even doctors. You can download that data on our or a teams portal and actually get, every single interview interval, sent to you.

So it's, it's more like an engineering thing. The nomenclature that you can use for measuring this is, you know, we, we use the standard which is rmsd or the root mean squared of successive differences in between each that it's just sort of a little bit of a formula.

Probably not worth getting into. But you know, I think that that's how we calculate it's more just that the other devices don't have the battery life or the engineering, accuracy to expand for a long time to capture all that data throughout the night.

And I think that's why so many people love our device, because it's such an easy thing to look at and get really accurate information on them. So, for and, if let's say you were to get up or there's a change in your HR v or sleep like how many minutes or is is the ring accurate for like I know it's sampling every you're saying is sampling so often.

Yeah you it all the time. So if you get up and go to the bathroom for I don't know 30s it's going to it's going to catch that. Yeah we still catch it.

But what we do is HR is typically calculated in a five minute interval. So each arm is calculated sort of over a five minute period. And we, you know, been each, period all throughout the night in five minute increments.

So if you get up and you move, you know, you might even see a whole in your data when you look at that. And that's, that's what that is. So, we'll catch it.

We'll still see it. Like, meaning you got up. But then because of that, we don't think that is, you know, as accurate so well excluded from that data. So.

Got it. Okay. Perfect. I got that, where what about, other, are you guys looking at, at, you know, partnering with other people. So, you know, there I know there's some, some companies are working on, you know, should Matt like working on, you know, cooling technology for the bed and seeing how that impacts sleep or.

Yeah. Is there any what do you think things are going and, you know, with the ring in the future? Yeah. I think, the pandemic really gave us the blueprint for sort of how this kind of technology can be used.

So, you know, during, during, Covid, we were actually the first wearable to partner, with an academic institution. So we worked with UCSF. We were the first wearable to start a study on Covid.

And, you know, I think what we showed is basically UCSF, actually had a paper published in December and what they, what they were able to show in that paper is that you could actually see data changing on an ring up to three days in advance before users felt symptoms.

And, I think, you know, it sort of shows the power of high quality data and then machine learning and data science that, you know, you can train these algorithms amongst many different thing.

In this case, it was positive Covid test. And UCSF was actually verifying that luckily they got great funding and were

able to actually send, you know, both saliva and blood tests and things like that to users who did get positive Covid, tests.

And many users were actually, you know, tracking their symptoms every single day, which is pretty cool. And so if you think about that for the future, just like you can train this wearable sensor data on sleep or activity, or even things like Covid, there's so many new health applications.

So I think women's health, that's a pretty interesting area. We had a study published there in Berkeley being able to look at, you know, the temperature data we see, plus HR v and correlate that to a large surge in luteinizing hormone surge.

I think you could do it for sleep apnea, as you were talking about. I think there's lots of things you can do in the heart space, whether it's hypertension, congestive heart failure or arrhythmias.

I think there's going to be so many new use cases where you can keep developing all these algorithms. So that's one area, just more health sensing features.

I think the other area is you mentioned was like, okay, how do I now that I have this data, how do I prove it? Should I be doing things like using a chair like that?

How much does alcohol actually affect my usage or working late? What if I start meditating? What if I start exercising? How much going to improve this data?

So I think, you know, I always say that people want two things like one is, is data accurate? Like what's the use case and isn't accurate. And then two, you know, sort of what do I do with the data.

Yeah. How do I improve it. How do I change, you know, change it. And so I think both those things are what we're focused on. Yeah I think the predictive analytics if there's recommendations because I know generally we know that yes, I'll call we have to kind of put this through our own brain computer to figure out, okay, what impact is the one thing going to have at 10:00 at night.

Yeah. But if you can tell me, hey, it looks like if you do this, you're going to have like a, you know, 20% reduction in your sleep. That would be pretty cool because you have you have that data.

Yeah. You put that through your instrument. So here we are.

Future Health Applications and Predictive Insights

I think one thing we ask our users to do is just keep tagging. Like the more people use our tagging function, the more we learn. And I think you'll see us too, actually, frankly, in more studies with volunteers.

Right. That's what Covid was. So we reached out to our user base, you know, not to any of us wanted to get Covid, but likely some of us were going to end user base.

But what if we asked our users to drink a glass of alcohol tonight or turn your thermostat down? I think, I think you'll see us engage in a lot more of that.

And we already are, because we get we do get, you know, tens of thousands, if not hundreds of thousands of tags every single night or week. And so I think as we start to aggregate more of those, you know, we'll see.

Well, I think we'll see us do some pretty fun stuff in the future. That's awesome. Anything you want to end off, like with the main message to our to our viewers and listeners, you can honestly, I mean, I sort of come back to everyone's going to sleep every single night.

It's perhaps one of the most meaningful things you can do for your quality of life and improving your health. You

know, we've made it so easy, as have other companies are making it easy for you to understand.

It's a really easy way to look at sort of cause and effect every day and start to understand what health changes you can make that are actually driving an impact.

And so I think, you know, most people don't realize that, you know, lack of deep sleep, for example, can be linked to early onset of Alzheimer's. You know, lack of sleep as a whole can really cause, you know, weight gain, mainly because your hormones start to get imbalanced.

Your ghrelin, your hunger hormone, you know, shoots up your leptin hormone, how you feel after every meal, you know, unfortunately, it goes down. And so, you know, whatever you are trying to improve your health and performance for, just sleep makes it so much easier.

So I sort of look at it as Matt Walker said, like it's the perhaps the single most legal performance enhancing drug you can do right away. And we all do it every night.

You're going to do it no matter what, right? So why not get good at something that you're going to have to do every day anyway? That's going to make a huge impact on how you feel and perform for the rest of your life.

Yeah, I think that's the ultimate. Yeah. I think it's, the ultimate area for the biohacker those who are trying to change their life, to hack their sleep.

And so I think this is amazing work that, that you're doing because it changes, like, people's lives. So, hats off to you. And always appreciate it. Luckily, we got, awesome team, and they keep growing and working really hard.

I can't do anything by myself, but, you know, I think we've had an amazing, you know, experience with our community and early users who share this with others.

I think that's that's a lot of it, too. It's like, you know, people seeing the changes they make. We've had some users that are like, man, I got this.

And I just realized I cut out my caffeine after 4:00. I stopped eating after eight, and I'm like, I feel better, I perform better, I have more energy to hit the gym and then, as you know, as I turn and I'm losing weight and I've actually been more, you know, alert and productive doing my work day.

So I think all those things together. Right? It's just, all of us are a community. And, you know, we got to teach each other. We got to share with each other.

And, you know, we got to do what we can and do our part to make things for each other, too. So, you know, appreciate you. You know, putting this together because this is, you know, frankly, how people learn about these things and start to practice them.

And then, you know, for your listeners, right. If they do see improvement, they've seen a positive think, share it. Right. Because for every one of us that's improved, there's still ten other people who may still be suffering. So, just really appreciate the work that you're doing as well.

So thanks a ton. Yeah. Thanks so much. I just want to say one last thing. Is that the first thing I do when I get up in the morning, I roll over as my wife let her score is me.

And so I can tell you that I haven't met. I mean, I think there's not too many things out there that people are that fanatic about. Like, you know, you have Mac users, you know, people who, you know, just took up a car or whatever.

Sleep as the Foundation of Performance and Health

But I feel like the ordering is in that type of situation or like, so I don't know, I'm wondering, do you feel left about your user base that some of the extremely we do I mean, no, I think, again, you're going to do it every day.

So it becomes a daily habit and it's that little reminder and how you can perform a little bit better. And yeah, we, we see that behavior a lot, that, you know, first thing people do, I think we've even said that that, you know, majority of our users, I think it's like 75, 80% of our users check the app in the first hour when they wake up.

Yeah. And and frankly, that's such a good reminder because it's just you see it first thing in the morning and then it sort of shifts your focus. Okay.

I'm a little behind the eight ball today. What can I do to do better tonight. So I feel better you know, tomorrow or vice versa. Hey I'm feeling really good today.

Today is probably a really good day for me to push extra hard in that workout, or get into your office early and get a lot of work done, because I'm going to be in the zone.

So I think, I think it's just it makes it a little bit more actionable. I also found that I only asked my significant other, my partner, how I'm doing if I know my score is bad because I do not like I don't want to get a humblebrag space if I'm like, you know, if I'm like 70, I'll be okay.

How was your score outside? 85? And I'm like, oh man, I was 70. But otherwise, I let her I let her ask me or tell me first what's really interesting. I think you in the ordering is in a very unique position to actually change.

Now people's be, like how their day will go depending on the crown or not, because you're actually giving some type of if you give it some like positive feedback, you might actually change that person's totally alibi how the day is going to go.

Yeah, it's you know, they're feeling more positive. So it's kind of almost like a it's like a feedback loop. Yeah. Agreed with. Yeah. Anyways thank you.

I really appreciate your time today. And and for our viewers, we're going to put a little link for them to go to the ordering so that they can, get one.

Cool. Well, thanks a ton for the time. And thanks again for putting this together, Sanjiv, I appreciate it. All right. Okay. Take care. All right. Bye. All right.