

Transcript: Sleep Junkies Podcast Episode 002

Can a video game cure your snoring? - Dr Brian Krohn

<https://sleepjunkies.com/brian-krohn-soundly-snoring-app/>

Jeff Mann: So I'm here with Brian Krohn today, now I bumped into Brian down at the Somme next show a couple of weeks ago and we happen to be on the same speaking panel and when Brian introduced himself and the app that he's developing.

I got very interested because the project that Brian is involved in now soundly is based on some research that we wrote about a few years ago, and so we had a chat after the show and Brian has kindly agreed to talk to sleep junkies and explain a bit more so... hi Brian hey ding

Brian Krohn: Hi Jeff yeah thanks for having me, it's great to catch up after the show.

Jeff Mann: Yeah fantastic, yeah really excited to hear what you've got to say. So before we start can you give us a little elevator pitch for your app soundly?

What is the Soundly app?

Brian Krohn: Yeah totally so soundly is an app based therapy, that helps reduce snoring. So it's an app that reduces snoring and how we do that, is there's a lot of science to the research that shows that you can strengthen and tone the upper airway, by doing specific vocalizations and that helps reduce the vibrations that cause snoring.

So we're an app that's a game that you play and you control the game with your voice, and by doing those vocal exercises and playing the game you strengthen and tone your upper airway and you reduce the vibrations that cause snoring.

Jeff Mann: Cool now a lot of you would have heard that and thought okay snoring? Video games, how does that work?, so we'll talk about that a bit later because there's some really clever stuff you're doing with the app, and you've kind of gamified this type of therapy.

So he's really interesting but we'll get into that a bit later but before we talk about the app in particular, I just want to talk a little bit about your background because you've got a super interesting CV.

I looked you up on LinkedIn and you've been described as a renaissance talent by some of your colleagues and your mentors and you've been involved in some really interesting cool projects both as a scientist and also as a serial entrepreneur.

Brian Krohn: I have had a lot of fun. Well too much fun I think.

Dr Brian Krohn explains his eclectic career

Jeff Mann: and it's quite unusual for people to be working on a high level in academia and research to also combine that with being an entrepreneur so I'm just kind of interested in your background and maybe you can talk about some of the projects, and maybe just talk about some of your motivations in being so heavily involved in research but also in being an entrepreneur and the business side of things as well.

Brian Krohn: Yeah absolutely, generally again... pretty all over the place I've done things in film and renewable energy, research, chemistry research, environmental policy, environmental science or

helped co-founded a company that grows hops for local craft brewers, built a couple of apps that did reasonably well yeah I've just been kind of all over the place.

One of my more fun projects right now is, we built a Kickstarter for fun of wizard staffs that actually do wizard things. So they shoot fire and fog and all sorts of fun stuff so you can see that at magicwizardstaff.com but, academically I've been you know I got my PhD at the University of Minnesota I got some master's degrees from Oxford University so that's why I love the UK.

In philosophy of science and environmental policy and an undergrad in chemistry so yeah so really what I... the motivation is that, I really like understanding how the world works and I like helping people and at the core of research you are trying to understand how the world works and create new human knowledge, and at the core of entrepreneurship and really innovation and using science and entrepreneurship you're trying to take that new human knowledge and information and you're trying to in people's lives in some way you're trying to provide value to people.

You do something for them and then they give you some value in return and that's you know yeah what business and entrepreneurship is. So I just really like bringing science and entrepreneurship together because it's going from a completely abstract idea to actually impacting people's lives.

Jeff Mann: So I guess you're by the sounds of it you are a very curious mind and you like solving problems not only on the research level but also bringing those ideas into fruition, and commercialization as well, what's your view on how those things mix? Because often they're perceived as sort of oil and water.

Academia and business. Oil and water?

Brian Krohn: Yeah absolutely and I'd say that was my view as an undergrad, I was a chemistry major and we studied research and the business school was over on the other side of campus, and we didn't talk to them, they would corrupt you and corrupt your science and there is legitimate reasons to keep them separate.

You know you want to... in science you have to be objective and remove bias and so you have to be very careful about what you're getting paid to do right? And how you're influencing people. So for instance on soundly, the principal investigator is a world class leading sleep physician at the [University of Minnesota's Sleep Center](#), and he is intentionally entirely independent.

So the research actually came out of his lab. I was a postdoc at the University Minnesota's medical device Center and the Medical Device Center the goal is to go around the university and create new technology and then actually help get it commercialized.

So I worked with him about what he saw as problems in sleep and he had some ideas on things that could help people and that was the soundly therapy eventually, but he remained entirely independent he helped run the clinical study.

We did some tests you know and he was the objective observer and then once you've shown that it works then, now I'm using that science to actually work on the commercialization side of things so you know you do definitely have to be careful a little bit but at the same time science's power to identify problems and identify effective solutions and then you can write a paper about that, but you know that's not really going to change people's lives.

So the next step is, how do you actually solve people's problems in the real world? And that's where entrepreneurship comes in.

Jeff Mann: Yeah that's really interesting because, we deal with a lot of people in there at the sleep technology space. The [consumer sleep tech](#) space, and often you see a lot of studies about the

efficacy of a product but Soundly is very much coming from research led basis as opposed to we've got a product and let's try and validate it afterwards.

Creating a research-led product

Brian Krohn: Yeah and we are, so we... in our group for instance when we did the clinical study right, you know I helped a lot with the clinical study and one of the things we said going into it is if we don't hit specific metrics then we'll kill the project you know that said you know we have one study and then there's a couple other... there's other studies and they myofacial oral [pharyngeal exercises](#).

So there's a good about a literature in there but there's still a lot more we can do on the research side. so it's it is this balance between like okay we think we have something cool, research shows it's positive how we build a product without spending the next 2,10 years just doing research right? So it's kind of that balance between getting something now, but then also being getting the research done.

Jeff Mann: So let's talk about your journey into sleep, and you explained a little bit about how you have expert advisors on board who specialize in sleep, but your background is in environmental science so what was that transition into getting into sleep and how did you feel about being thrust into this world of sleep science and snoring?

From climate change to sleep research

Brian Krohn: So one of the things was I've always been interested in like I said bringing science and turning it into products that solve problems. So like doing an undergrad I did chemistry research on a new way to make green fuels and we got a patent and a process was commercialised and I got to see that whole process, which was really cool.

Then I did my PhD in masters in environmental science and policy to also look at renewable energy and one of the main motivations for that was, I thought we had all the technology? I mean we have the solutions to solve climate change and renewable energy that they've been around for 15 years at least but they're not being implemented and so my question was well why not?

So that's why I studied environmental science, environmental policy and environmental economics, but really it was innovation. It was how do you, take a product on a large scale, you know how do these actually get out into the market and actually solve these big challenging problems. and then I'm you know I'm also an academic sort of write papers but I also love to do things in the real world and so I started doing Lean Startup stuff.

I started a couple small companies just to see the process of like okay? if I have this technology how do I actually sell?, how do you actually... what's the business process because I was making all these models of like economics and assuming that businesses are entirely rational decision makers and things like that but it's like all right well what does it mean to actually run a business.

And so I was studying a lot of innovation and this idea of product development and that's where I got landed at a postdoc at the University of Minnesota's medical device Center. so I have no medical background but was in the medical advice center the reason was because, I was interested in innovation and at the medical advice center, it's an amazing program you get one year to work with seven other researchers engineers and medical doctors and you get full access to the hospital and the University.

You just wander around and look for problems, you come up with new solutions and like we filed about a dozen patents from everything from like new brain surgery tools to help surgeons identify

tumors from healthy brain tissue, so they can remove just the tumor and not leave as much of the brain tissue as possible.

Um to you know stuff and sleep so that's where Soundly actually came from, was from that process of going working with researchers identifying big problems and identifying products that could actually solve those problems and then so yeah we did the study and then I spun that out of the University, to see if we can you know get it out in the world and help some people.

Jeff Mann: So what was the first time you came across this piece of research which ended up being a product?

Brian Krohn: Yeah so that was really interesting. So I actually was not on the initial team we can't explain the groups of four and my co-founder Adam black he's a researcher, he was also a postdoc PhD in optics and signal processing with a medical background. So Adam black was working on sleep and initially the problem was what alternatives are there to sleep apnea?

What they found is there's this paper that showed that you could play the didgeridoo, and by playing the [didgeridoo](#) you could actually reduce sleep apnea and reduce snoring and he was talking with these sleep physicians and they were saying yeah they really want to figure out why this works and then how do they make it more accessible because some of the physicians were actually recommending people go out and buy and didgeridoo and you know this is a big weird long-tube instrument yeah?

So not a lot of people are doing it but that was the first research that actually kind of indicated that you could actually do these exercises and help reduce snoring and sleep apnea and then we ended up just focusing just on snoring.

Jeff Mann: I guess it's such a strange weird concept we can go into that a bit more later about how that actually works and what that research is but I just wanted to talk about snoring in general.

[Snoring](#) is often regarded... is a bit of a joke husband or your wife or your partner will complain that you're a snorer I mean we have obviously sleep apnea and snoring is often a first sign that someone might be suffering from sleep apnea, but in general it's not really regarded as a serious health condition more of an inconvenience. So can you give us an overview of the health implications of snoring and not doing anything about it?

A brief overview of snoring

Brian Krohn: Yeah so it's definitely a leading indicator of you know sleep apnea and more severe issues primarily it's a social problem right? And it definitely can be a very serious social problem between bed partners because there's a lot of conflict and intimacy issues. So when you talk to people you know it's definitely a serious problem in a lot of people's lives that they're looking for solutions to,

And yeah it's you know sometimes it's written off as more of a joke or it's maybe not quite that serious of medical issue, but it definitely impacts people's lives a lot I mean it's 50% of people age 50 snore, and a huge percentage of them you know it actually disrupts their sleep or their bed partner sleep and now with all the research coming out on just like how important sleep is really any sort of disruption you know is a significant problem because you know, sleep impacts just so much of our life.

The other thing too is like you said, it does... an indicator of sleep apnea, well snoring and sleep apnea are kind of on the same spectrum where sleep apnea is caused by a weak upper airway that collapses, and it collapses all the way so that it cuts off your breathing people stopped breathing for 30 seconds

or more and then they have these 30 or so events an hour where they stop breathing for 30 seconds or more and that causes all sorts of issues with your lungs, and

Your heart and increases your likelihood of stroke and heart attack and also you don't sleep because you're basically suffocating for half of the night so that's sleep apnea right? that's a very serious issue the solution that works a hundred percent in addressing sleep apnea is called CPAP and what that is it's a device... it's a mask you put on your face and it pushes air into your lungs so it opens up that airway now snoring is like I said on kind of similar spectrum,

Where it's also caused by a floppy weak upper airway, but rather than collapsing all of the way snoring just collapse is a little bit and causes the tissue vibrations, and so that's what causes that sound. Usually what they see with the sleep centers and the physicians we are working with is basically everyone comes to the sleep clinic because they snore that's really one of the main reasons everyone comes into the door to talk to the sleep doctor,

And then they do a sleep study and then you know big chunk of them are diagnosed with sleep apnea and then they're able to get a CPAP machine but about 25% of the people who come in are diagnosed as primary snorers so they don't have sleep apnea so then they don't have access to an affordable CPAP machine and there are other options you know are just a lot more limited and so that's where soundly comes in as we can help address those people who come in who just have snoring as a problem and are looking for alternatives and then we hope in the future we're going to continue to do research and see if we can improve the efficacy and actually help address sleep apnea in the future

Jeff Mann: There's probably a lot of people who still haven't got a real concept of what soundly does could you tell us a bit more about the actual science behind the soundly approach?

Sleep apnea, snoring and didgeridoos - the research

Brian Krohn: yeah absolutely it's really fascinating, so first is the didgeridoo which is you know, if you think of Australian Aboriginals they have their traditional instrument it's a big long tube and it's like whoa what's cool is we actually ultra sounded people's upper airways and actually image what was going on one of the things is we notice is that you're doing a circular breathing technique so you're really opening up that airway and you're holding it open again.

Ideas like you're doing a push up basically for your upper airway and then there's yeah research that says you can do singing techniques there's plane may be different you know different instruments like woodwind instruments and things can also strengthen and tone on the upper airway and help reduce snoring and then there's speech therapists you know techniques which are called myofacial which is your ear face facial muscles and oral pharyngeal which are the muscles kind of down back your throat and your tongue and so basically it's doing exercises for your face in your tongue and those were like a list of about 30, so different little tongue movements like stick your tongue out you know push the tongue against the top of your mouth smile really big puff your cheeks out you know do all these different things and those studies that had people do that showed that, could reduce snoring and in some cases you know basically eliminate it,

A 'push-up' for your breathing airway muscles

And what we did those... then we studied all these different patterns and we looked at the physiology of what was going on and then we looked at different vocalizations and what we found was that if you say the e sound rat brings the base of the tongue up and forward.

Jeff Mann: can you give us an example?

Brian Krohn: Yes, you say e so e e e like that yeah and that brings the base of tongue up and forward and then if you say oh like you drop your jaw and you say na or saw that brings the base of the tongue all the way down and back and so by alternating the two by saying e oo e oo your base of your tongue is going back and forth back and forth and it's like doing a push-up for your tongue.

And the idea is that you can then do that a whole bunch and that will actually we improve the, tone of the muscles so reduce kind of the floppiness increase the strength of it as well as improve your coordination your brain to muscle coordination so that your tongue gets out of the way when it needs to when you're when you're asleep.

Jeff Mann: I mean it's absolutely fascinating and but essentially when you're making these different sounds the position of the muscles in your jaw and your face are changing and so it's kind of like doing a... it's kind like going to the gym, and then I say today I'm working on my biceps, today I'm working on my triceps. So these therapies are kind of doing that but for the muscles in the breathing airway. You looked at that... you looked at those therapies.

I think I remember you saying and your talk at summer, that's you had to do something about 600 of these reps?

Brian Krohn: Yeah, and then we also add a and n and sound in there so the two words we use are Li and na like you know your knee and then na and that end sound engages the soft palate but you're right so you could do this yourself you can do this in the shower to say me me me na na na Nina Nina Nina and that's your exercises but in order to be therapeutic you have to do 600 to 800 of these Nina's a day you know that's just pretty boring.so

Jeff Mann: you motivated or odd... or just a bit weird to kind of want to do that on your own I mean I can imagine if you were part of a trial you might stick to it but to actually commit to doing that on your own that's right that's a big thing.

Brian Krohn: yeah, we yeah we actually had in our study you know we had people do it for use an app that guided them through their knees and Nas for you know 15 minutes a day and that's where we got you know we saw what was effective and it was about 1800 knees and na's why

Jeff Mann: so I mean I love the journey that you've taken through soundly so you've identified a problem you've identified solution to the problem but the solution isn't something that people are naturally going to want to do so you thought right how can we coerce people how can we make people want to cure their snoring but not make it like going to the gym and doing exact fifteen hundred bench presses.

So you turned it into... you turned it as a game you gamified it and on your many talents --is as a as an app designer and a developer so you gamer fight the whole therapeutic process so can you explain that process for us

Space invaders: how to gamify a clinical therapy

Brian Krohn: Yes, so the game is so one it's a voice-controlled game so you say it's a it's inspired by space invaders so what you say knee knee knee knee knee and that moves a little character to the right across your screen and that little character shoots at enemies that are coming down from the top and your goal is to keep the enemies from reaching the bottom.

So you say Nene named move to the loop for the right and they say nah nah nah to move it to the left and you have all these enemies coming down at you and seriously me Nani not you need you know to shoot these things as a way of you know getting you engaged and kind of forgetting that you're doing the therapy and yeah just to make a little more fun and accessible and then we also have another component which is your little character he's like a little Pokemon type character where, as you play

your airway it gets you know stronger and your character gets stronger so he evolves he gets bigger and stronger and more interesting and you unlock new characters and new worlds, and if you do your therapy every day you know each day you should unlock a new character, and then that way you can see your progress because you can't really see the inside of

Your throat and it gives you a little more feedback and then if you miss a therapy day your airway gets weaker and so does your character. so you actually start to lose points and progress again it's like a way to represent what's going on inside your body but it's fun, it's engaging and something that people can actually be engaged with.

Jeff Mann: I'm hoping to get some screen shots or maybe some you know some video clips, because you kind of have to see the app it's hard to describe anyway yeah and this is the reason I wanted to get you on a call, because I think people need to know that this, lack of a lot of sleep, technology a lot of people don't know that you know these kind of things exist and you have to kind of see soundly to you know... to see the potential right and that ah right?

I get it so you've published a paper with the app? What... was that with the finished Apple was that where they beat a version of it but the test came back quite positive?

Soundly: the clinical study

Brian Krohn: yeah, it was definitely a beta, the participants were very kind and you know working through the app version that we did have yeah. We got a lot of data from that and you know it was really interesting from a scientific perspective is it's a physical therapy and just like the other any other physical therapy that you do whether it's for you know a bum leg or something like that it doesn't work for everybody exactly the same way.

So some people it works really well for, and you basically reduce snoring entirely and that's also what the other literature shows in terms of the mild facial & oral pharyngeal exercises some people have like great response to it you know then there's kind of the middle chunk of people who have about a 30% reduction in quantitative snoring, but what's interesting in that is the quantitative measurement of snoring doesn't matter as much as what your bed partner perceives.

Jeff Mann: Yes, just this snore reduction makes him a big difference,

Brian Krohn: But then and conversely for some bed partners for instance we had like an example as a patient who comes into the sleep clinic and she's like "my husband snores the worst I can't" sleep and this you know all the sleep physicians that get all the equipment hooked up and they're listening they don't hear anything and she and so they bring her in there like so can you should point to us you know what you're hearing and she's like "that that don't you hear that?"

And it was a guy the guy was breathing you know it wasn't smart enough so it's so snoring and again kind of the social issue around snoring is highly subjective which you know also presents kind of an interesting challenge for us but it's uh you know like I said with just reducing snoring, we've gotten a lot of responses from people where it's you know it's been beneficial to them hugely beneficial even if it doesn't you know cure it a hundred percent.

Jeff Mann: Yeah, well I imagine it's going to be attractive to people who don't want to stick a clip on their nose or wrap it a strap around their head you know people are always looking for things that are less invasive and treatments like that. So what's the sort of time frame then if you use soundly what do you recommend for people use X amount of days or weeks until they start seeing results.

How long does it take to work?

Brian Krohn: We recommend two to six weeks you know again just like any other physical therapy typically two to six weeks to really see the improvement. Then afterwards you do a like a maintenance period can I keep on it you know but you don't have to do it as often or as intensely you know we do have people who report within the first week reductions, and you know just like when you work out you know your muscles kind of tighten up, and so in the first couple days or first week you know if people notice some reductions just from the kind of initial tightening and then you know you do want to spend the next two to six weeks making that kind of more permanent

Jeff Mann: I guess in terms of general lifestyle as well snoring you say that the prevalence is higher are people in their 50s so other there's other things you can do alongside soundly diet and lifestyle and exercise and I guess it's all kind of Tom right general awareness is optional

Brian Krohn: Yeah, I mean it's you know the biggest one is losing some weight because you have that you know again it's a floppy airway so if you have extra weight extra pressure that will cause your airway to collapse more easily and vibrate more and then alcohol right said it is anything that makes you your muscles relax more so [alcohol](#) is the next big one and then smoking which is again kind of causes inflammation which causes swelling, you know increasing the tissue floppiness there, and so those are kind of the three big ones if you kind of lifestyle change those you can make a big difference and then if you add soundly into that you can have a really holistic approach to reducing snoring and then you can also use it as a co-therapy so the most prescribed thing to reduce snoring are mandible devices so these mouth guards that pull your jaw forward not super comfortable but they work.

They also are not a hundred percent effective but they can reduce you quite a bit so again if you pair that with soundly we think you can get better results

Jeff Mann: That's awesome Brian thanks, so much for explaining how the app works. Before you go I just wanted to pick your brains and about the general subject of sleep science and how that tallies into this boom we're seeing at the moment in consumer sleep technology and there's kind of a... an intersection point for some of these devices where they are more medical sleep interventions,

As opposed to lifestyle products and I just wanted to get your general feelings and opinions on how you kind of see things like you're doing with soundly now and how that might ductile into the future of how we treat sleep problems as a whole it's a big question

Thoughts on the future of sleep medicine

Brian Krohn: Yeah, that's great that's a great question the so i think sleep is really interesting because it's really at the forefront of personalized medicine you know that's something we've been talking about a lot but like what does that actually mean and then quantified medicine evidence-based medicine and then it's also just like a new frontier there really hasn't been a ton of research or products around brown sleep until recently but it's a third of your life and then there's just more research coming out showing that how important sleep is to your overall mental health and physical health and just you know general well-being so what's interesting is in terms of you know the evidence-based medicine side of things is that we're getting all this data from how people sleep.

There's tons of [sleep tracking devices](#) out there and they've been improving a ton in their quality of the data, so getting more and more data that's higher quality and sleep is unique because you get eight hours or presumably of data starting to be able to get things like you know you're not just your movement in your sleep or your position your heart-rate your breathing we're we got machine learning algorithms to determine what type of snoring you have or what type of breathing patterns you have we can track your when you go to bed, and when you wake up you can time that, you can track how much light exposure you have in the time leading up to when you go to sleep.

So we just have right now there's of data being collected and it's not really well pulled together, but there's a lot of companies and researchers who are trying to figure, out how do we take this pile of

data? and then identify your problem specifically and then pair that with a solution that works best for you and I think a great contrast is like how we treat sleep apnea right now?

If you have sleep apnea and you go to a doctor you get diagnosed that's a one-time visit you get diagnosed with sleep apnea they give you a machine because the problem is that you're not getting enough air and then they just pump that air down into your lungs and it's a hundred percent effective if you do it you know?

Jeff Mann: yeah, there's a whole big problem with non-compliance with sleep apnea because if anyone doesn't know you know some people described it may be a bit unfairly it's the Darth Vader sort of treatments you wear a big mask on your face or with it,

Brian Krohn: Yeah, and it's like 50% non-compliance by six months so that means we have a solution that works a hundred percent of the time if you use it only works it's a hundred percent of the time fifty percent of the time right and so what do you do with the other fifty percent of people? And that's where soundly comes in and these other you know again we're not approved for sleep apnea but you have mandible devices you have these other things and we hope that,

Soundly is an example in the future would be a therapy or something you could be prescribed recommended for that,

Jeff Mann: yeah, I think the future is really interesting, and I have friends who have sleep apnea and they do the CPAP thing because that's the only option they've got if they don't know they don't sleep but I know if there was something out there which was alternative they would jump on it straight away yeah exactly um so Brian give us the the price model and how people get hold of soundly

Where to get the Soundly app

Brian Krohn: so yeah, so you can go to soundlyapp.com, or you can go to the Apple App Store and type in soundly snoring and will be one of the first ones that pop up with that, and it's free to download you can try it out see if it works if it starts to work for you get like the first day or so for free and then it's a subscription model after that 20 to 30 bucks for a whole year.

Jeff Mann: are you planning to do an android? Because it's just iOS at the moment.

Brian Krohn: I know where we're trying to get out to Android as soon as possible,

Jeff Mann: Great well thank you Brian, is there anything else you want to add?

Brian Krohn: I just want to say you know thanks for the conversation it's been really fun to chat with you and your audience we really hope everyone goes out tries it or recommends it to people because a lot of it right now is this education like you were saying there's a lot of people who don't know that you can do a therapy during the day that's fun and effective to help you sleep better at night.