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Episode #16: What all physicians need to know about wearables (and tech) in mental health care

David Gratzer: Today, I've walked 11,000 steps. I know this because I've got a wearable on my wrist. That's pretty cool, but what might be even cooler is what we could do with such devices in mental health care.

Today on *Quick Takes*, we talk about wearables and other new technologies. Joining us, Dr. John Torous, a returning guest. He's the director of Digital Psychiatry Division at the Department of Psychiatry at Beth Israel Deaconess Medical Centre. Of course, a Harvard Medical School affiliated teaching hospital. He is also a staff psychiatrist and assistant professor. And yes, he does have a background in electrical engineering. Welcome, Dr. John Torous.

John Torous: Thank you so much for having me back.

David Gratzer: Thank you for joining us. Dr. Torous, what is a wearable?

John Torous: I suppose a wearable is anything you want to wear. I think in the context that we're going to talk about, a wearable is going to be a digital device, a sensor that is able to capture electronic data related to behaviour or physiology. We could probably classically think of, say, a smartwatch or a pedometer as examples that we may be familiar with.

David Gratzer: What are some of the implications, then, for mental health care?

John Torous: You know, as we know in all health care, we want to have a multimodal assessment of how people are doing. And we would always want to know – we ask our patients about things like diet, exercise, sleep behaviour – and wearables could be a useful tool to give us new insights and information into how patients are experiencing their life, how active they are, how sedentary are they, how good is their sleep? And again, these are important targets because these are things we can modify and help improve to improve their behavioural health, and, as a bonus, of course, physical health too.

David Gratzer: As a practising psychiatrist, why might this be attractive to me?

John Torous: I think it's really attractive, because if you ask me, "John, how has your sleep been for the last week?" I don't quite remember. And if you ask me "How many steps?", I actually don't know if I took 11,000 steps like you today, but I could actually go on to my phone, right? And I could check it, I could figure out, it could tell me, because in some ways it's acting like a wearable. In some cases if we're trying to learn about, say, panic attacks and understand when people are kind of having changes in a nervous system. Some

wearables can pick up changes to galvanic skin conductance. So proxies for the nervous system kind of, perhaps, overreacting. So there's a lot of relevant information that really could, again, tie these disorders in some ways back to biological bases. It really could help us clinically treat people, make their lives better. It really could help us understand the mechanism behind some of these diseases, the triggers behind some of them, which is important for move us towards prevention. All too often, we're trying to react in the moment or after the fact. But I think if we can move mental health down to this level of understanding the mechanism, we could really make some tremendous paradigm shift in progress.

David Gratzer: What would be an example of a future state you would find compelling?

John Torous: I think even a future state that could be possible today, if we think about patients with illnesses like schizophrenia that we treat we know that the number one cause of premature mortality in schizophrenia is cardiovascular disease, right? And we know that related to certainly many factors, sometimes the medications can have side effects. But for many reasons, the people we work with are more sedentary and we know this is a case where we want people to actually be more active. And a wearable can be a very easy way to encourage people to be more active, to keep them on that goal. So that could be a case. We're going to improve people's mental health symptoms through exercise, but also increase their lifespan. And again, we could be doing that today. That future is not in 2050.

David Gratzer: We're talking about wearables. Of course, we'll talk about other things in a moment. What are some exciting projects that you've heard about in this space?

John Torous: What's interesting is, without naming [any], companies seem to come and go in the wearable space, but there's a lot more form factors. What I mean by "form factor" is some wearables are now just a ring that you would put on your finger. Some wearables are just a patch you could put on your undergarments or your skin, and they're very innocuous. They could stay there for some time. Some of them could be necklaces or jewellery that you wear. They don't all have to be a smartwatch anymore. Again, smartwatches are kind of these wrist ones are popular, but you can always say that was the first generation of them. The first generation will get better, but maybe again, people just want to wear a ring. Maybe your shoe will have the wearable in it if that makes sense. Maybe it'll be a new device, maybe something that you kind of turn off and on if you want, external to it. So, I think we're going to see in 2022 and onwards, new form factors for wearables that kind of make it easier and more convenient for people to collect this data.

David Gratzer: What sort of data do you think would transform mental health care?

John Torous: I think if you look at kind of the day, if you look at our diagnoses, right, sleep seems to come across almost every disorder that we talk about. If we just think about what we talk about with patients, there's always going to be sleep. And again, if you think about what do we really know about people's quality of sleep, what do we really know about people's duration of sleep? Not that much, as we started out saying. And again, if we could even bring great information about sleep into clinical care, that's terrific because we have CBT for insomnia. We even have a therapy for it. We have medication treatments for it. We know it's perhaps a central node in so many illnesses. It's probably mechanistically related. So again, if we can make it easy to assess sleep in an accurate, convenient way, I think we really could be focussing on something in the illness that we know we've wanted to, as a field, but if we can't easily measure and assess it, it's really hard to intervene.

David Gratzer: This is hardly the distant future, "Blade Runner" style, where we're all zipping about in our spaceships. A Fitbit or an iPhone actually does not a bad job with sleep, right?

John Torous: Exactly. In some ways, we're talking about wearables, but the phones are getting more advanced too, right? So without buying anything extra, if you have a smartphone that you've purchased in the last couple of years, it's probably trying to collect steps already. They're working towards improving sleep

based on it. And, of course, the phone can only be a proxy of how you use it. If you leave the phone in a drawer at home all day, it's not going to tell you much about your behaviour or your mental health. But for the large per cent of the population, it kind of keeps their phone on them. It goes with them. The phone itself can act in some way as a wearable. It's something you're, in some ways, wearing away. It could be in your purse, in your pocket. Mine happens to be on the desk. It's travelled with me to work today. There's some information we're getting already. So you could almost think of the phone as a base station for the wearable, the wearable sending information. But that phone could be kind of collecting information without the wearable today.

David Gratzer: So let's forget about whether it's technically a wearable or technically or phone or, in the case of the phone, on your desk and on mine by the way, straddling the line more and more. Passive data we're collecting could include geography, could include voice, pitch, a voice, touching the phone. But what other data sets could there be?

John Torous: There's a whole world of relevant data to be discovered. If you think about something certainly very sensitive like the location where you are, that can be converted right into a metric like: "What is your green space exposure? What is the pollution where you are? What is kind of the level of crime? What is the level of poverty? What is your environment?" So have you almost think back to the basic behavioural model and environmental model and try to do social determinants of health. The phone can help us quantify those, right? Those don't have to be the subjective things where we go, well, the patient says they're from this area and we're going to use various stereotypes and say, this is this type of neighbourhood. We can say, well: "What was (in my case) John's cumulative exposure to light? Was it cloudy? Was the weather horrible in the last month? What was John's exposure to neighbourhoods with different pollution levels being triggered?" And yet so again, these are things just from GPS we can get, and again, we can quickly get rid of the raw data that says "John was at this latitude and longitude," and turned that into something that says, well, "This was John's green space exposure for a day". So I think there's a lot of new data, and perhaps we haven't considered all of the factors.

David Gratzer: We're talking about the larger concept, to use the trendy term, of digital phenotyping. For those of us who are new to this space, what is the digital phenotyping?

John Torous: I think digital phenotyping is one word amongst many. We could also be calling it 'social sensing'. We call it 'smartphone sensing'. The idea is, can we use data from consumer electronics, not things that we specifically buy for research, and can we use that data to help learn about people's mental health, either a preventative way or to offer people resources just in time or to gather information about it? So, could we be using the step count that your phone is gathering towards your mental health? Could we transform GPS into something like green space to learn about its impact on mental health?

David Gratzer: So here you're talking about the potential to understand more about mental health and mental health problems. I mean, before you also spoke about prevention. So, somebody has a diagnosis, there's a change in their pattern, say they're bipolar affective disorder, they're going into unfamiliar neighbourhoods at different times. There's also the potential to try and solve the problem before it starts. So long before they might tell a relative who calls the psychiatrist office. Perhaps the phone intervenes, dispatches some CBT techniques in real time, and books [them] into the psychiatrist. Do you think this stuff is flaky or full of potential?

John Torous: It's full of potential, which is perhaps what makes it so exciting. And perhaps what's exciting is we haven't fully realized that potential. But a nerdy or technical term for it is "Just in Time Adaptive Intervention." Somehow it sometimes gets abbreviated as "Jedi", which I don't quite see it as that (from a "Star Wars" nerdy point), but we'll call it Just in Time Adaptive Intervention. But the idea being if the phone could say, "Well, John, your mood is worse and we've noticed that your exercise is less," that seems like a correlation that would naturally lend itself to a recommendation to say, "Why don't you try exercise intervention?" So, I

think what we're going to see, perhaps in the next generation of mental health apps, is we're going to be informed by both surveys, wearables, digital phenotyping data to become context aware and tailored. Because a lot of apps on the marketplace today, if you really peel back their layers, they're kind of just books that have been put onto a phone - and that's more convenient, that does add value, but they're not quite tailored to say me in my unique needs at five o'clock on a day. Right. They're not perhaps tailored to your unique needs at two o'clock, on a different day, in a different region with a different environmental situation. And if you think about it, what is technology really good at? We've talked about it can help us sensing this phenotype in wearables. It can help us bring in information. Phones have displays. They change, right? They're adaptive. Everyone can watch a different video on YouTube. Why can't everyone then kind of have a different course of CBT at the pace they want, adapted to how they want it and when they want it based on this kind of data? So I think it's that marriage between the digital phenotyping, between the wearable, between the smartphone surveys and these kind of CBD-based apps that kind of customise and tailor, is the exciting future.

David Gratzer: That has potential. I'm carrying my phone everywhere. It's a lot of passive and active data that could be collected. What about the implications for patient privacy?

John Torous: I think it's perhaps the number one concern or barrier in this. Again, we can probably collect too much data today. I think that we know all of health care is based on trust and especially mental health care. If there's not trust, there's really not going to be mental health care – it's not going to be productive discussion. And I think that we know that there's ways we can collect this data in a secure, safe and privacy preserving manner. I think that we're also all aware that no digital data is ever perfectly secure – also in the digital app space. I mean, the work that you and I do with the APA App Evaluation Framework, we know there's a lot of apps that simply just don't respect patient data still. The situation is getting better, but we know that the average app that you and I go to look for is not really handling my data in a way that perhaps either us would be super comfortable with, and we know there are apps that do it well. So, I wonder if perhaps the focus has to be right if we're doing this, and I think we're going to see efforts that we first demand information on how it is protecting data, why should we trust it as a first step? And again, that almost goes back to our work with the APA framework. The first thing is privacy and safety. And if we can guarantee that, then we look at efficacy: "How does it work? How does it improve mental health? What does it do?" But if we don't have that foundation of privacy, I think no matter how interesting, it's not going to be health care. That's going to be surveillance. And I think there is a fine line between what is innovation in mental health and clears as a field of a legacy of not always having the best innovations. So, I do think we have to be careful and cognisant. That said, we could do it in the right way after it's the right commitment to it and the right stakeholders at the table.

David Gratzer: And, of course, patient consent is the pillar of all of this.

You've just written a very compelling paper for *World Psychiatry*, "The growing field of digital psychiatry." You are the first author and I assume the prime mover. I note that you cover a lot in terms of new technologies, but very little in terms of wearables. How come?

John Torous: So, one, the field is just ever expanding. I think a lot of the wearable research we saw was exciting, but in very early pilot phases most of the time. It was kind of interesting signals. We know that it's feasible to collect this data, right? But we haven't seen a lot of integration into treatment plans, as we said, integration into just in time adaptive interventions, and into these responsive apps. We also have seen a lot of different devices come and go. It can be very hard to compare wearables from 2016 to wearables in 2021. Different manufacturers. Not many standards for looking at the data. So I think we are excited about it, but in some ways they're trying to say what is the high level summary of wearables? There's not as much to say — yet.

David Gratzer: Let's pivot then and look at other technologies. I'll hit on a few. Please give comment. Chat

bots.

John Torous: So chat bots. Certainly a broad term that can cover a lot of different interventions, but usually there's going to be either a text based system that responds to you, an avatar a little character that responds to you. But something that tries to engage you in a conversation that is not a human being. There are even virtual reality chat bots, too. So again, a broad term. But the idea being, can you in some ways take the human out of the loop? Can you have a conversation with a computer, be it the computer being a text messaging programme? It being it looks like a bot, or even being against something virtual reality that you look at. A lot of interest in chat bots, a lot of funding, at least in the US, pouring into chat bot companies. Interestingly, a lot of the data still being very preliminary, basic. If you kind of sit down and look at the studies and say, "Well, what is the control group? What are they proving? How much better are people getting? Is it clinically significant?" By now clear data these are feasible. People are interested in them. Are they better than, say, checking the weather app? We don't fully know. "Are they really engaging? Do they keep people using them for long term?" We don't know. "Is the improvement clinically significant?" We perhaps don't yet know. That said, I imagine we're going to start seeing a lot more research because these things are going to have to soon show the value given all the money they've taken on.

David Gratzer: Virtual reality.

John Torous: Virtual reality. Again, another term that we're seeing. A lot of different ways you can deliver virtual reality. You don't need to have these expensive headsets anymore. You can buy something I call Google Cardboard, other people make it, but basically you just find a headset and you put your smartphone in front of your eyes and you can kind of turn your own smartphone into a virtual reality.

A lot of research has been done around PTSD and exposure therapies for virtual reality. It's much easier to handle a spider or to go up on a tall building on virtual reality than to do it in person. And those exposure therapies seem to have pretty strong evidence. Of course, there's also a concern for iatrogenic effects, right? What is the harm of doing unguided exposure therapy? Exposure therapies, by definition, have some challenging parts to them, and a lot of research we've been sent has been done as kind of with direct clinical supervision. It's a research study. It has safety built in. What does it mean when you're doing unguided exposure therapy to the mass public? We don't know because it hasn't fully taken off. But I think we're seeing research certainly beyond exposure therapy – exciting research and psychosis. We help people develop skills around negative symptoms of schizophrenia. So, I think a lot of potential, a lot of ways to deliver it. Still not mass market or nothing that you and I would be prescribing on a routine basis even in late 2021.

David Gratzer: Social media.

John Torous: Social media. Certainly in hot water in 2021 with Instagram and Facebook and a lot of concerns. I think at the time of this podcast, Facebook was thinking of renaming itself because of perhaps all of the bad implications. And I think in some ways, social media has been seen as perhaps the "dangers" of technology, at least in mental health sense. What's been most interesting is, I would say consensus of research says, we don't know a lot about screen time. If you look at the hard data on screen time it seems to be kind of neutral. Some people good, some people bad, some people the same. But the reason is, "Is screen time a shadow of all of the of what you're doing on the internet?" And as the research community is clinicians, it's been very hard to work with social media to understand what people are doing. "What is the quality of what you're being exposed to? Is it all hate groups? Is it people are volunteering online?" All we can kind of see is was the screen off or on. So I think that's why the screen time metric has been a little bit misleading. It's true screen time doesn't seem to impact mental health, but it's a shadow for what we need to learn about what it really is.

David Gratzer: Do you think there might be potential good in terms of social media, in terms of treatment or prevention, even of mental illness?

John Torous: I think, I mean, you and I both spoke and peer support is very impactful. Peers are perhaps the future of mental health. A new workforce that could really embrace technology, become the technology experts. And I think using social media to connect with people, to help build positive experiences, to help share experiences, in some ways to crowdsource treatments, has tremendous potential too if used in the right way. But again, I think we've seen the focus on social media has perhaps been monetizing our emotions often, so we haven't really seen the full therapeutic potential of it come out.

David Gratzer: You know, the last time you and I released a podcast, we were, at least by Toronto standards, somewhere between the first and second wave of the pandemic, which seems like a long time ago, but was only a handful of months ago. The pandemic has changed a lot. How has the world of mental health care and technologies changed with the pandemic, do you think?

John Torous: You know, I think when we met last time, we knew telehealth was effective and synchronous telehealth, when you're doing a video visit, was certainly underutilised. And I think that we've seen the COVID situation across the world has made synchronous telehealth, phone calls in real time or video visits, become the norm. And if you think about it, what we're talking about smartphone apps, wearable sensors, virtual reality, chat bots, these are often asynchronous telehealth, right? You're not working with a therapist in real time. A therapist may be reviewing it for you afterwards. You may be needing to check in about it, but if you really want to increase access to care, you need to use asynchronous telehealth. If you just look at the number of providers, look at the need, it doesn't match up, it doesn't matter how you spin the math. So, what we really have to do is bring these asynchronous technologies to bear with synchronous telehealth. I think COVID in some ways got us halfway there, that we're using synchronous telehealth. We've got people ready to do online therapy. And I think the advancements that we're going to see towards closing the mental health gap in countries that have relatively good mental health resources like Canada, the U.S. and even low middle-income countries, is how do we now use asynchronous telehealth again? Fancy words for sometimes apps and wearables and chat bots and virtual reality.

David Gratzer: And thinking about a world without a pandemic, what then would be some of your predictions?

John Torous: I think that we're going to see perhaps actually these technologies, just like we were kind of surprised how quickly people up took video visits and synchronous telehealth got embraced. I think we're going to quickly see asynchronous become embraced just as well. I think this is not going to be perhaps only just steps. It's gradual. I think that the potential is so high. We know that we can do it. If you look at investments from the private sector, right, it's phenomenal kind of how people are investing into this. And again, I think that we're going to see kind of a lot of moves towards asynchronous, and it'll be interesting: "What does the health care system look like in that way? Are we going to have a more step-care system where we kind of start with asynchronous therapies? Are we going to have different layers of care to people move through? Are people going to select what they want? Are more people going to come into care because of these easy pathways? Are we going to actually kind of make it too hard to access care if people feel they have to go through programmes they don't want to?" There's a lot of systems issues and perhaps implementation issues that I think will come up as these technologies get developed. But I think that again, you and I have said this on *Quick Takes* before, the technology has been there and is there for a while, right? We're not - there's no shortage of apps. There's no shortage of sensors and wearables. It's really now going to be "How do systems want to implement them? Will they implement them? What do crowds reimbursement issues look like around them?" But it's not a technology issue anymore.

David Gratzer: Dr. Torous, as always, we appreciate your comments. It is a *Quick Takes* tradition, to have a rapid-fire minute with several questions in a row. Goodness you're a returning guest, you're familiar with the drill. Shall we? Shall we put a minute on the clock?

John Torous: Let's do it.

David Gratzer: All right. Ready. Here we go. Dr. Torous, do you have a wearable?

John Torous: No, it got lost.

David Gratzer: What did you have before?

John Torous: I had an Apple Watch Series 2.

David Gratzer: Do you think the wearables in the future will be something of a game changer for mental health care?

John Torous: No.

David Gratzer: Biggest surprise for you in 2021.

John Torous: Rapid adoption of synchronous telehealth.

David Gratzer: Biggest prediction for 2022,

John Torous: Asynchronous telehealth, like apps, takes off rapidly.

David Gratzer: Do you lose sleep over patient privacy issues?

John Torous: It's the number one thing I think in this whole work I lose sleep about.

David Gratzer: Are you optimistic about the future?

John Torous: Overall, yes. There're so many exciting avenues.

David Gratzer: Favourite new technology?

John Torous: I think favourite new technology... I can't say mindLamp since we build it, but we give it away for free, so there's not a direct conflict of interest.

David Gratzer: Now at the buzzer. One last question. You've alluded to sleep several times. You've just published a major paper in *World Psychiatry*. You've published almost two hundred papers, even though you're so early in your career. Between you and me, sir, do you *really* sleep?

John Torous: I think about seven and a half hours a night.

David Gratzer: Wow. Well, we'll take you at your word – though I'm a bit sceptical.

Dr. Torous it's always an enormous pleasure to talk to you about these things. Thanks for being again a *Quick Takes* guest. For those who are interested in learning more about Dr. Torous' work, on our website we have several links, including to that *World Psychiatry* paper. And that's this episode of *Quick Takes*.

John Torous: Thank you.

[Outro:] *Quick Takes* is a production of the Center for Addiction and Mental Health. You can find links to the relevant content mentioned in the show and accessible transcripts of all the episodes we produce online at porticonetwork.ca/web/podcasts. If you like what we're doing here, please subscribe.

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