Welcome to Yale Cancer Answers with Doctor Anees Chagpar.

Yale Cancer Answers features the latest information on cancer care by welcoming oncologists and specialists who are on the forefront of the battle to fight cancer. This week it’s a conversation about the use of digital neurotherapy to address anxiety and depression in cancer patients with Doctor Bruce Wexler.

Doctor Wexler is a professor emeritus and senior research scientist in psychiatry at the Yale School of Medicine.
where Doctor Chagpar is a professor of surgical oncology.

Dr. Wexler, maybe we can start off by you telling us a little bit more about yourself and what it is you do.

Well, I’m a psychiatrist and a neuroscientist. I’ve been interested my whole career in how our brains work. And how our brains support and what their relationship is to the way we think and feel as people. And then how our brains and our minds together interact with the rest of our bodies. We’re learning more and more
about all of these things. And you can see already that I don’t shy away from the complexity of these questions and of the way these wonderful parts of us are actually organized and work. Our brains, as you may know have over 80 billion neurons and each one can be connected to 1000 other ones. It’s the most complex living system that we know about, and I’m a systems thinker and I’m happy to explain what that means and how we relate it to how the
brain works and our minds work.

And then issues like depression, anxiety, and physical illness.

Yeah, so tell us more about what exactly a systems thinker is and how it applies.

The systems thinker likes to look at and appreciates the necessity of understanding the complexity of how things interact.

And a key concept in these is called an emergent property.

An emergent property is something that comes into existence when different parts interact. But doesn’t exist in either one by themselves.

Like water, for example.
Water has all these wonderful properties of freezing and expanding and creating crystals, forming snow, flowing in water in streams and rivers. So you might say, a scientist might say, well, I want to understand where this comes from. The water, when you break it apart, those properties disappear.
They don’t exist in hydrogen and oxygen, only in their special combination. So apply that to what I told you about our brain. 80 billion neurons and each one connected to a 1000 others. This is a complex system of interacting parts, and it’s those interactions that create the emergent processes and among those emergent processes are the way we think and feel. Because our brain is organized hierarchically, from single cells, to two cells, dyads that work together to local
00:03:26.140 --> 00:03:28.910 neurons that create little microcircuits,
00:03:28.910 --> 00:03:30.534 to neurosystems that integrate
00:03:30.534 --> 00:03:32.564 hundreds of millions of neurons
00:03:32.564 --> 00:03:34.308 from all across the brain.
00:03:34.310 --> 00:03:36.490 And cognition and emotion live
00:03:36.490 --> 00:03:38.670 there at the neurosystems level,
00:03:38.670 --> 00:03:41.270 not in individual cells.
00:03:41.270 --> 00:03:43.410 So as a psychiatrist,
00:03:43.410 --> 00:03:46.085 I'm interested in how people
00:03:46.090 --> 00:03:48.465 think and feel and what
00:03:48.465 --> 00:03:49.890 could cause disturbances,
00:03:49.890 --> 00:03:50.982 subjective discomfort in
00:03:50.982 --> 00:03:53.166 the way we think and feel.
00:03:53.170 --> 00:03:55.585 So that means that these are disruptions
00:03:55.585 --> 00:03:57.570 and changes in their systems,
So a systems thinker understands emergent properties, embraces the complexity. It's an alternate approach to science. The reduction approach has its own values which it takes things apart. The systems part puts them together and then says what happens when you put them together in more and more complex and in our brains, dynamic ways that reconfigure themselves constantly. Then we put the brain in the context of the body and we're learning more about how the brain affects the body.
The mind affects other parts of brain function, the neurosystems affect other parts of brain function, how those affect the body, how the body affects the brain. We’re learning about that, for example, the microbiome, all the bacteria that live in our gut, in fact, the way our brains work at times. And this then takes us into the realm of depression, anxiety, psychiatric problems, emotional problems and how they
interact with body processes

and in certain situations, how they interact with.

Chronic diseases, which are affecting different parts of our bodies and the brain and the body interact in those processes too.

Yeah, you know, it’s it’s really interesting when you kind of think about the brain and the complexity that it has being really the Control Center for pretty much everything that our body does including controlling our emotions.

When we think about cancer patients, however, we often think that this is a devastating diagnosis and that
that just engenders this emotion
of depression and anxiety.
For many patients who are facing this,
this diagnosis, rarely do we actually think about, well,
how does that work at a neuron level?
So tell us more about how exactly that does work and what are the implications because.
If this is just a matter of,
you know, how neurons interact,
well, maybe there’s something that we can do about that.
Absolutely, That’s absolutely right.
So we know, First off to start with,
that different people react to different
life experiences in different ways and those reactions may facilitate dealing with the life situation, whether it be a. Emotional work challenge or whether it be a health challenge like cancer. Or they could act aggravate the problems. So we understand then that at this neuro systems level we are reacting to processing, regulating our emotions, processing information and figuring out just how am I going to respond to that as a person who I am, how am I going to deal with that? And we know from studies that. Many patients with cancer feel that their depression compromises a recovery,
and many oncologists believe that there's data to support it. So that's an example. Depression in studies of people with cancer have shown that the presence of depression can compromise survival significantly. So right there we have multiple reasons for wanting to consider the options of how somebody when faced with this real challenge, as you say, and these this threat to them as a person. The complications of their lives, the changes and the losses that
people experience in terms of the type of activities that they can do in the discomfort of involving being involved in the treatments and the anxiety about the outcomes. And so many things change the way people deal with that can make a difference in the outcome. And digital neurotherapy is a new type of intervention that’s been
proven to reduce depression without medication and without any side effects.

So I mean it certainly makes sense that those who may suffer from depression may have worse survivals.

I mean, because certainly it may not be the depression in and of itself, but the effects of that depression.

Too depressed to get out of bed.

Too depressed to take my medicine.

Too depressed to go to the doctor.

Too depressed to do much of anything.

And so that has ramifications.

But tell us more about digital neurotherapy.
I’m not certain that many of our listeners know what that is. They probably don’t because it’s a new class, a new type of treatment of CNS or brain disorders and emotional disorders. And you’re absolutely right about the things you say that the mechanisms on the behavioral level that we can understand how cancer might a depression, health and survival in cancer patients and other patients with other medical diseases because it’s just as big an impact in cardiovascular disease or diabetes addition might to the things you listed in these patients,
people might exercise less,

might have less social contact in

the social world, supports us,

might have compromised immune system function.

So those are some just to add to your list of our understanding of the mechanisms,

but what is digital neurotherapy?

So remember I said that it is these neuro systems that integrate action of a hundreds of millions of neurons that are the place where we are emotions arise from and are also our cognitive abilities and our ability to regulate emotion to a set of these
functions are called executive cognitive functions that are defined as those cognitive functions important for Regulating and managing ourselves and our feelings and information. So that is is a target that we’d like to enhance those particular functions. Now we also know from work done in the 1950s that in after birth is when these neuro systems are shaped not by our genetics primarily, but by experience from the environment. Hubel and Weisel got the Nobel
Prize for showing the degree to which our frames are shaped structure and function these neurosystems after birth by stimulation from the environment.

Now how does their digital neurotherapy fit into that? Imagine if you’re going around the corner and you’re trying to decide if it’s a bear or a delivery truck coming at you. The only information you have is the pattern in the light waves coming to your eye that are reflected off the object.
I'm going to figure this out.

Let me look at it this way. What could that be?

The only information, the only data coming into your brain is a pattern of light waves coming into your eye.

Now, if it's a bear or a delivery truck, it activates very different neural systems, different feelings, different behaviors.

So digital neurotherapy, we use the eyes and ears to physically interact with the brain.

But we have much more precise control and smaller differences between whether
00:11:28.376 --> 00:11:31.360 it’s a bear or a delivery truck.

00:11:31.360 --> 00:11:33.425 So Digital Neuro Therapy looks

00:11:33.425 --> 00:11:35.077 like a computer game,

00:11:35.080 --> 00:11:39.120 but it’s actually carefully crafted,

00:11:39.120 --> 00:11:43.504 incrementally changing challenges,

00:11:43.504 --> 00:11:46.800 perceptual and cognitive processing

00:11:46.800 --> 00:11:49.505 that each one activates a

00:11:49.505 --> 00:11:51.669 slightly different neuro system.

00:11:51.670 --> 00:11:53.749 So why is this applicable to depression?

00:11:53.750 --> 00:11:54.266 Well,

00:11:54.266 --> 00:11:56.846 depression itself now is understood

00:11:56.846 --> 00:11:58.910 as a neurosystems disorder.

00:11:58.910 --> 00:12:01.490 The frontal executive systems of

00:12:01.490 --> 00:12:04.070 the brain that regulate emotion,

00:12:04.070 --> 00:12:08.550 regulate negative feelings are impaired,
and the negative feeling parts of the brain start to actually overwhelm these executive control systems. And then.

It gets worse and worse because there’s more dysregulation of the emotion part. So we can actually strengthen those frontal executive control systems by exercising them the same what we call active activity dependent enhancement of the neural systems. That’s the same thing that shaped them at the beginning. That’s how our brains evolved so wonderfully to be responsive to our environments. So we harness that neuroplastic
potential using the eyes and ears and
input as input pathways and present
very carefully crafted incrementally
changing cognitive and perceptual tasks.
And those then activate the parts of the brain and that we need to target to strengthen and when they’re activated that produces activity dependent enhancement. Now we’ve demonstrated this with brain imaging. That we are actually changing brain activation. We’ve demonstrated in depression they were actually changing
the connectivity in the brain that creates the neuro systems.
And we’ve demonstrated in multiple published studies now in the top journals that this type of intervention reduces depressed mood more effectively than medicine and also improves cognition is a side benefit by the way for people with cancer because sometimes. The treatments for cancer can compromise. As we know called chemo brain are thinking and cognitive functions. So we’re enhancing those at the same time with digital neuro therapy. So it looks like a computer game, but it’s crafted the way I said to
harness the brains neuro potential,
neuroplastic potential to enhance under functioning neuro systems that regulate emotion.
Wow, that sounds really interesting,
but we’re going to pick up this conversation and learn more about. Digital Neurotherapy and how it can be used to address depression and anxiety right after we take a short break for a medical minute.
Funding for Yale Cancer Answers comes from Smilow Cancer Hospital, where their oncodermatology program
treats dermatologic concerns, including very dry skin, itching, and skin changes that arise as side effects from chemotherapy. Smilowcancerhospital.org. It’s estimated that over 240,000 men in the US will be diagnosed with prostate cancer this year, with over 3000 new cases being identified here in Connecticut. One in eight American men will develop prostate cancer in the course of his lifetime. Major advances in the detection and treatment of prostate cancer have dramatically decreased the number...
NOTE Confidence: 0.94179736
00:14:58.649 --> 00:15:00.900 of men who die from the disease.
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00:15:00.900 --> 00:15:02.750 Screening can be performed quickly
NOTE Confidence: 0.94179736
00:15:02.750 --> 00:15:04.600 and easily in a physician’s
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00:15:04.660 --> 00:15:06.450 office using two simple tests.
NOTE Confidence: 0.94179736
00:15:06.450 --> 00:15:08.844 A physical exam and a blood test.
NOTE Confidence: 0.94179736
00:15:08.850 --> 00:15:11.255 Clinical trials are currently underway
NOTE Confidence: 0.94179736
00:15:11.255 --> 00:15:13.179 at federally designated comprehensive
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00:15:13.179 --> 00:15:15.311 Cancer Centers such as Yale Cancer
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00:15:15.311 --> 00:15:17.490 Center and Smilow Cancer Hospital,
NOTE Confidence: 0.94179736
00:15:17.490 --> 00:15:19.465 where doctors are also using
NOTE Confidence: 0.94179736
00:15:19.465 --> 00:15:20.650 the Artemis machine,
NOTE Confidence: 0.94179736
00:15:20.650 --> 00:15:22.570 which enables targeted biopsies
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00:15:22.570 --> 00:15:24.010 to be performed.
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00:15:24.010 --> 00:15:26.282 More information is available
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00:15:26.282 --> 00:15:27.272 at yalecancercenter.org.
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You’re listening to Connecticut Public Radio.

Welcome back to Yale Cancer Answers.

This is Doctor Anees Chagpar,

and I’m joined tonight by my guest,

Doctor Bruce Wexler.

We’re talking about ways to address depression and anxiety in cancer patients using digital neurotherapy.

So before the break, Doctor Wexler, you were telling us that this looks like a computer game, but it’s carefully crafted so that it actually exercises or strengthens executive. Portions of your brain that are underutilized so that you actually can improve the manner in
which you respond to a stressful or emotional stimulus and can improve your cognition as well.

Is that right?

That's absolutely right. Yeah.

So a couple of questions. First off, it sounds like this would be something that people should be doing. Why wait until they get cancer to start exercising this part of the brain? Is there a right time to start using digital neurotherapy? And it doesn’t really need to be a neurotherapy?

Or could it actually be, you know,
a downloadable app that you can play with if it truly is like a computer game, But that just has the side benefit of making your brain stronger. Great questions. It is a downloadable app. That’s exactly what it’s used and it’s available for people to use. Now. Now, who should use it, when they should use it and why they should use it are really key questions. If we step back from a therapy perspective and say, well, what about all these processes of how our brains are shaped by the environment and strengthening our ability to manage
ourselves and manage our emotions, that’s what we do. In schools, that’s what we do in growing up. That’s what we do in processing life experience, and that’s what we do with the input that’s coming into us all the time. It’s shaping our brains. Every night they get reshaped. So this happens. Why would we want to do something more specific to focus it? Well, we already make big attempts with education, for example, right? A major feature.
Of modern societies or schools, where we put together a certain type of expertise and curriculum and activities specifically to shape the brain in the neuroplastic change period when their brain is being really actively shaped in childhood. So in this we actually have a whole program for schools and why in schools? Why not just let the curriculum do its job. Well, there we specifically addressing achievement gaps related to poverty because they are the children just haven’t had the experiences that
they need to promote development of these neuro systems and in fact have some bad type of experiences that actually compromise the development of the executive functional systems. So there I call it a school lunch program for the brain, just like we give children from less ideal backgrounds. Additional food in school, they actually then grow faster and reach their growth potential. Same thing with this.
that can build on itself, right?

Because the children then don’t aren’t prepared to no fault of their own neurologically to meet the demands made of them in school. And this sets off a problematic development developmental trajectory. Affecting how they think and feel about themselves, how they engage with the school curriculum. They lose the second time they come to school where they’re supposed to be getting this educational enrichment, they can’t engage with it. And so that’s the type of situation where you would say,
00:19:31.030 --> 00:19:31.358 yeah,
00:19:31.358 --> 00:19:33.982 well there is when we really need this sort of intervention now in certain.
00:19:37.860 --> 00:19:39.140 For a variety of reasons,
00:19:39.140 --> 00:19:41.054 and I’m speaking as a psychiatrist for a variety of reasons which have to do with cascading effects.
00:19:43.081 --> 00:19:45.145 have to do with cascading effects.
00:19:45.145 --> 00:19:47.459 of life experiences and stresses,
00:19:47.460 --> 00:19:48.396 genetic predispositions.
00:19:48.396 --> 00:19:52.140 Our brains all start off in different ways.
00:19:52.140 --> 00:19:54.300 Some people develop their brain systems in certain ways that have limitations and problems,
00:19:54.300 --> 00:19:56.460 and they seek help for that.
00:20:00.580 --> 00:20:03.490 It could be seeing a psychiatrist
00:20:03.490 --> 00:20:05.800 for a talk therapy that can help
NOTE Confidence: 0.944566485714286
00:20:05.870 --> 00:20:07.830 restructure those neuro systems.
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00:20:07.830 --> 00:20:10.110 Because you’re feel very sensitive,
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00:20:10.110 --> 00:20:12.990 say to rejection or you don’t have a
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00:20:12.990 --> 00:20:14.458 confidence in nothing yourself
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00:20:14.458 --> 00:20:16.660 because of the way certain things
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00:20:16.724 --> 00:20:18.924 happen to you and the way your brain
NOTE Confidence: 0.932102266666666
00:20:18.924 --> 00:20:20.627 responds to them at that point.
NOTE Confidence: 0.932102266666666
00:20:20.630 --> 00:20:22.989 So then we’re talking about a corrective,
NOTE Confidence: 0.932102266666666
00:20:22.990 --> 00:20:24.925 deliberate intervention, right,
NOTE Confidence: 0.932102266666666
00:20:24.925 --> 00:20:28.150 to help reshape the neurosystems.
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00:20:28.150 --> 00:20:29.718 So for depressed patients,
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00:20:29.718 --> 00:20:33.322 we have a lot of data quite
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00:20:33.322 --> 00:20:37.078 independently independent of.
NOTE Confidence: 0.932102266666666
00:20:37.080 --> 00:20:39.887 Any medical condition that may be related
NOTE Confidence: 0.932102266666666
00:20:39.887 --> 00:20:42.520 to the depression that we can enhance.
As you said, these neuro systems that support the executive control systems that regulate emotion now having a chronic medical disease happens to be one of the type of life experiences that your listeners know all too well. Many of them compromise your ability to relate to the environment that sustains us. We’re so connected to the environments. I didn’t have time to fully explain that. I developed more fully of all these dimensions and in a book I wrote. But I don’t have time now to go into all the ways that we need to stay
connected to these environmental inputs that shaped us, to also sustain us. That’s why the COVID isolations were so hard for so many people who wanted, you know, to go back to my pub or my haircut salon. That’s my life. That’s part of me. And so all that gets disrupted by a chronic illness and then there’s more stress put on these key neuro systems and they can then become compromised in the way I said. And so this becomes another type of situation right there where we would say we want a special intervention.
So in answer to your question, there are, there is our brains are continually shaped. We need to be connected to the right type. Hopefully that largely happens from the way we as a society have created those environments and we relate to those environments and we relate to other people and that goes along nicely. There are times of course when there are times of course when we see in the troubled places as we see in the troubled places around the world where violence is totally disrupted, the community and the lives and the
00:22:22.506 --> 00:22:24.455 type of stimulation that’s coming
NOTE Confidence: 0.932102266666666
00:22:24.455 --> 00:22:26.765 into those people’s brains and minds,
NOTE Confidence: 0.932102266666666
00:22:26.770 --> 00:22:28.254 that’s really distorting them
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00:22:28.254 --> 00:22:30.480 in ways that are have lifelong.
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00:22:31.011 --> 00:22:34.535 So the time when you ask, should
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00:22:34.535 --> 00:22:36.880 everybody be doing this all their lives?
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00:22:36.880 --> 00:22:38.476 Well, yes, we are.
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00:22:38.476 --> 00:22:40.471 We’re doing it through established
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00:22:40.471 --> 00:22:42.798 social structures of reading books,
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00:22:42.800 --> 00:22:44.198 listening to music,
NOTE Confidence: 0.932102266666666
00:22:44.198 --> 00:22:45.596 going to school,
NOTE Confidence: 0.932102266666666
00:22:45.600 --> 00:22:47.076 interacting with other people.
NOTE Confidence: 0.932102266666666
00:22:47.076 --> 00:22:49.679 But there are special times when we
NOTE Confidence: 0.932102266666666
00:22:49.679 --> 00:22:51.635 want a special type of intervention.
NOTE Confidence: 0.90588216
00:22:52.320 --> 00:22:56.730 So let me kind of nail that down a little

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bit, you know, when we think about. Cancer patients, not only have they now been given this devastating diagnosis which routinely never puts an appointment invite on your calendar. So it is often unexpected and you are now thrust into this life changing experience dealing with not only the physical ailment but also. You know, how is this going to affect your family, your children, your job, the financial toxicity, losing your hair, your body image, and on and on and on and on. You have a myriad of doctor’s
appointments and diagnostic tests.

So a couple of questions.

While the digital neurotherapy sounds like it would be advantageous, particularly for your emotional health.

Two questions.

One, how does that fit into this incredible whirlwind that you’re already in?

Would that increase anxiety and depression by being yet another thing I need to do?

And #2, in terms of rewiring or reshaping or strengthening the brain and the cognitive processes, does that take time?
Because certainly with cancer it’s gonna move at its own pace. And are we playing catch up at that point?

These are again, great questions. I know there’s a big burden of the illness and also of the treatments. The nice thing about the digital neuro therapy is that you do it when you want at home. And so for example,

if you logged on to the Ch Sciences website, which is a Yale startup company that’s tried to is bringing the dirt, making the digital neurotherapy available for the world,
00:24:57.200 --> 00:24:59.860 you just create an account and you
NOTE Confidence: 0.95434236
00:24:59.860 --> 00:25:02.480 play the games whenever you want.
NOTE Confidence: 0.95434236
00:25:02.480 --> 00:25:03.425 Now you’re right,
NOTE Confidence: 0.95434236
00:25:03.425 --> 00:25:05.315 it does take effort in time.
NOTE Confidence: 0.95434236
00:25:05.320 --> 00:25:07.120 The amount of time we’re
NOTE Confidence: 0.95434236
00:25:07.120 --> 00:25:08.920 talking about would be about.
NOTE Confidence: 0.93857629
00:25:12.170 --> 00:25:14.408 100 minutes or so a week,
NOTE Confidence: 0.93857629
00:25:14.410 --> 00:25:17.868 less than two hours a week and it can
NOTE Confidence: 0.93857629
00:25:17.868 --> 00:25:21.310 be done anytime and it’s painless.
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00:25:21.310 --> 00:25:25.900 It’s actually enjoyable and you can
NOTE Confidence: 0.93857629
00:25:25.900 --> 00:25:29.850 feel your systems getting stronger the.
NOTE Confidence: 0.9301902
00:25:33.920 --> 00:25:36.120 So, yeah, so, so you can access it,
NOTE Confidence: 0.9301902
00:25:36.120 --> 00:25:38.115 you you do it when you want,
NOTE Confidence: 0.9301902
00:25:38.120 --> 00:25:40.840 but you do like you said, it does take time.
NOTE Confidence: 0.9301902
00:25:40.840 --> 00:25:42.552 Now I I said it takes.
NOTE Confidence: 0.9301902
00:25:42.552 --> 00:25:45.202 So like let’s say you did a 20 minute
training session five days a week,

Think of it like going to the gym though. 
You’re absolutely right in these

And it does take time.

Now it takes time in terms of what 
we’ve talked about, the intensity, 

how frequently per week, 

but how long do you have to do it?

Well, in the published studies, 

it was 4 weeks and there was dramatic 

benefit that was done with actually 

people were doing it five days a 

week and doing it for an hour a day.
But we think of that if you do it four times a week for 30 minutes,
within 8 to 12 weeks, people start feeling better. And thinking better and then building in more able to engage in other activities in their lives, which will amplify it.

As you said, amplify the benefits. Attend their doctor’s appointments, remember their medication, do exercise, do more time reading spent and interacting with other people. Smiling more itself makes you feel better,
so it will build on itself.

Now the amount of time you have it is that you know the sooner you start the better.

Because we do know that the presence of depression compromises survival duration in patients with cancer that’s been established.

So I think that this would be something that would be valuable for people to start sooner rather than later and work it into the routine.

And let me add further, you try it and you feel, you know, I’m just not feeling that well or I
had some chemotherapy that’s really making me just too exhausted to try it.
You can do it lying in bed, by the way. On your tablet, touchscreen tablet. But I’m just too exhausted to even try it. I’m just going to do 10 minutes today, and this week I may only get in, you know, 40 minutes total. That’s all right. But then you can build it up gradually.
And so then the next question is how long do the effects last? So for example, if you did this for four weeks, as the studies as suggested is there.
A tail, in other words, does this have a glow effect where you know you’ve strengthened the cognitive portions of your brain and you can continue to reap that benefit for years to come? Or is this something that you need to do on an ongoing basis?

Well, I think it’s advantageous to do it on a longer than four weeks and longer than I’d said you can see benefit for in the studies, 4 weeks, 8 or 10 weeks we’re recommending. At a somewhat lower intensity use at home, but I think there’s more
benefit the longer you do it.

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Doctor Bruce Wexler is a professor emeritus and senior research scientist in psychiatry at the Yale School of Medicine.

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If you have questions, the address is Cancer Answers at Yale dot Edu.

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And past editions of the program are available in audio and written form at yalecancercenter.org.

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We hope you'll join us next week to learn more about the fight against cancer here on Connecticut Public Radio.

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