

Alan Hu Foundation Mental Health Lecture Series

Harnessing Brain Adaptability Webinar by Victor G. Carrión, MD

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Hello everyone. Welcome to the Alan Hu Foundation Mental Health Lecture Series. I am Chih-Ching Hu, Co-Founder of the Alan Hu Foundation, and the host for your webinar today. Dr. Victor Carrion will present Harnessing Brain Adaptability. Before moving forward, I want to thank the Mental Health Association of Chinese communities for providing simultaneous Chinese interpretation. I would speak Chinese to briefly explain how to use language interpretation.

Alan Hu Foundation Mental Health Lecture Series aims to make mental health knowledge common knowledge. Alan Hu foundation's mission is to promote mental health, raise awareness, and remove stigma surrounding psychiatric disorders, and support fundamental research for cures. Please consider making a gift to the Alan Hu Foundation. Your gift will be 100 percent invested into the foundation's mission to support mental health. Today I'm honored and privileged to introduce Dr. Victor Carrion. Dr. Carrion is the John A Turner MD Professor of Child and Adolescent Psychiatry at the Stanford University School of Medicine, and Vice-Chair of the department of Psychiatry and Behavioral Sciences. He directs the Stanford Early Life Stress and Resilience Program. Since joining the faculty at Stanford 25 years ago, Dr. Carrion's research has concentrated on understanding how early life stress such as traumatic experiences alter behavior and emotion, and the role of brain structure and function in these findings. He has also developed new treatment modalities that are focused on and targeted. Dr. Carrion was appointed by Vice President Kamala Harris, then Attorney General, to the Mental Health Services Oversight, an accountability commission for the State of California, which he chaired from 2014 to 2016. He published the main text on the neuroscience of post-traumatic stress disorder in youth, as well as texts on treatment and prevention. He has received multiple awards from the American Academy of Child and Adolescent Psychiatry, the American Foundation for Suicide Prevention, and the National Institute of Health. In the presentation, Dr. Carrion will address the impact of traumatic stress from a biological, social, and psychological perspective. Recent events of the past year highlighting pandemic, political, and social stressors are considered significant stressors to our system as individuals, but also to communities and society. Personal and social resilience will need to be strengthened, Dr. Carrion will share his approaches to building strong resilience and adaptation for youth and for adults.

Following the presentation there will be a 10 to 15 minute Q&A session. Please submit your questions using the Zoom Q&A feature. The presentation is for educational purposes only and it's not intended for medical diagnosis. If you have any persistent symptoms, please seek professional help. With that, I'm going to turn it over to Dr. Carrion. The stage is yours.

Thank you, thank you so much for having me here. I really want to thank the Alan Hu Foundation not only for inviting me to give this talk, but for really connecting all of us. Connectedness is a very important part of what I'm going to talk about, and you know one of the terms that I really have disliked this year is social isolation. Which really is physical distancing is a better term, but we don't want to be isolated socially, so thank you Alan Hu Foundation for connecting all of us today. I am going to start by sharing my slides. Let me see if I can get this done right.

Let me stop sharing here.

Okay and you can all see that.

Yes, I can see it okay.

You know today we're going to talk about adaptability, and we're all very familiar with the term that we call resilience, right? They kind of bounce back to our normal state, a physics type of term, but sometimes when we bounce back we don't bounce back exactly where we were. We bounced back to another spot, to another place, and that place may actually be better than where we were before and we called that adaptability. And that is the goal of what we're going to do. Once again, I feel very honored being here in such an important month, the Asian American and Pacific Islander Heritage Month. Which is shared, I have to say, with the Mental Health Awareness Month, so this is a time to commemorate, but it's also a time to remember that this happens every year and that means that we have work to do, and we have work to do for years to come. As you all know, the celebrations really are clouded by the violence that we have seen in the past few months in the United States, and even before then. So, we have to keep at it, we have to keep remembering how much the cultures, the Asian culture and the Pacific Islander cultures, have contributed to what America is today. And we have to do that in part with mental health. Mental health not only for AAPI, but mental health for the nation.

So, with that in mind, let me discuss what we're going to discuss today. I'm going to start with some general remarks about stress, because we all have different thoughts about it. So I want to share what mine are and then some work, some research, that we've conducted for the past 25 years on the biological markers of stress early in development and how those have influence in the brain structure and the brain function during development. What that means is that if the brain is vulnerable to something that can happen outside, that means that if something good happens outside, that's also going to influence the brain and that's because there is neuroplasticity. So we'll talk about neuroplasticity, and how to take advantage of that, and how we have done that in my lab with treatments and with prevention interventions. And then lastly, we'll all engage in some exercise in terms of how can we become more adaptable cognitively, in terms of what we think, and emotionally, in terms of how we feel. The first thing to say about stress is that stress is not inherently a negative thing. In fact, we actually need stress to develop a lot of our systems, including the immunological system. If we don't care about that exam that we have tomorrow, we'll probably fail, so actually, the more stress that we have the better we perform, the happier we are, the better our health is. But, only to an optimal point. After that optimal point, what we see is that the performance, the happiness, and the health start to decline. I am going to be talking about, and I have started talking already, about violence. That second half of the inverted u-curve shape curve, and the cost that that has for our physiology.

This is an example of something that would be on that second half of the curve. It's a picture from a child that has been exposed to war, and you see is you would say it's just a drawing, but if you look at the faces of the children you can see the expressions of horror and really non-enjoyment in terms of what's happening. This child probably not only experienced war, but experienced family separation, experienced hunger, experienced threat, and we call that this accumulation of stressors and allostatic load. So, we don't only respond to the fire or to the earthquake or to what happened last week, but we respond to what we carry with us as like a backpack. Most of the time, and like a backpack, we tend to really be able to carry it right in the same way, that we regulate our temperature, we can regulate how much stress we have, but if that backpack gets too heavy it starts ripping apart. And if you are six, seven, eight years old, you may even fall backwards. Other examples of violence are man-made. Right here we have a picture from a child about 9/11. This is a child that actually never drew during the sessions, but when 9/11 happened it was the only thing he could do. It was the only way that he could express what he had witnessed. So we have two examples of man-made terror and man-made stress and man-made trauma war terrorism. And then, there are natural disasters. This is a four-year-old girl from Haiti after a massive earthquake there in 2008, I believe. And here, she's really depicting how she and her sister were found in the rubbles of what was their home and they were the only survivors at that time. And then there's sexual abuse, physical abuse, witnessing violence. A lot of what I'm going to talk about today and the data comes from

children that have experienced interpersonal violence. And to them, I thank them for our knowledge and the knowledge to share with you. And of course, this world pandemic that we have all been experiencing during this past year, continues to experience an accelerated rate in many different countries and diffusing further as we speak into areas of Asia.

So, the whole battle between genes and the environment and how we manage stress, it's really not nature versus nurture, right. We know that genes and environments interact to alter our stress vulnerability, and depending on that stress vulnerability of ours, we may develop conditions, we may become resilient, we may become adaptive, but just because we are resilient and adaptive today doesn't mean that we're going to be resilient and adaptive tomorrow. If we think of a threshold, right, where, after the threshold, psychopathology is developed or symptoms or dysfunction or you name it. Anything, any type of problem, happens after that individuals are very far from there can get closer and closer as that backpack gets heavier and heavier. Our job, then, is to lighten that backpack up. Decrease that allostatic load. So what happens when we are on the second part of the curve, is that we have a system called the hypothalamic-pituitary-adrenal axis that secretes cortisol, and I'm gonna be talking about that in a second, but here's an example of what an allostatic load does. It does affect our physiology and then that creates individual differences that we pass through our subjective perception of what we are experiencing and it alters our behavioral responses and, consequently, those behavioral responses like fight or flight or freeze can alter further the physiological response. So, by the end of the talk, I hope that you grab a little bit of a concept of this with the material that I am going to present. Just to let you know, before the pandemic, this is CDC data from 1999 to 2016, the national suicide trends in Americans aged 10 and above were considerably high. And we are having this other pandemic really because it's worldwide of suicide in youth. The data this year is really not that well recorded, so we actually don't know very well what has happened in 2020, but I can tell you this is how the data looked before that. So this is reason for alarm. This is reason for concern for all of us and really a call to action. Something needs to be done.

As children are developing their brain, a hundred billion neurons are forming. There are trillions of synapses, of pruning, of myelination, that's taking place. I mean it's really a miracle, when things don't go wrong, because there are so many possibilities here for something to get derailed and that allostatic load-that backpack- does its job in really trying to alter this development. Let me tell you a little bit about the mechanism of how that happens. On the top of our kidneys we have some glands called the adrenal glands. Those adrenal glands secrete a hormone that helps us manage stressors. So if we're crossing the street and there's a truck coming at us and we jump, that's the adrenal gland secreting a lot of cortisol so that we can get out of there and that, it involves the epinephrine system and other systems as well, but the cortisol is a big part of this. The message of when to release that cortisol comes from the brain, comes from the hypothalamus, and then that goes to the anterior pituitary, and then the anterior pituitary secretes another hormone that tells the adrenal gland okay secrete cortisol. This is what we call the hypothalamic-pituitary-adrenal axis, and our cortisol goes high even when we have lunch right. When we have lunch, that's a minor stressor for our system, so the cortisol helps us with digestion. But if you are a little kid, or if you're an adult, and you feel like a truck is coming at you day, after day, after day, after day, that has at all because this adrenal gland has to keep secreting this cortisol and that sends messages to the brain to shut the system down. And when the system shuts down, then that causes illness and it affects the immunological system and cardiovascular system and other systems. In the chronological system, as well. Now we know, from animal research, that cortisol secreted in high amounts in animals is called corticosterone, and can actually be neurotoxic. What that means is that it can actually kill neural cells. This was a lot of concern to me in terms of children that were experiencing stress and trauma, and as early as 2002 I started looking for levels of cortisol in children that had post-traumatic symptoms after experiencing many of these events that I have talked about. And what we see in comparison to the healthy kids with no psychiatric symptoms, is that there's a normal circadian rhythm, right, a diurnal variation that is pretty similar in both groups, but that groups with post-traumatic symptoms, the green line, had higher levels of cortisol. And that wasn't surprising to me because you may perhaps need more cortisol if you're being stressed. But this pre-bedtime level here at the end was significantly higher and as the years went by and we kept accumulating data and looking at it with better statis-

tical methods, that pre-bedtime elevation of cortisol became really a biological marker of children that acutely have experienced trauma and have symptoms of post-traumatic stress disorder. I say acutely because chronically the picture changes and sometimes you don't have enough cortisol, which is the picture that we see in adults that have started their trauma history early in life. Now, while is high, my concern was if this has the potential, if cortisol has the potential to be neurotoxic. What is this hormone doing to the brain? Specifically, what is it doing to areas like the prefrontal cortex, where we really process our executive function, we organize there, right, and our limbic system, where the amygdala, the center core of emotion lives, and also the hippocampus where we process memories? And not only these isolated regions, but how they all communicate, right? This frontal striatal and frontal limbic pathways, how are they affected? So I was looking at these areas specifically for two reasons. One because these are functions that we see behaviorally being affected in children that have chronic post-traumatic symptoms, but also because these regions happen to have a lot of receptors for cortisol. So they act, cortisol actually gravitates towards these regions. So let's talk a little bit about what we found here. So the first time that we looked at this we looked at cortisone, and when we looked at the structure, meaning, like a polaroid of the hippocampus, there was not much to be seen cross-sectionally. National groups were looking at this. But one thing that my group did is that we actually looked at it longitudinally, through time, and there was a very insidious effect of the cortisol in how the hippocampus would grow, through time. So it wouldn't grow as much when the hippocampus was there. And further, when we did not structure, but functional imaging, MRI, and we actually gave a task of memory, we can see here the yellow demonstrating the increased performance of the individuals that are healthy and do not have post-traumatic symptoms in comparison to those that have post-traumatic symptoms. And here we see in a graph also the difference between both of these. The prefrontal cortex is also an area that has a lot of cortical receptors, and it really works as the break of that limbic system. So when there's an emotion, you can see the the amygdala firing up, memories from the hippocampus working with that. Sometimes there's only connections of one nerve cell between the two of them, that's why sometimes when we remember something it gives us an emotion or an emotion may bring us a memory. And if that is too much of a reaction that we're getting like in fight or flight or freeze, the prefrontal cortex wants to control that. So it is like the break. It is a little bit more complicated than that, because now we are also finding that it's bi-directional, but it can actually go the other way. The limbic system can't tell if you're from the cortex. No, you calm down in a way. But we have also found areas of the prefrontal cortex that correlate with cortisol meaning that the higher the cortisol, the smaller the volume of specific prefrontal cortex areas. And then, when we do functional imaging and do a task of emotion, we can see that very early the children that have PTSD symptoms activate their amygdala significantly more than the healthy children. And you may ask well why isn't the prefrontal cortex coming and acting as a break? And we look at the prefrontal cortex is not as active, right? Those areas that have been affected by cortisol may actually may be affecting the function of the frontal cortex to calm the amygdala down. And we can see the activity of the prefrontal cortex in healthy children in the green line.

So there is a lot more in terms of what happens in the brain, and my good friend Carl Weems and I have written a text on the neuroscience of pediatric PTSD, and that's a summary of all the work that has been done in this area. It's not that thick because it's not that much, but there are definitely biological correlates of neuroscience. But the point that I really want to make is, that the reason this is happening is because areas like the limbic system and the cortical areas are very plastic. So that makes them vulnerable. But that's only one side of the coin. Let's look at the other side of the coin. If trauma and stress and traumatic stress, if trauma is teaching us that the cortical part of the brain and the limbic system are responding to the environment, how can we use that to our advantage? Especially how can we use it to our advantage when we know that executive function, a function of the prefrontal cortex, and emotional regulation, a function of the frontal limbic pathways, is particularly altered? If I want to treat kids then that have this experience, I am going to develop an intervention that targets both executive function and emotion regulation. To take advantage of neuroplasticity, especially early in life, and this is why the role of prevention and early intervention is so important, because plasticity is most active during this part of development. We know that there are things that promote neurogenesis; aerobic exercise promotes neurogenesis, stimulation promotes neurogenesis, and the best improvements happen to be in these two areas: the prefrontal cortex and the hippocampus. And this neurogenesis doesn't exist only in isolated regions, like

I'm presenting right now, but really in synapse connections between neurons, and also in pathway networks, in the brain by either strengthening them or weakening them. So how did we take advantage of that neuroplasticity was the development of an intervention, called Cue-Center Therapy for Youth Experiencing Post-Traumatic Symptoms, that enhances emotional regulation and executive function, and really put it to the test. What's happening to these networks, what's happening to these regions, while the kid is going through this intervention? That is like a three-month intervention that has a number of steps where they first get educated on what trauma is, what PTSD is and they learn coping mechanisms, and they create a narrative of their life story, then they identify triggers. And I'm going to present a case where I take you through the treatment of a kid that went through something like that. This manual that exists now for therapies was also translated into Spanish by the Spanish press, and is being used in Spain, and we've done trials in Puerto Rico, and other areas as well. There are two randomized control trials. It does decrease PTSD symptoms, either child's score or parent score, it does decrease anxiety symptoms. And I really like this chart here, because it talks about the importance of education. Just learning, just knowing that you are not crazy, that you are not bad, that you are not a problem, or that your body is responding in the same way that any of us could respond at any time to traumatic stress is healing, right? I call it empowerment through knowledge. So the biggest slope of the kind of symptoms as you can see here is at the beginning. And at the beginning, there's nothing terribly sophisticated happening there. We're basically teaching the children what classical conditioning is, and I'll talk to you about that, too, in a minute. But in terms of what's happening to the brain while this therapy is happening, we know from previous work that areas of the prefrontal cortex become also hyperactivated when there's a lot of these symptoms. And these symptoms are really incapacitating, they affect academic life, they affect emotional life, they affect interpersonal relationships, they are nighttime intrusions, and as I mentioned earlier, they can even lead to suicide, and suicidal ideation. So, through a mechanism, called Functional Near Infrared Spectroscopy, something that is more portable than an MRI and that you can actually do in a clinic. We know that those children that go through this Cue-Center Therapy Treatment have decreased activation of the dorsolateral prefrontal cortex, that area that is associated with the symptoms. And you may say well, but can you just see them doing better? Do you really have to do these invasive or semi-invasive procedures? And the reason that we do it is one to increase the empirical evidence of the protocol, but also to predict treatment outcome. Neuroscience changes happen before behavioral changes, so this decrease here in dorsolateral prefrontal cortex activity may be happening even before the symptoms improve. What is telling us the symptoms are going to improve? So, I mentioned classical conditioning, and we all go through this is we are very simple animals. We learn only two ways through it, something that is being reinforced and not reinforced, or through this classical conditioning, where our brain associates things that they have experienced before and responses we've had before with things that we're going to have in future cues or triggers. So an unconditional stimulus, for example, could be a fire. An unconditioned response would be to run away right. Which is very adaptive, but a year later, the condition, now it's conditioned stimulus, may not be a fire but maybe the smell of smoke that someone is doing a barbecue at the end of the street, but I start running. And I start running right away. I take my behavior, that was adaptive, which is very understandable, right because it did save my life at one point, but now it's maladaptive. And that requires some relearning. And notice how I say relearning and not unlearning, because we're not great at unlearning things that we have learned. And this has treatment implications, because we don't want sometimes to have kids stop doing certain behaviors. But, we want to teach them competitive behaviors with the behaviors that are causing problems to them.

So, Cue-Center Therapy helps the child pay attention to triggers, to cues, emphasize self-efficacy, empowerment, it engages coaches when available, but they don't necessarily have to be available. And it teaches them about these relationships between what we think, what we feel emotionally, what we feel physically, and our behavior. And these are squares and we create squares, and you know we don't have time to go through the whole treatment protocol. Maybe in the future we will.

Sammy was an 11-year-old boy who was brought to our clinic because of increased aggression towards his siblings. Mom reported that this was very uncharacteristic of Sammy's previous demeanor. She also reported decreased academic performance. Feeling guilty and confused, she reported to the authorities that Sammy's

father had regularly abused her and the children physically and emotionally for a number of years. Sammy had been hit numerous times with metal bars, wooden bars, and bamboo sticks. Sammy's mother felt the boy's behavior was directed at her for "breaking the family up"; mom and kids were now living in a new apartment after the father had been arrested and deported. Sammy had nightmares and difficulty sleeping, and score with moderate symptoms of PTSD. So, what this story tells us is that trauma is complex, right? Trauma has secondary trauma associated with it, and Sammy put this in very good words when the father was arrested and deported. He said he felt relieved, right? Because the physical abuse had stopped, but also not all the time was negative with the father, right? Sometimes they used to go to the park, sometimes they used to go and have ice cream, and that was also gone. As you can see, there's a lot of guilt in the mom because she wasn't sure what to do, and one of the things that we have identified also is that guilt is a significant predictor of individuals that are going to develop PTSD versus those that do not. So, if we really want to target something early in treatment, we really go after that guilt. But triggers, conditions, stimuli can really be neutral. They are not negative things. So, for mom, Sammy was a cue. It was the trigger. And for Sammy, mom it was a cue, was a trigger. And this needed to be addressed with psychosocial intervention, with therapy. There's no known drug or medication that can take care of that.

So, at first we did, education into PTSD symptoms and this helped Sammy with his nighttime episode that I was talking about earlier. And then, before we get into the story, we really want them to be equipped with coping tools. And he learned some relaxation exercises, which is part of what we do, and when he felt more comfortable, then he told his story. He now felt safe, but he also missed his father, as I mentioned. The aggressive episodes, during the episodes he felt confused, as in a daze. His heart rate would accelerate, and after taking out his feelings on his siblings he would feel guilty and ashamed. Now how do we know that this is not just Sammy, right? So one important thing about trauma is that there's a behavior change. This was an all A student who had a good relationship with his siblings, and then there was this drastic change after the trauma. As the sessions went on, they were introduced to the concept of cues, the fact that they were mostly neutral, and self-efficacy is very important here. The therapist doesn't give you all the cards, but Sammy discovers himself that the sound of the car when mom comes home, the closing of the door, it's a cue. It's a trigger because it reminds him of dad coming home and then the arousal would ensue in him. And you know mom and him were like, what, should we get rid of the car? And I'm like, no no, there's nothing wrong with the car, right? The car is a cue, it's a trigger. And we're actually going to use it, so we go through a process of exposure that goes into stages where we use this imaginary sound of the slamming of the car, then the slamming of the officer's store, and then the actual car in vivo, so that he can desensitize his physiological response. Eventually, Sammy was able to make a connection between his history and his behavior and his emotions. Kids sometimes are aware of all of those, but they are living in silence, very compartmentalized, and the center of therapy helps them put them all together. By termination he was feeling better at school, not arguing with his mom, not hitting his siblings, and he felt that many of these core issues had been addressed.

Now what do we do this is when children are already going through trauma and they're already experiencing symptoms. But, what do we do for youth when we want to prevent them from even reaching that point, right? Well, we developed a program on yoga and mindfulness. This was a partnership with Your Edge, and we built together something called the Pure Power Curriculum, which we incorporated in the curriculum of a whole school district having a similar school district as a controlled group, and really did the study longitudinally and it was multiple methods, looking at that cortisol, looking at brain structure and function, looking at sleep quality. Lots of information there. We're still getting data, but I'm going to concentrate on this first block here of sleep and how the importance of sleep. And I'm gonna do that because sleep can really have an impact on how we think, in our mood, in our behavior, of the whole family. It is at night that we process the events of the day, and if we're not sleeping well, they are not being processed. We kind of remain there and we specifically look at a type of sleep called rapid eye movement, which is a key time for development of neurons and for cognitive performance. So, we were able to do portable sleep studies in their own house, which is great because usually this data is very subjective. But, this is objective data, as the children were really more and more engaged in

yoga. Yes, yoga, process and mindfulness. Being at the moment type of exercises, they were sleeping better. The REM, the rapid eye movement, part of sleep significantly increased, so the total sleep and cortisol seems to have played a role in that, as well. Meaning that those kids that had higher cortisol, which we know is more symptoms, benefited the most from yoga and mindfulness. In terms of brain function, we can see that those children that went through yoga and mindfulness their amygdala activation decrease when viewing uncomfortable figures or pictures. So, let me see how much time we have here. Oh perfect.

The third part of the talk, and what I want to do with all of you, and you can do in the privacy of your own little Zoom square in your home, is to really engage in some exercises that involve breathing. When we breathe, we get more oxygen into our body, to our hemoglobin, and that goes, that is delivered to our muscle and our muscle relaxes further. Breathing is also an anchor to the moment, so it is a mindfulness type of thing. Breathing is life, right? If we stop breathing, we die, so that means that the better we breathe, the better we live. So breathing really needs a lot of attention and sometimes people are like, yeah, but I'm breathing all the time, but you're breathing shallow breaths. You're not paying attention to them, you're not filling your lungs to full capacity, and all of that plays a role. So, we'll talk a little bit about that and then we'll talk a little bit about the importance of positive thoughts, right? So there are negative thoughts that we all have, there are positive thoughts that we all have. Now let me tell you a little bit about this negative thoughts. They are also called automatic thoughts, because they come for free, we have them ingrained in our brain, in our limbic system, in a reptile brain, because they have lived there for millions and millions of years. Thoughts like something is going to happen to me, the lion is going to kill me. I better climb this tree. These types of thoughts have helped us evolve. So negative thoughts are automatic thoughts to the point. Now, when we may not be as much as in danger we may still have, putting the pandemic aside, which has brought a bunch of considerable negative thoughts, right. So the best way of fighting a negative thought is with a positive thought. But, guess what. Positive thoughts are not automatic. Positive thoughts require a conscious effort. Positive thoughts arise from our frontal areas of the brain, and this is the youngest part of our brain. Only 50 million years the frontal lobe has been developing. But, it is very impactful in terms of being able to control negative thoughts. And why do we want to control them? We want to control them because spiraling negative automatic thoughts are associated with depression, are associated with anxiety, and are associated with suicide risk. So they are to be taken very seriously. And in times like this, when there are negative thoughts that we need to take, we need to separate which of those are adaptive, right, like I'm going to be careful with x y and z versus which of those are not. And sometimes that's not easy and we need to seek professional advice to help with that. Okay, so in terms of breathing, and how to increase the depth of our breath, I am going to just tell you something that is very simple. Which is that, we increase the depth of our breath, we're going to do 10 breaths together, and the first five are going to go as deep as one, two, three, four, five. And then, we're gonna come and make them less deep: five, four, three, two, one. But, while we're doing that, you should know that our diaphragm is activating our vagus nerve, which will help us calm our heart rate. So it does bring a sense of peace and a sense of calmness. So let me perform for you a breath of one. One in one out. A breath of two. One, two, two, one. A breath of three. One, two, three, three, two, one. When we breathe out we want to breathe out slowly, as if through a straw. And we want to make it. If we can make it slower, then the way that we breathe, the more powerful it also becomes. Let's put all the breathing together. One, two, three, four, four, three, two, one. I'm saying the numbers so that you know I'm going. You don't have to do the numbers, because it's very easier to breathe without saying, without talking. So let's do the five breaths without counting.

It has to become part of a practice, part of a routine. If I gave you a guitar right now and told you please play me a song and you don't play guitar it's a difficult thing to do. But, if you take lessons and a year from now I ask you to play guitar, you probably will. So, the same thing with positive thoughts, the same thing with breathing, the same thing with having a mindfulness practice. How to teach this breathing to children, there's the idea of a starfish, the hand, where you breathe in, and you breathe out. And you don't do it as fast as I'm doing it, you actually take your time and breathe in very slowly and breathe out very slowly. And then come back. Kids love this exercise and so you can do your own, you can teach this one to the kids, you can do it together with the kids, or

you can do a separate one. In terms of being in the moment, it is really activation of our senses. Our senses are really the windows to our nervous system, to our brain, and the rest of our neural system. And it is in our senses actually that many of the cues actually reside and live. So, if we want to be mindful for a second, we can think of five things we can see. Consciously tell yourself I am seeing this, I am seeing a chair, I'm seeing a book, it's a portrait, I'm seeing the table. Four sounds that you hear. I hear that car passing, right? Three things that you feel. I can feel my shirt, you can feel your shoes. You can feel this chair. Two things that you can taste. Something salty. Something sweet. One thing you can smell, which is not too difficult in the spring here in California at this time. So, breathing, mindfulness, I'm not going to do yoga, but a mountain pose, that can help us centralize, and be centered. All these things are having an impact on our brain, how our brain functions, how we sleep at night, and how we process the events of the day, so that our backpack doesn't get too heavy. And so that we alleviate our allostatic load, because the allostatic load for all of us this past year has been very heavy. And it is very important for all of us to engage in self-care with these practices.

With my good friend, John Rettger, we actually edited a book on applied mindfulness in approaches for children and adolescents, and how to do this at school, how to do it in nature, how to do it in different settings, in the clinic, with different types of kids. Very helpful book. And then, in terms of everything I have talked about, youths exposed to traumatic stress, with the American Psychiatry Association, I also edited this other text. And I think you will all have access to these slides, so you can refer to them after that. I want to thank my team, right? All of this work couldn't be done by one person, so it takes a lot of people that are very dedicated and work really hard and have their heart in the right place. And, those that actually support the work that I do, and anonymous donors from the Lucile Packard Children's Hospital Foundation, from Stanford Healthcare, the Evans Foundation, the National Institute of Health, NARSAD, AFSP, and the American Academy of Child and Adolescents. So, thank you, thanks to all of them, and thank you all. And now, we're going to open it up for questions.

All right thank you so much Dr. Carrion for the wonderful presentation. Now we are open to Q&A sessions. We have a question coming, in specific for some of the data, actually. The first question is regarding that u-curve. So the question is in the curve that you showed optimum stress. I saw anxiety and depression on opposite ends, but could a high stress situation that has chronic high levels of anxiety then actually leads to depression rather than low stress depression?

Yes it can. Being on that second half of the curve can certainly put us at risk to develop a depression and an anxiety that impacts our function. So all of us, as human beings, get sad right and can get also anxious, and anxiety is just part of who we are. It's wired in, right, in those negative thoughts that I was talking about. But how do we know when it's more than that? Well, the rule of thumb is that you look at three areas of function. You look at your interpersonal relationships, you look at your work, and you look at your level of distress. If those are affected, then yes there is something more serious here that we need to address. If not, then probably if it's not causing impairment of function, then it's probably on the first part of the curve, right. It's just part of anxiety about that test that I'm going to have and so forth, yeah.

Okay thank you and the next question is, it's also related to one of the slides here. Is HPA axis and cortisone secretion that causes the system to shut down, as you mentioned, affecting cardiovascular systems? Is it at all thought to be a part of what we see with the POTS (postural orthostatic tachycardia syndrome) syndrome?

It does play a role. There are many neurotransmitters in the nervous system. The reason I highlight the cortisol one is, because cortisol really plays a role in the fight or flight response. Which is our normal response to a threatening experience. Now, fight or flight doesn't come that easy to children. They are too small so they cannot fight and they are very dependent, so they cannot flight. They cannot say I'm out of here, I'm going to the movies, or something like, you know. They're stuck in that situation. So, sometimes the reaction that we see in them is freezing. They freeze. We also call that sometimes dissociation, right? Kind of pretending that you're not there, pretending this is really not happening. And sometimes dissociation can be adaptive, but sometimes

it can become a problem, as well. And cortisol at high levels, having an effect in the hippocampus, is probably related to that dissociation. But, the sympathetic system and the parasympathetic system, which are part of the autonomic nervous system, are also part of this shutdown that is being referred to in the question. And the cortisol communicates with that system, as well. So, when cortisol goes up, epinephrine goes up as well, and sends messages to many different organs and many different vessels.

Okay. The next question is, as for the breathing practice, can singing very loud help?

Can singing aloud help?

Yes, can singing very loud help?

If you live alone, I believe that probably can help you, you have to make sure that everyone around you likes it too, as well. Yes, yes, I think, but I don't think it's through the breathing mechanism. I think it's through the rhythmicity. We have found that rhythmicity, as in melody, as in music, listening to music, or singing, or hearing others sing, that rhythm, that melody, is also something that anchors you in the present and can give you a state of well-being. Now that is not all types of music, there is something about the rhythmicity, and I'm not an expert in that area, but I think it's like six hertz per second or something like this that is like a key. Like, for example, when you see a drop of water falling and you kind of almost get hypnotized by it, because you're so relaxed or hear drums, it's the same thing. So, music has that rhythm within it and I would think that singing does that too. And I'm sure it depends on the song, but yeah, that's probably a good thing.

All right, okay. Next question is about the same question. How do you teach mindful breathing to a six-year-old that has no interest in joining in the exercise?

I'm sorry did you say six or sixty?

Six years.

Okay. Six- year-old has no interest in practicing mindful breathing. How can we? Well, I think the starfish, right is something that captures the imagination of many of the young children. So, we use that sometimes. We talk to them about an imaginary birthday, and how old is your friend and you have to blow out how many candles, and we engage them in things like that. So, the more like a child you become and the more that you can play with the developmental level that you're working with, and that includes the 60 years old, the more successful you'll be.

Okay. Next question is, if some traumatic memory continues to show up in our past, taking attention and time, what therapy could we do to decrease that?

Yes, so this is a very important question. I talked about some of the principles, but I'll tell you something that I think is key in my team. We have a saying, and the saying is PTSD, Post-Traumatic Stress Disorder, feeds on avoidance. It loves avoidance, so the more we avoid, the stronger PTSD gets. So, what that means is that if we really want to fight it then what we have to do is approach it. So, for this question, the way that we would approach is, to identify what those cues are, what those triggers are, what those reminders are, and recognize which ones are threatening or which ones are neutral, right. I said most of them would be neutral, but if there's something that is dangerous, of course you're not going to get involved with that. But, if you can expose yourself to things that give you fear because of their previous association with the previous traumatic experience, then that could be very helpful. In terms of trends of treatment, there's, in addition to the Cue-Center treatment that I mentioned, there's Trauma Focused Cognitive Behavioral Therapy, there's Prolonged Exposure for Symptoms of Trauma, as well, and the story seems to be like a cardinal component of many of the treatments. However, re-

member that curve that I showed and the decline of symptoms that happens by just learning about the subject. Many of the symptoms may be linked by your concern that there might be something wrong with you, when in fact 99.9 percent of us have a system that will respond exactly the same way with the right amount of allostatic load. And so, it's almost not a disorder and, in fact, many people do not use the term post-traumatic stress disorder, but refer to it as post-traumatic stress injury. Almost as when you hurt your arm, it gets dislocated, you have to go to the emergency room, and they have to put it back. It's gonna hurt, but it's going to heal right. If you avoid it and pretend that the arm didn't get hurt, it's gonna get worse. So it's more of an injury of that fight or flight response, of that cortisol, and of all those systems, than anything else. And the first step for healing is recognition and acceptance.

Okay. So Dr. Carrion we are at 7:30. We have so many questions coming in. Could we pick the last one ?

Yes, sure.

The question is, I think this is probably going to be the last one because it's already 7:30. Okay, so the question is how we can release the fear, the shock, our body and the cells have remembered? Any tips on some exercises?

Yeah, I think for the relief of fear and for the relief of shock, mindfulness is particularly helpful. And being in touch with your body with yoga is also particularly helpful. So, it really has to be a practice, it almost has to be daily, you know. It cannot be something that you do like whenever you think of it, or once a week. It has to be a daily practice, just like brushing your teeth.

Okay, all right. Thank you so much Dr. Carrion for the wonderful presentation and Q&A. I'm going to share some information for the foundation. Some information I want to take this opportunity just to share with everyone about the Alan Hu Foundation Scholarship. We will offer the scholarship to students who are enrolled in the high schools in Pleasanton Unified School District in Pleasanton, California. And applicants should be high school seniors going to colleges or universities and planning to major in fields of psychology, psychiatry, or neuroscience. And, please check out the Alan Hu Foundation website for more details. And, please also stay tuned for the future Alan Hu Foundation Mental Health Lecture Series webinars, and we also have some information that we would like to share. These are some useful resources for mental health related from the National Institute of Mental Health. Some information regarding drugs and some clinical studies. So I'm gonna stay on this page for people to take notes and take a shot of the screen. And, we'll also put it on our website for you to come back to. Thank you very much Dr. Carrion for giving a wonderful presentation. I learned a lot from this, and it is good to know the information about neuroplasticity and in fact everyone to join, and especially thanks to MHACC and the Chinese interpreter, Ida and Barbara for the Chinese interpretation. And with that I'm going to close the event. Thank you everyone. Goodbye, stay healthy and stay safe.