WEBVTT

NOTE duration:"00:47:21"

NOTE recognizability:0.880

NOTE language:en-us

NOTE Confidence: 0.80906819

00:00:00.000 --> 00:00:02.370 This really kind introduction and for

NOTE Confidence: 0.80906819

00:00:02.370 --> 00:00:05.192 the invitation to visit here it's I will

NOTE Confidence: 0.80906819

00:00:05.192 --> 00:00:07.560 say it's it's always fun to visit Yale.

NOTE Confidence: 0.80906819

00:00:07.560 --> 00:00:09.240 The the first time I came here

NOTE Confidence: 0.80906819

00:00:09.240 --> 00:00:12.012 was in 2012 and then I was here

NOTE Confidence: 0.80906819

00:00:12.012 --> 00:00:14.603 again in 2018 and now it's 2024.

NOTE Confidence: 0.80906819

00:00:14.603 --> 00:00:16.790 So I hope to see you all again in

NOTE Confidence: 0.80906819

00:00:16.853 --> 00:00:18.946 2030 because it seems like every six

NOTE Confidence: 0.80906819

00:00:18.946 --> 00:00:21.196 years I get the opportunity to come

NOTE Confidence: 0.80906819

00:00:21.196 --> 00:00:24.132 and and and meet and just benefit from

NOTE Confidence: 0.80906819

00:00:24.132 --> 00:00:26.988 these wonderful environment in the

NOTE Confidence: 0.80906819

00:00:26.988 --> 00:00:29.450 outstanding discussions and just feel

NOTE Confidence: 0.80906819

00:00:29.450 --> 00:00:31.280 the collegiality every time I'm here.

NOTE Confidence: 0.80906819

00:00:31.280 --> 00:00:33.877 So it's really nice to be back.

NOTE Confidence: 0.80906819

00:00:33.880 --> 00:00:35.040 Thank you again, Denise,

NOTE Confidence: 0.80906819

00:00:35.040 --> 00:00:36.200 for this wonderful introduction.

NOTE Confidence: 0.80906819

00:00:36.200 --> 00:00:37.970 Thank you, John and and everyone

NOTE Confidence: 0.80906819

00:00:37.970 --> 00:00:40.000 else for for the warm welcome.

NOTE Confidence: 0.80906819

00:00:40.000 --> 00:00:41.808 Now I suppose I need to figure out

NOTE Confidence: 0.80906819

00:00:41.808 --> 00:00:43.398 where the slide advancement is.

NOTE Confidence: 0.80906819

00:00:43.400 --> 00:00:46.837 So. Oh, here we go. OK All right.

NOTE Confidence: 0.80906819

00:00:46.837 --> 00:00:51.017 So it's just it's an honor to be

NOTE Confidence: 0.80906819

00:00:51.017 --> 00:00:53.448 here following up this introduction

NOTE Confidence: 0.80906819

00:00:53.448 --> 00:00:54.954 of of RIBICOFF.

NOTE Confidence: 0.80906819

00:00:54.960 --> 00:00:57.776 So I'll talk to you today about our

NOTE Confidence: 0.80906819

00:00:57.776 --> 00:01:00.799 work on brain dynamics and flexible

NOTE Confidence: 0.80906819

00:01:00.799 --> 00:01:03.265 behaviors and I think it's it's of

NOTE Confidence: 0.80906819

00:01:03.265 --> 00:01:05.198 interest for our lab but I think

NOTE Confidence: 0.80906819

00:01:05.198 --> 00:01:07.039 for a lot of people in psychiatry

NOTE Confidence: 0.80906819

00:01:07.039 --> 00:01:08.798 to think about flexibility.

NOTE Confidence: 0.80906819

00:01:08.800 --> 00:01:11.104 We are we focus a lot on children

NOTE Confidence: 0.80906819

00:01:11.104 --> 00:01:14.097 with autism in our own research and in

NOTE Confidence: 0.80906819

00:01:14.097 --> 00:01:16.104 this particular clinical condition we

NOTE Confidence: 0.80906819

00:01:16.104 --> 00:01:18.354 often see this insistence on sameness,

NOTE Confidence: 0.80906819

00:01:18.360 --> 00:01:19.150 behavioral inflexibility.

NOTE Confidence: 0.80906819

00:01:19.150 --> 00:01:19.940 For example,

NOTE Confidence: 0.80906819

00:01:19.940 --> 00:01:22.918 a child might want to wear a particular

NOTE Confidence: 0.80906819

00:01:22.918 --> 00:01:25.284 pair of socks or eat as only yellow

NOTE Confidence: 0.80906819

00:01:25.284 --> 00:01:27.818 foods or you know these kinds of

NOTE Confidence: 0.80906819

00:01:27.818 --> 00:01:30.157 repetitive behaviors that sometimes can,

NOTE Confidence: 0.80906819

00:01:30.160 --> 00:01:32.440 you know this insistence on sameness

NOTE Confidence: 0.80906819

00:01:32.440 --> 00:01:33.960 can sometimes cause challenges

NOTE Confidence: 0.80906819

00:01:34.019 --> 00:01:36.034 for caregivers and and difficulty

NOTE Confidence: 0.80906819

00:01:36.034 --> 00:01:38.519 in in day-to-day life activities.

NOTE Confidence: 0.80906819

00:01:38.520 --> 00:01:40.152 And so I used to kind of introduce

NOTE Confidence: 0.80906819

00:01:40.152 --> 00:01:41.933 my talk saying you know flexibility

NOTE Confidence: 0.80906819

00:01:41.933 --> 00:01:42.595 is important.

NOTE Confidence: 0.80906819

00:01:42.600 --> 00:01:44.184 But during the pandemic I think

NOTE Confidence: 0.80906819

00:01:44.184 --> 00:01:46.590 we all had a a big dose of what

NOTE Confidence: 0.80906819

00:01:46.590 --> 00:01:47.880 it means to be flexible.

NOTE Confidence: 0.80906819

00:01:47.880 --> 00:01:50.670 So we went from our everyday lives and and

NOTE Confidence: 0.80906819

00:01:50.670 --> 00:01:53.120 routines to something completely different.

NOTE Confidence: 0.80906819

00:01:53.120 --> 00:01:56.544 We started giving talks over zoom instead of

NOTE Confidence: 0.80906819

00:01:56.544 --> 00:01:59.716 giving them at at lecture podiums like this.

NOTE Confidence: 0.80906819

00:01:59.720 --> 00:02:02.296 So I'm myself readjusting

NOTE Confidence: 0.80906819

00:02:02.296 --> 00:02:05.516 to being standing up again.

NOTE Confidence: 0.80906819

00:02:05.520 --> 00:02:05.862 So.

NOTE Confidence: 0.80906819

00:02:05.862 --> 00:02:08.256 So we've all sort of experienced this

NOTE Confidence: 0.80906819

00:02:08.256 --> 00:02:10.720 like how changes and and be having

NOTE Confidence: 0.80906819

00:02:10.720 --> 00:02:12.420 difficulties with flexible behaviors can

NOTE Confidence: 0.80906819

00:02:12.420 --> 00:02:14.800 kind of impact our our day-to-day lives.

NOTE Confidence: 0.80906819

00:02:14.800 --> 00:02:17.167 So we try to focus on the lab on

NOTE Confidence: 0.80906819

00:02:17.167 --> 00:02:19.481 thinking about the neural basis of

NOTE Confidence: 0.80906819

00:02:19.481 --> 00:02:21.658 flexibility and we do kind of take a

NOTE Confidence: 0.80906819

00:02:21.658 --> 00:02:23.360 developmental look at these questions.

NOTE Confidence: 0.80906819

00:02:23.360 --> 00:02:25.705 So we think about how brain networks

NOTE Confidence: 0.80906819

00:02:25.705 --> 00:02:28.398 develop and mature in ways that can

NOTE Confidence: 0.80906819

00:02:28.398 --> 00:02:29.577 support increasingly sophisticated

NOTE Confidence: 0.80906819

00:02:29.577 --> 00:02:31.681 types of cognition like flexibility

NOTE Confidence: 0.80906819

00:02:31.681 --> 00:02:32.920 across the lifespan.

NOTE Confidence: 0.80906819

00:02:32.920 --> 00:02:34.720 So we think about how brain

NOTE Confidence: 0.80906819

00:02:34.720 --> 00:02:35.920 networks develop from childhood,

NOTE Confidence: 0.80906819

00:02:35.920 --> 00:02:37.540 adolescence into adulthood,

NOTE Confidence: 0.80906819

00:02:37.540 --> 00:02:40.240 how that underlies cognitive development.

NOTE Confidence: 0.80906819

00:02:40.240 --> 00:02:43.467 And you know basically how can compromised

NOTE Confidence: 0.80906819

00:02:43.467 --> 00:02:45.762 connectivity within and between large

NOTE Confidence: 0.80906819

00:02:45.762 --> 00:02:48.276 scale brain networks be related to

NOTE Confidence: 0.80906819

00:02:48.280 --> 00:02:49.180 developmental neuropathologies.

NOTE Confidence: 0.80906819

00:02:49.180 --> 00:02:52.780 And we try to think about how we

NOTE Confidence: 0.80906819

00:02:52.856 --> 00:02:55.141 can use this basic information

NOTE Confidence: 0.80906819

00:02:55.141 --> 00:02:57.426 about brain structure and function

NOTE Confidence: 0.80906819

00:02:57.502 --> 00:03:00.082 to inform diagnosis and design

NOTE Confidence: 0.80906819

00:03:00.082 --> 00:03:00.978 interventions ultimately.

NOTE Confidence: 0.80906819

00:03:00.978 --> 00:03:04.380 And so I'm really excited to be here in

NOTE Confidence: 0.958801587272727

00:03:04.457 --> 00:03:06.235 the in the Ribicoff series because

NOTE Confidence: 0.958801587272727

00:03:06.235 --> 00:03:10.062 we do try to do in our lab a sort of

NOTE Confidence: 0.958801587272727

00:03:10.062 --> 00:03:11.526 combination of basic neuroscience

NOTE Confidence: 0.958801587272727

00:03:11.593 --> 00:03:14.438 developmental work and clinical clinically

NOTE Confidence: 0.958801587272727

00:03:14.440 --> 00:03:17.488 translatable kind of research in the

NOTE Confidence: 0.958801587272727

00:03:17.488 --> 00:03:20.478 same umbrella or under the same lab.

NOTE Confidence: 0.958801587272727

00:03:20.480 --> 00:03:22.105 So we use structural and

NOTE Confidence: 0.958801587272727

00:03:22.105 --> 00:03:22.755 functional neuroimaging.

NOTE Confidence: 0.958801587272727

00:03:22.760 --> 00:03:25.310 So that includes task functional

NOTE Confidence: 0.958801587272727

00:03:25.310 --> 00:03:26.840 magnetic resonance imaging,

NOTE Confidence: 0.958801587272727

00:03:26.840 --> 00:03:28.067 resting state fMRI,

NOTE Confidence: 0.958801587272727

00:03:28.067 --> 00:03:30.112 diffusion weighted imaging to look

NOTE Confidence: 0.958801587272727

00:03:30.112 --> 00:03:32.133 at structural connections and also

NOTE Confidence: 0.958801587272727

00:03:32.133 --> 00:03:33.649 some causal modeling approaches

NOTE Confidence: 0.958801587272727

00:03:33.649 --> 00:03:36.203 to look at relationships among and

NOTE Confidence: 0.958801587272727

00:03:36.203 --> 00:03:38.550 between brain regions as they relate

NOTE Confidence: 0.958801587272727

00:03:38.550 --> 00:03:40.200 to things like executive function,

NOTE Confidence: 0.958801587272727

00:03:40.200 --> 00:03:41.140 flexible behaviors.

NOTE Confidence: 0.958801587272727

00:03:41.140 --> 00:03:43.960 And although we we love neuroimaging,

NOTE Confidence: 0.958801587272727

00:03:43.960 --> 00:03:45.720 we're a network neuroscience lab,

NOTE Confidence: 0.958801587272727

00:03:45.720 --> 00:03:47.330 we loved all this sort of cutting

NOTE Confidence: 0.958801587272727

00:03:47.330 --> 00:03:48.919 edge tools that are now available.

NOTE Confidence: 0.958801587272727

00:03:48.920 --> 00:03:50.996 I think it's important to remember

NOTE Confidence: 0.958801587272727

00:03:50.996 --> 00:03:53.944 how much of this work just dates back

NOTE Confidence: 0.958801587272727

00:03:53.944 --> 00:03:56.800 to before we had these fancy tools.

NOTE Confidence: 0.958801587272727

00:03:56.800 --> 00:03:59.117 So the foundations of what we now

NOTE Confidence: 0.958801587272727

00:03:59.117 --> 00:04:00.442 call network neuroscience were

NOTE Confidence: 0.958801587272727

00:04:00.442 --> 00:04:01.797 planted a long time ago.

NOTE Confidence: 0.958801587272727

00:04:01.800 --> 00:04:03.696 You know before MRI was really

NOTE Confidence: 0.958801587272727

00:04:03.696 --> 00:04:04.960 very much in vogue.

NOTE Confidence: 0.958801587272727

00:04:04.960 --> 00:04:08.192 I I love some of these papers from

NOTE Confidence: 0.958801587272727

00:04:08.192 --> 00:04:10.422 Marcel Maslam who is who has you know

NOTE Confidence: 0.958801587272727

00:04:10.422 --> 00:04:13.384 is a is a neurologist who were and

NOTE Confidence: 0.958801587272727

00:04:13.384 --> 00:04:15.544 a neuropsychologist who had these

NOTE Confidence: 0.958801587272727

00:04:15.544 --> 00:04:17.640 great ideas about brain function.

NOTE Confidence: 0.958801587272727

00:04:17.640 --> 00:04:20.040 That that really came from looking

NOTE Confidence: 0.958801587272727

00:04:20.040 --> 00:04:22.355 at patients and lesions and figuring

NOTE Confidence: 0.958801587272727

00:04:22.355 --> 00:04:24.640 out what the deficits were in

NOTE Confidence: 0.958801587272727

00:04:24.640 --> 00:04:26.560 in patients with focal lesions.

NOTE Confidence: 0.958801587272727

00:04:26.560 --> 00:04:28.136 And the interesting conclusions

NOTE Confidence: 0.958801587272727

00:04:28.136 --> 00:04:30.500 that are nicely summarized in one

NOTE Confidence: 0.958801587272727

00:04:30.564 --> 00:04:31.960 of his Seminole papers.

NOTE Confidence: 0.958801587272727

00:04:31.960 --> 00:04:34.642 Or that cognition is served by

NOTE Confidence: 0.958801587272727

00:04:34.642 --> 00:04:36.430 interconnected neural networks and

NOTE Confidence: 0.958801587272727

00:04:36.507 --> 00:04:38.844 any complex behaviour is mapped at

NOTE Confidence: 0.958801587272727

00:04:38.844 --> 00:04:40.896 the level of multifocal neural systems

NOTE Confidence: 0.958801587272727

00:04:40.896 --> 00:04:43.120 rather than specific anatomical sites.

NOTE Confidence: 0.958801587272727

00:04:43.120 --> 00:04:45.650 And I, I love these these papers,

NOTE Confidence: 0.958801587272727

00:04:45.650 --> 00:04:47.650 They're kind of just a history of how

NOTE Confidence: 0.958801587272727

00:04:47.650 --> 00:04:49.799 the brain works and they really hold up.

NOTE Confidence: 0.958801587272727

00:04:49.800 --> 00:04:50.760 I think to this day,

NOTE Confidence: 0.958801587272727

00:04:50.760 --> 00:04:51.424 if you read this,

NOTE Confidence: 0.958801587272727

00:04:51.424 --> 00:04:52.386 you'll say, hey everything.

NOTE Confidence: 0.958801587272727

00:04:52.386 --> 00:04:53.638 And he was right.

NOTE Confidence: 0.958801587272727

00:04:53.640 --> 00:04:55.880 He was right about everything.

NOTE Confidence: 0.958801587272727

00:04:55.880 --> 00:04:57.581 And I think this is interesting because

NOTE Confidence: 0.958801587272727

00:04:57.581 --> 00:04:59.558 there was the trend at one point to say,

NOTE Confidence: 0.958801587272727

00:04:59.560 --> 00:04:59.986 well, OK,

NOTE Confidence: 0.958801587272727

00:04:59.986 --> 00:05:01.477 we have a lesion to this brain

NOTE Confidence: 0.958801587272727

00:05:01.477 --> 00:05:03.118 area and that causes this deficit,

NOTE Confidence: 0.958801587272727

00:05:03.120 --> 00:05:03.486 that brain,

NOTE Confidence: 0.958801587272727

00:05:03.486 --> 00:05:03.852 you know,

NOTE Confidence: 0.958801587272727

00:05:03.852 --> 00:05:05.543 there must be a one to one mapping

NOTE Confidence: 0.958801587272727

00:05:05.543 --> 00:05:07.193 between that function and that structure.

NOTE Confidence: 0.958801587272727

00:05:07.200 --> 00:05:09.333 But even you can use the same data to

NOTE Confidence: 0.958801587272727

00:05:09.333 --> 00:05:11.436 make the opposite conclusion is that,

NOTE Confidence: 0.958801587272727

00:05:11.440 --> 00:05:12.160 you know,

NOTE Confidence: 0.958801587272727

00:05:12.160 --> 00:05:13.960 brain regions can be relatively

NOTE Confidence: 0.958801587272727

00:05:13.960 --> 00:05:15.766 specialized and not sort of

NOTE Confidence: 0.958801587272727

00:05:15.766 --> 00:05:17.758 specifically tied to to one function.

NOTE Confidence: 0.958801587272727

00:05:17.760 --> 00:05:20.546 And so I think this is some

NOTE Confidence: 0.958801587272727

00:05:20.546 --> 00:05:22.200 really nice foundational work.

NOTE Confidence: 0.958801587272727

00:05:22.200 --> 00:05:24.538 There's also one of my favorite papers

NOTE Confidence: 0.958801587272727

00:05:24.538 --> 00:05:27.092 is from Randy McIntosh in 2004 where

NOTE Confidence: 0.958801587272727

00:05:27.092 --> 00:05:29.794 he introduced the concept of neural context.

NOTE Confidence: 0.958801587272727

00:05:29.800 --> 00:05:31.620 The idea that relevant functional

NOTE Confidence: 0.958801587272727

00:05:31.620 --> 00:05:33.823 relevance of any given brain area

NOTE Confidence: 0.958801587272727

00:05:33.823 --> 00:05:35.725 depends on the status of other

NOTE Confidence: 0.958801587272727

00:05:35.725 --> 00:05:37.800 connected areas to that brain region.

NOTE Confidence: 0.958801587272727

00:05:37.800 --> 00:05:40.610 So kind of not just focusing on the one,

NOTE Confidence: 0.958801587272727

00:05:40.610 --> 00:05:42.080 one or two areas at a time,

NOTE Confidence: 0.958801587272727

00:05:42.080 --> 00:05:43.592 but the whole kind of context

NOTE Confidence: 0.958801587272727

00:05:43.592 --> 00:05:44.800 in which brain function is,

NOTE Confidence: 0.958801587272727

00:05:44.800 --> 00:05:46.880 is occurring.

NOTE Confidence: 0.958801587272727

00:05:46.880 --> 00:05:48.374 And we also think a lot

NOTE Confidence: 0.958801587272727

00:05:48.374 --> 00:05:49.800 nowadays about the time domain,

NOTE Confidence: 0.958801587272727

00:05:49.800 --> 00:05:51.963 so about how networks need to be

NOTE Confidence: 0.958801587272727

00:05:51.963 --> 00:05:53.771 understood in terms of interactions

NOTE Confidence: 0.958801587272727

00:05:53.771 --> 00:05:55.804 as they unfold temporally between

NOTE Confidence: 0.958801587272727

00:05:55.804 --> 00:05:57.420 between multiple brain regions

NOTE Confidence: 0.958801587272727

00:05:57.420 --> 00:05:59.036 as they unfold temporarily.

NOTE Confidence: 0.785139995

00:05:59.040 --> 00:06:02.336 A nice paper from Luis Pasoa 10 years

NOTE Confidence: 0.785139995

00:06:02.336 --> 00:06:05.480 ago really drives this point home.

NOTE Confidence: 0.785139995

00:06:05.480 --> 00:06:07.300 So there are some things that many

NOTE Confidence: 0.785139995

00:06:07.300 --> 00:06:09.239 of you are very familiar with.

NOTE Confidence: 0.785139995

00:06:09.240 --> 00:06:12.200 And so back in 1995,

NOTE Confidence: 0.785139995

00:06:12.200 --> 00:06:13.775 Broad Bizwell published a paper

NOTE Confidence: 0.785139995

00:06:13.775 --> 00:06:15.810 showing that you can find these

NOTE Confidence: 0.785139995

00:06:15.810 --> 00:06:17.004 coherent spontaneous fluctuations

NOTE Confidence: 0.785139995

00:06:17.004 --> 00:06:19.392 in different parts of the brain.

NOTE Confidence: 0.785139995

00:06:19.400 --> 00:06:20.876 You focused on the motor cortex.

NOTE Confidence: 0.785139995

00:06:20.880 --> 00:06:24.360 But since that 1995 paper there have been,

NOTE Confidence: 0.785139995

00:06:24.360 --> 00:06:26.424 you know, thousands of studies showing

NOTE Confidence: 0.785139995

00:06:26.424 --> 00:06:29.449 that at this very low frequency the brain

NOTE Confidence: 0.785139995

00:06:29.449 --> 00:06:31.832 seems to recapitulate in the resting state.

NOTE Confidence: 0.785139995

00:06:31.832 --> 00:06:34.269 All of the the brain networks that we

NOTE Confidence: 0.785139995

00:06:34.269 --> 00:06:36.313 can see engaged in tasks like memory,

NOTE Confidence: 0.785139995

00:06:36.320 --> 00:06:38.468 attention, vision, motor processing.

NOTE Confidence: 0.785139995

00:06:38.468 --> 00:06:41.896 At these point O1 to .1 Hertz

NOTE Confidence: 0.785139995

00:06:41.896 --> 00:06:43.000 is low frequency.

NOTE Confidence: 0.785139995

00:06:43.000 --> 00:06:45.000 We can see these oscillations

NOTE Confidence: 0.785139995

00:06:45.000 --> 00:06:45.890 spontaneously occurring.

NOTE Confidence: 0.785139995

00:06:45.890 --> 00:06:48.560 And this is just a ongoing,

NOTE Confidence: 0.785139995

00:06:48.560 --> 00:06:49.004 you know,

NOTE Confidence: 0.785139995

00:06:49.004 --> 00:06:50.114 fMRI of somebody doing nothing

NOTE Confidence: 0.785139995

00:06:50.114 --> 00:06:51.359 at all in the scanner,

NOTE Confidence: 0.785139995

00:06:51.360 --> 00:06:54.040 just kind of asked to just lay still.

NOTE Confidence: 0.785139995

00:06:54.040 --> 00:06:56.350 But it's not sort of random

NOTE Confidence: 0.785139995

00:06:56.350 --> 00:06:57.120 spontaneous activity,

NOTE Confidence: 0.785139995

00:06:57.120 --> 00:06:59.016 but really coherent in these systems

NOTE Confidence: 0.785139995

00:06:59.016 --> 00:07:01.118 that we've been studying for many years.

NOTE Confidence: 0.785139995

00:07:01.120 --> 00:07:02.398 If you wait around a while,

NOTE Confidence: 0.785139995

00:07:02.400 --> 00:07:04.400 you'll see a language network or a vision,

NOTE Confidence: 0.785139995

00:07:04.400 --> 00:07:06.026 a visual cortices.

NOTE Confidence: 0.785139995

00:07:06.026 --> 00:07:09.278 So these kind of spontaneous fluctuations,

NOTE Confidence: 0.785139995

00:07:09.280 --> 00:07:11.163 many labs have been exploiting now for

NOTE Confidence: 0.785139995

00:07:11.163 --> 00:07:13.400 a number of years to try to understand

NOTE Confidence: 0.785139995

00:07:13.400 --> 00:07:16.760 the functional organization of the brain.

NOTE Confidence: 0.785139995

00:07:16.760 --> 00:07:17.360 And as I,

NOTE Confidence: 0.785139995

00:07:17.360 --> 00:07:18.160 as I mentioned before,

NOTE Confidence: 0.785139995

00:07:18.160 --> 00:07:19.798 we all know what flexibility is

NOTE Confidence: 0.785139995

00:07:19.798 --> 00:07:22.052 and we've had to be very flexible

NOTE Confidence: 0.785139995

00:07:22.052 --> 00:07:23.516 across this pandemic period.

NOTE Confidence: 0.785139995

00:07:23.520 --> 00:07:24.339 During that period,

NOTE Confidence: 0.785139995

00:07:24.339 --> 00:07:26.632 I had the time to sit down and

NOTE Confidence: 0.785139995

00:07:26.632 --> 00:07:28.516 write a bunch of invited reviews.

NOTE Confidence: 0.785139995

00:07:28.520 --> 00:07:30.800 So that was my my COVID,

NOTE Confidence: 0.785139995

00:07:30.800 --> 00:07:32.840 my my pandemic was review writing.

NOTE Confidence: 0.785139995

00:07:32.840 --> 00:07:34.964 But it gave me time to really think about

NOTE Confidence: 0.785139995

00:07:34.964 --> 00:07:37.000 what we mean when we study flexibility,

NOTE Confidence: 0.785139995

00:07:37.000 --> 00:07:38.460 what we're what we're using

NOTE Confidence: 0.785139995

00:07:38.460 --> 00:07:39.920 that term to refer to.

NOTE Confidence: 0.785139995

00:07:39.920 --> 00:07:42.608 And in in human sort of cognitive

NOTE Confidence: 0.785139995

00:07:42.608 --> 00:07:44.472 neuroscience and psychology we tend

NOTE Confidence: 0.785139995

00:07:44.472 --> 00:07:46.398 to use things like the Wisconsin

NOTE Confidence: 0.785139995

00:07:46.398 --> 00:07:48.874 cards sort tasks and we ask people

NOTE Confidence: 0.785139995

00:07:48.874 --> 00:07:50.922 to make categorizations and then you

NOTE Confidence: 0.785139995

00:07:50.922 --> 00:07:52.896 know switch the criteria and and we

NOTE Confidence: 0.785139995

00:07:52.896 --> 00:07:55.118 use that as an index of flexibility.

NOTE Confidence: 0.785139995

00:07:55.120 --> 00:07:57.480 But I also think we have all these

NOTE Confidence: 0.785139995

00:07:57.480 --> 00:07:59.639 parallels in behavioral neuroscience.

NOTE Confidence: 0.785139995

00:07:59.640 --> 00:08:01.440 In reversal learning paradigms for

NOTE Confidence: 0.785139995

00:08:01.440 --> 00:08:03.240 example you're just asking animals

NOTE Confidence: 0.785139995

00:08:03.300 --> 00:08:05.148 to make different kinds of stimulus

NOTE Confidence: 0.785139995

00:08:05.148 --> 00:08:07.086 outcome mappings and we we call

NOTE Confidence: 0.785139995

00:08:07.086 --> 00:08:08.382 that behavioral flexibility and

NOTE Confidence: 0.785139995

00:08:08.382 --> 00:08:10.354 I think mainly because we can't

NOTE Confidence: 0.785139995

00:08:10.354 --> 00:08:12.039 guess what animals are thinking.

NOTE Confidence: 0.785139995

00:08:12.040 --> 00:08:14.232 So we have them do a behavior and

NOTE Confidence: 0.785139995

00:08:14.232 --> 00:08:16.836 we see how how they flexibly behave.

NOTE Confidence: 0.785139995

00:08:16.840 --> 00:08:19.276 When we look at developmental psychology,

NOTE Confidence: 0.785139995

00:08:19.280 --> 00:08:21.056 we often come up with things

NOTE Confidence: 0.785139995

00:08:21.056 --> 00:08:22.640 that kids can do like,

NOTE Confidence: 0.785139995

00:08:22.640 --> 00:08:23.004 you know,

NOTE Confidence: 0.785139995

00:08:23.004 --> 00:08:24.722 tell me you know which color is this fish

NOTE Confidence: 0.785139995

00:08:24.722 --> 00:08:26.276 or which direction is the fish pointing.

NOTE Confidence: 0.785139995

00:08:26.280 --> 00:08:28.380 But we do things like task switching

NOTE Confidence: 0.785139995

00:08:28.380 --> 00:08:30.180 to engage the development of

NOTE Confidence: 0.785139995

00:08:30.180 --> 00:08:32.280 flexible behaviors in in children.

NOTE Confidence: 0.785139995

00:08:32.280 --> 00:08:35.928 But all of these kinds of paradigms tend

NOTE Confidence: 0.785139995

00:08:35.928 --> 00:08:38.256 to engage frontal parietal networks.

NOTE Confidence: 0.785139995

00:08:38.256 --> 00:08:41.088 They tend to engage singular insular

NOTE Confidence: 0.785139995

00:08:41.088 --> 00:08:43.384 cortices and frontostriatal systems and

NOTE Confidence: 0.785139995

00:08:43.384 --> 00:08:46.520 and many of you have been, you know,

NOTE Confidence: 0.785139995

00:08:46.520 --> 00:08:47.720 working in this field for years.

NOTE Confidence: 0.785139995

00:08:47.720 --> 00:08:49.757 So I'm not telling you anything new.

NOTE Confidence: 0.785139995

00:08:49.760 --> 00:08:51.530 What I do think is interesting

NOTE Confidence: 0.785139995

00:08:51.530 --> 00:08:52.710 about flexibility is that

NOTE Confidence: 0.949673947857143

00:08:52.763 --> 00:08:54.079 you can see difficulties,

NOTE Confidence: 0.949673947857143

00:08:54.080 --> 00:08:55.820 oops, across many different

NOTE Confidence: 0.949673947857143

00:08:55.820 --> 00:08:57.560 kinds of clinical conditions.

NOTE Confidence: 0.949673947857143

00:08:57.560 --> 00:08:59.666 So we focus a lot on autism and early

NOTE Confidence: 0.949673947857143

00:08:59.666 --> 00:09:01.867 life conditions like ADHD where you get

NOTE Confidence: 0.949673947857143

00:09:01.867 --> 00:09:03.920 things like and autism specifically,

NOTE Confidence: 0.949673947857143

00:09:03.920 --> 00:09:06.038 you get restricted and repetitive behaviors.

NOTE Confidence: 0.949673947857143

00:09:06.040 --> 00:09:07.305 But then you have things

NOTE Confidence: 0.949673947857143

00:09:07.305 --> 00:09:08.317 like anxiety and depression,

NOTE Confidence: 0.949673947857143

00:09:08.320 --> 00:09:10.085 which come along more during

NOTE Confidence: 0.949673947857143

00:09:10.085 --> 00:09:11.497 adolescence that are associated

NOTE Confidence: 0.949673947857143

00:09:11.497 --> 00:09:13.480 with repetitive negative thinking.

NOTE Confidence: 0.949673947857143

00:09:13.480 --> 00:09:15.349 Worry in the case of anxiety or

NOTE Confidence: 0.949673947857143

00:09:15.349 --> 00:09:17.288 rumination in the case of depression

NOTE Confidence: 0.949673947857143

00:09:17.288 --> 00:09:19.436 are kind of inflexible thought patterns.

NOTE Confidence: 0.949673947857143

00:09:19.440 --> 00:09:21.988 So it's another way of thinking about

NOTE Confidence: 0.949673947857143

00:09:21.988 --> 00:09:23.506 flexibility and and difficulties

NOTE Confidence: 0.949673947857143

00:09:23.506 --> 00:09:24.358 with flexibility.

NOTE Confidence: 0.949673947857143

00:09:24.358 --> 00:09:25.636 And of course,

NOTE Confidence: 0.949673947857143

00:09:25.640 --> 00:09:27.584 OCD is another great example of

NOTE Confidence: 0.949673947857143

00:09:27.584 --> 00:09:29.739 a case where you really have

NOTE Confidence: 0.949673947857143

00:09:29.739 --> 00:09:32.115 difficulty coming out of a routine.

NOTE Confidence: 0.949673947857143

00:09:32.120 --> 00:09:33.440 And then even later in life,

NOTE Confidence: 0.949673947857143

00:09:33.440 --> 00:09:34.928 things like Alzheimer's and

NOTE Confidence: 0.949673947857143

00:09:34.928 --> 00:09:36.416 and Parkinson's are associated

NOTE Confidence: 0.949673947857143

00:09:36.416 --> 00:09:37.680 with cognitive rigidity.

NOTE Confidence: 0.949673947857143

00:09:37.680 --> 00:09:38.334 So, you know,

NOTE Confidence: 0.949673947857143

00:09:38.334 --> 00:09:40.211 these are maybe not all the same thing

NOTE Confidence: 0.949673947857143

00:09:40.211 --> 00:09:42.035 we're seeing at these different stages,

NOTE Confidence: 0.949673947857143

00:09:42.040 --> 00:09:43.975 but there's something about getting

NOTE Confidence: 0.949673947857143

00:09:43.975 --> 00:09:45.910 stuck in a particular behavioral

NOTE Confidence: 0.949673947857143

00:09:45.970 --> 00:09:47.776 pattern or thought pattern that we

NOTE Confidence: 0.949673947857143

00:09:47.776 --> 00:09:50.056 can see perhaps as a, you know,

NOTE Confidence: 0.949673947857143

00:09:50.056 --> 00:09:51.944 transdiagnostic, you know, difficulty.

NOTE Confidence: 0.949673947857143

00:09:51.944 --> 00:09:54.520 And so for us, we think,

NOTE Confidence: 0.949673947857143

00:09:54.520 --> 00:09:55.720 well, let's try to figure out,

NOTE Confidence: 0.949673947857143

00:09:55.720 --> 00:09:56.406 you know,

NOTE Confidence: 0.949673947857143

00:09:56.406 --> 00:09:58.464 what in the brain is allowing

NOTE Confidence: 0.949673947857143

00:09:58.464 --> 00:10:00.238 flexibility in the first place.

NOTE Confidence: 0.949673947857143

00:10:00.240 --> 00:10:01.576 And so a lot of the work that

NOTE Confidence: 0.949673947857143

00:10:01.576 --> 00:10:03.269 I won't talk about today is on

NOTE Confidence: 0.949673947857143

00:10:03.269 --> 00:10:04.579 thinking about development of brain

NOTE Confidence: 0.949673947857143

00:10:04.627 --> 00:10:06.119 networks involved in flexibility.

NOTE Confidence: 0.949673947857143

00:10:06.120 --> 00:10:08.624 So we'll do things like look at MRI

NOTE Confidence: 0.949673947857143

00:10:08.624 --> 00:10:10.000 data collected from participants

NOTE Confidence: 0.949673947857143

00:10:10.000 --> 00:10:12.890 between the age of 6 and 85 S really

NOTE Confidence: 0.949673947857143

00:10:12.890 --> 00:10:14.552 kind of lifespan data sets and

NOTE Confidence: 0.949673947857143

00:10:14.619 --> 00:10:16.647 look at changes in brain signals

NOTE Confidence: 0.949673947857143

00:10:16.647 --> 00:10:18.824 as they associate with, you know,

NOTE Confidence: 0.949673947857143

00:10:18.824 --> 00:10:20.472 like flexibility of brain

NOTE Confidence: 0.949673947857143

00:10:20.472 --> 00:10:22.120 networks across the lifespan.

NOTE Confidence: 0.949673947857143

00:10:22.120 --> 00:10:23.992 We'll look at things like differences

NOTE Confidence: 0.949673947857143

00:10:23.992 --> 00:10:25.927 in children versus adults in the

NOTE Confidence: 0.949673947857143

00:10:25.927 --> 00:10:27.829 strength of certain circuits or the

NOTE Confidence: 0.949673947857143

00:10:27.829 --> 00:10:29.165 effective connections between brain

NOTE Confidence: 0.949673947857143

00:10:29.165 --> 00:10:31.440 regions and how they change with development.

NOTE Confidence: 0.949673947857143

00:10:31.440 --> 00:10:33.150 And we'll get how network interactions

NOTE Confidence: 0.949673947857143

00:10:33.150 --> 00:10:34.760 again change across the lifespan,

NOTE Confidence: 0.949673947857143

00:10:34.760 --> 00:10:35.520 for example,

NOTE Confidence: 0.949673947857143

00:10:35.520 --> 00:10:37.800 between age of 6 and 85.

NOTE Confidence: 0.949673947857143

00:10:37.800 --> 00:10:40.065 There's a nice Nathan Klein

NOTE Confidence: 0.949673947857143

00:10:40.065 --> 00:10:42.102 Institute data set that that

NOTE Confidence: 0.949673947857143

00:10:42.102 --> 00:10:43.656 provides a lot of these data and

NOTE Confidence: 0.949673947857143

00:10:43.656 --> 00:10:44.720 they're publicly available now.

NOTE Confidence: 0.949673947857143

00:10:44.720 --> 00:10:47.536 So lots of things are are you know

NOTE Confidence: 0.949673947857143

00:10:47.536 --> 00:10:49.722 analysis are available and we're

NOTE Confidence: 0.949673947857143

00:10:49.722 --> 00:10:52.249 we've we've shown kind of how these

NOTE Confidence: 0.949673947857143

00:10:52.249 --> 00:10:54.116 differences in brain organization

NOTE Confidence: 0.949673947857143

00:10:54.116 --> 00:10:56.040 across the lifespan differentially

NOTE Confidence: 0.949673947857143

00:10:56.040 --> 00:10:58.120 relate to executive function.

NOTE Confidence: 0.949673947857143

00:10:58.120 --> 00:11:01.200 So like some of these brain variability

NOTE Confidence: 0.949673947857143

00:11:01.200 --> 00:11:03.164 metrics you know are associated

NOTE Confidence: 0.949673947857143

00:11:03.164 --> 00:11:05.069 with better executive function and

NOTE Confidence: 0.949673947857143

00:11:05.069 --> 00:11:06.474 adolescence but worse executive

NOTE Confidence: 0.949673947857143

00:11:06.474 --> 00:11:08.400 function and old age for example.

NOTE Confidence: 0.949673947857143

00:11:08.400 --> 00:11:09.760 And I know you can't see that slide,

NOTE Confidence: 0.949673947857143

00:11:09.760 --> 00:11:10.678 so I apologize.

NOTE Confidence: 0.949673947857143

00:11:10.678 --> 00:11:13.198 I'll make it bigger next time, I promise.

NOTE Confidence: 0.949673947857143

00:11:13.198 --> 00:11:15.910 But what we do do in this scanner

NOTE Confidence: 0.949673947857143

00:11:15.993 --> 00:11:17.998 is sometimes we just test.

NOTE Confidence: 0.949673947857143

00:11:18.000 --> 00:11:19.494 You've tried to develop a paradigm

NOTE Confidence: 0.949673947857143

00:11:19.494 --> 00:11:21.319 that can be used across children,

NOTE Confidence: 0.949673947857143

00:11:21.320 --> 00:11:24.480 across adults, across clinical populations.

NOTE Confidence: 0.949673947857143

00:11:24.480 --> 00:11:26.952 And we took this one paradigm from the

NOTE Confidence: 0.949673947857143

00:11:26.952 --> 00:11:27.976 developmental psychology literature

NOTE Confidence: 0.949673947857143

00:11:27.976 --> 00:11:30.118 called the flexible item selection task.

NOTE Confidence: 0.949673947857143

00:11:30.120 --> 00:11:31.864 And what you do here is you ask

NOTE Confidence: 0.949673947857143

00:11:31.864 --> 00:11:33.677 somebody to pick two things that go

NOTE Confidence: 0.949673947857143

00:11:33.677 --> 00:11:35.308 together and they might say, well,

NOTE Confidence: 0.949673947857143

00:11:35.308 --> 00:11:38.080 the 2nd and the 4th card are both blue,

NOTE Confidence: 0.949673947857143

00:11:38.080 --> 00:11:40.036 so they go together on color.

NOTE Confidence: 0.82012907

00:11:40.040 --> 00:11:40.795 And then you might say, OK,

NOTE Confidence: 0.82012907

00:11:40.795 --> 00:11:42.440 now pick another two things that go

NOTE Confidence: 0.82012907

00:11:42.440 --> 00:11:43.893 together and they might say, well,

NOTE Confidence: 0.82012907

00:11:43.893 --> 00:11:45.917 the 3rd and the 4th are both rabbits.

NOTE Confidence: 0.82012907

00:11:45.920 --> 00:11:48.360 I think that's right. And so it's OK.

NOTE Confidence: 0.82012907

00:11:48.360 --> 00:11:49.280 Pick another set of things

NOTE Confidence: 0.82012907

00:11:49.280 --> 00:11:50.353 that go together and say, well,

NOTE Confidence: 0.82012907

00:11:50.353 --> 00:11:52.244 the 1st and the 4th, they both have one

NOTE Confidence: 0.82012907

00:11:52.244 --> 00:11:54.200 item so that they're both showing one.

NOTE Confidence: 0.82012907

00:11:54.200 --> 00:11:56.000 So that's something that goes together.

NOTE Confidence: 0.82012907

00:11:56.000 --> 00:11:57.480 And this requires, you know,

NOTE Confidence: 0.82012907

00:11:57.480 --> 00:11:58.575 working memory, inhibition,

NOTE Confidence: 0.82012907

00:11:58.575 --> 00:12:00.426 all of these processes, attention,

NOTE Confidence: 0.82012907

00:12:00.426 --> 00:12:02.356 but also of course flexibility.

NOTE Confidence: 0.82012907

00:12:02.360 --> 00:12:04.075 The further you get along these dimensions,

NOTE Confidence: 0.82012907

00:12:04.080 --> 00:12:05.781 the harder it is to come up

NOTE Confidence: 0.82012907

00:12:05.781 --> 00:12:07.239 with things that go together.

NOTE Confidence: 0.82012907

00:12:07.240 --> 00:12:08.528 So we tried to put this in

NOTE Confidence: 0.82012907

00:12:08.528 --> 00:12:09.750 the scanner and we said, OK,

NOTE Confidence: 0.82012907

00:12:09.750 --> 00:12:11.640 here's just a control version of it,

NOTE Confidence: 0.82012907

00:12:11.640 --> 00:12:13.290 just hit the two buttons that

NOTE Confidence: 0.82012907

00:12:13.290 --> 00:12:13.840 are highlighted.

NOTE Confidence: 0.82012907

00:12:13.840 --> 00:12:16.200 So OK, just follow along.

NOTE Confidence: 0.82012907

00:12:16.200 --> 00:12:19.666 So we spent some years validating this task,

NOTE Confidence: 0.82012907

00:12:19.666 --> 00:12:20.874 having adults do it,

NOTE Confidence: 0.82012907

00:12:20.880 --> 00:12:22.400 putting people in the scanners,

NOTE Confidence: 0.82012907

00:12:22.400 --> 00:12:24.000 looking at their accuracy

NOTE Confidence: 0.82012907

00:12:24.000 --> 00:12:25.600 inside of the scanner,

NOTE Confidence: 0.82012907

00:12:25.600 --> 00:12:26.890 outside the scanner,

NOTE Confidence: 0.82012907

00:12:26.890 --> 00:12:29.612 all the typical validation stuff come by,

NOTE Confidence: 0.82012907

00:12:29.612 --> 00:12:31.614 created an efficiency metric to look at

NOTE Confidence: 0.82012907

00:12:31.614 --> 00:12:33.809 how good people are at this task and

NOTE Confidence: 0.82012907

00:12:33.809 --> 00:12:36.036 how much better they get at it over time.

NOTE Confidence: 0.82012907

00:12:36.040 --> 00:12:38.936 So Dejani did this work in our lab

NOTE Confidence: 0.82012907

00:12:38.936 --> 00:12:42.459 and found as one might expect really

NOTE Confidence: 0.82012907

00:12:42.459 --> 00:12:45.174 robust brain activation and flexibility

NOTE Confidence: 0.82012907

00:12:45.259 --> 00:12:47.824 trials in lateral prefrontal cortex,

NOTE Confidence: 0.82012907

00:12:47.824 --> 00:12:49.040 parietal cortices,

NOTE Confidence: 0.82012907

00:12:49.040 --> 00:12:52.292 cerebellum and basal ganglia and the

NOTE Confidence: 0.82012907

00:12:52.292 --> 00:12:55.240 anterior cingulate and the anterior

NOTE Confidence: 0.82012907

00:12:55.240 --> 00:12:57.808 ansula favorite brain region of mine

NOTE Confidence: 0.82012907

00:12:57.808 --> 00:13:00.728 that will come up again and really,

NOTE Confidence: 0.82012907

00:13:00.728 --> 00:13:02.184 really strong and robust

NOTE Confidence: 0.82012907

00:13:02.184 --> 00:13:03.640 activation across these regions.

NOTE Confidence: 0.82012907

00:13:03.640 --> 00:13:03.902 So,

NOTE Confidence: 0.82012907

00:13:03.902 --> 00:13:05.998 so we know as as from lots of

NOTE Confidence: 0.82012907

00:13:05.998 --> 00:13:07.566 literature that these are all

NOTE Confidence: 0.82012907

00:13:07.566 --> 00:13:09.426 very much involved in in flexible

NOTE Confidence: 0.82012907

00:13:09.490 --> 00:13:11.398 thinking and flexible behaviors.

NOTE Confidence: 0.82012907

00:13:11.400 --> 00:13:13.080 What I think is interesting to

NOTE Confidence: 0.82012907

00:13:13.080 --> 00:13:14.962 note though is for those fans

NOTE Confidence: 0.82012907

00:13:14.962 --> 00:13:16.717 of neurosynth and meta analysis.

NOTE Confidence: 0.82012907

00:13:16.720 --> 00:13:18.556 If you look at if you put a term

NOTE Confidence: 0.82012907

00:13:18.556 --> 00:13:20.171 like shifting or working memory

NOTE Confidence: 0.82012907

00:13:20.171 --> 00:13:22.193 for example into the neurosynth to

NOTE Confidence: 0.82012907

00:13:22.254 --> 00:13:24.079 look at automated across studies,

NOTE Confidence: 0.82012907

00:13:24.080 --> 00:13:26.068 what are the brain regions that are

NOTE Confidence: 0.82012907

00:13:26.068 --> 00:13:27.902 involved in shifting or I'm sorry,

NOTE Confidence: 0.82012907

00:13:27.902 --> 00:13:29.957 flexibility, you'll see these regions,

NOTE Confidence: 0.82012907

00:13:29.960 --> 00:13:32.120 right, the the same ones I just mentioned,

NOTE Confidence: 0.82012907

00:13:32.120 --> 00:13:33.380 frontal parietal cingulance or

NOTE Confidence: 0.82012907

00:13:33.380 --> 00:13:34.955 if you go into neurosynth,

NOTE Confidence: 0.82012907

00:13:34.960 --> 00:13:36.688 then you type in updating or

NOTE Confidence: 0.82012907

00:13:36.688 --> 00:13:37.840 you know working memory,

NOTE Confidence: 0.82012907

00:13:37.840 --> 00:13:40.078 whatever phrase you want to use,

NOTE Confidence: 0.82012907

00:13:40.080 --> 00:13:42.600 you'll see similar kinds of activation.

NOTE Confidence: 0.82012907

00:13:42.600 --> 00:13:44.364 And then if you type in inhibition

NOTE Confidence: 0.82012907

00:13:44.364 --> 00:13:46.328 again you'll see a lot of these

NOTE Confidence: 0.82012907

00:13:46.328 --> 00:13:47.195 overlapping brain regions.

NOTE Confidence: 0.82012907

00:13:47.200 --> 00:13:49.588 So they're really kind of broadly

NOTE Confidence: 0.82012907

00:13:49.588 --> 00:13:51.180 involved in these different

NOTE Confidence: 0.82012907

00:13:51.246 --> 00:13:53.398 components of executive function.

NOTE Confidence: 0.82012907

00:13:53.400 --> 00:13:54.234 It's hard to,

NOTE Confidence: 0.82012907

00:13:54.234 --> 00:13:56.645 I guess the point is it's hard to

NOTE Confidence: 0.82012907

00:13:56.645 --> 00:13:58.635 pull out of flexibility specific

NOTE Confidence: 0.82012907

00:13:58.635 --> 00:14:00.651 activations when almost all the

NOTE Confidence: 0.82012907

00:14:00.651 --> 00:14:02.775 tasks that try to tap flexible

NOTE Confidence: 0.82012907

00:14:02.775 --> 00:14:04.217 thinking also involve attention,

NOTE Confidence: 0.82012907

00:14:04.217 --> 00:14:06.479 working memory, inhibition and you know,

NOTE Confidence: 0.82012907

00:14:06.480 --> 00:14:07.144 everything else.

NOTE Confidence: 0.82012907

00:14:07.144 --> 00:14:09.800 So it's it's all not as clean as,

NOTE Confidence: 0.82012907

00:14:09.800 --> 00:14:10.673 as you know,

NOTE Confidence: 0.82012907

00:14:10.673 --> 00:14:11.837 we like to pretend,

NOTE Confidence: 0.82012907

00:14:11.840 --> 00:14:14.283 but you can do things like there's

NOTE Confidence: 0.82012907

00:14:14.283 --> 00:14:15.632 connectivity modelling approaches that

NOTE Confidence: 0.82012907

00:14:15.632 --> 00:14:17.632 let you get at some of these questions.

NOTE Confidence: 0.82012907

00:14:17.640 --> 00:14:19.692 One of them we've worked on

NOTE Confidence: 0.82012907

00:14:19.692 --> 00:14:21.880 here with Katie Gates at UNC,

NOTE Confidence: 0.82012907

00:14:21.880 --> 00:14:23.640 it's called group iterative

NOTE Confidence: 0.82012907

00:14:23.640 --> 00:14:25.840 multiple model estimation or Gimme.

NOTE Confidence: 0.845772302222222

00:14:25.840 --> 00:14:28.080 It's kind of a an iterative search

NOTE Confidence: 0.845772302222222

00:14:28.080 --> 00:14:30.148 algorithm that tries to fit a

NOTE Confidence: 0.845772302222222

00:14:30.148 --> 00:14:31.893 structural equation model to describe

NOTE Confidence: 0.845772302222222

00:14:31.893 --> 00:14:33.948 an individual connectome using user

NOTE Confidence: 0.845772302222222

00:14:33.948 --> 00:14:35.676 specified regions of interest.

NOTE Confidence: 0.845772302222222

00:14:35.680 --> 00:14:37.600 So if you take for example of all

NOTE Confidence: 0.845772302222222

00:14:37.600 --> 00:14:39.540 of these nodes that are activated

NOTE Confidence: 0.845772302222222

00:14:39.540 --> 00:14:41.634 in the flexible item selection task,

NOTE Confidence: 0.845772302222222

00:14:41.640 --> 00:14:42.560 you can look at OK,

NOTE Confidence: 0.845772302222222

00:14:42.560 --> 00:14:46.000 which sort of nodes kind of are most

NOTE Confidence: 0.845772302222222

00:14:46.000 --> 00:14:48.280 directly activated by this paradigm and

NOTE Confidence: 0.845772302222222

00:14:48.280 --> 00:14:51.079 which are sort of secondarily activated.

NOTE Confidence: 0.845772302222222

00:14:51.080 --> 00:14:53.204 So here we found that inferior

NOTE Confidence: 0.845772302222222

00:14:53.204 --> 00:14:55.591 frontal junction is sort of directly

NOTE Confidence: 0.845772302222222

00:14:55.591 --> 00:14:57.395 activated by flexible thinking

NOTE Confidence: 0.845772302222222

00:14:57.395 --> 00:14:59.199 or flexible item selection.

NOTE Confidence: 0.845772302222222

00:14:59.200 --> 00:15:00.960 And then there's information flow

NOTE Confidence: 0.845772302222222

00:15:00.960 --> 00:15:02.720 to other regions including the

NOTE Confidence: 0.845772302222222

00:15:02.779 --> 00:15:04.626 dorsilateral prefrontal cortex,

NOTE Confidence: 0.845772302222222

00:15:04.626 --> 00:15:06.998 anterior cingulate and others.

NOTE Confidence: 0.845772302222222

00:15:07.000 --> 00:15:09.590 And so there's kind of some regions

NOTE Confidence: 0.845772302222222

00:15:09.590 --> 00:15:12.141 that are more influential than others

NOTE Confidence: 0.845772302222222

00:15:12.141 --> 00:15:15.312 in this in this type of flexibility.

NOTE Confidence: 0.845772302222222

00:15:15.320 --> 00:15:17.632 So there's kind of ways of of teasing

NOTE Confidence: 0.845772302222222

00:15:17.632 --> 00:15:19.893 apart some of these activations and

NOTE Confidence: 0.845772302222222

00:15:19.893 --> 00:15:22.317 looking at more specific information flow.

NOTE Confidence: 0.845772302222222

00:15:22.320 --> 00:15:24.330 There's also a great deal of

NOTE Confidence: 0.845772302222222

00:15:24.330 --> 00:15:25.000 individual variability,

NOTE Confidence: 0.845772302222222

00:15:25.000 --> 00:15:27.709 like even though all subjects tend to

NOTE Confidence: 0.845772302222222

00:15:27.709 --> 00:15:30.479 activate these brain nodes during this test,

NOTE Confidence: 0.845772302222222

00:15:30.480 --> 00:15:32.365 there's group level paths or

NOTE Confidence: 0.845772302222222

00:15:32.365 --> 00:15:33.873 connections that are consistent,

NOTE Confidence: 0.845772302222222

00:15:33.880 --> 00:15:37.829 but a lot of sub sub sub group level

NOTE Confidence: 0.845772302222222

00:15:37.829 --> 00:15:39.887 paths meaning like some subjects engage

NOTE Confidence: 0.845772302222222

00:15:39.887 --> 00:15:41.920 these connections and others don't.

NOTE Confidence: 0.845772302222222

00:15:41.920 --> 00:15:46.141 So there's a lot of kind of more nuance

NOTE Confidence: 0.845772302222222

00:15:46.141 --> 00:15:49.092 to these blobs and activation patterns

NOTE Confidence: 0.845772302222222

00:15:49.092 --> 00:15:51.357 than we might initially realize.

NOTE Confidence: 0.845772302222222

00:15:51.360 --> 00:15:52.620 So we think about,

NOTE Confidence: 0.845772302222222

00:15:52.620 --> 00:15:53.880 for us at least,

NOTE Confidence: 0.845772302222222

00:15:53.880 --> 00:15:55.608 how cognitive flexibility involves

NOTE Confidence: 0.845772302222222

00:15:55.608 --> 00:15:57.336 the coordination among multiple

NOTE Confidence: 0.845772302222222

00:15:57.336 --> 00:15:59.495 brain regions that are all known to

NOTE Confidence: 0.845772302222222

00:15:59.495 --> 00:16:01.280 play a role in executive function,

NOTE Confidence: 0.845772302222222

00:16:01.280 --> 00:16:02.060 adults and children.

NOTE Confidence: 0.845772302222222

00:16:02.060 --> 00:16:03.880 I didn't show the maps from children,

NOTE Confidence: 0.845772302222222

00:16:03.880 --> 00:16:05.452 but children between the ages of

NOTE Confidence: 0.845772302222222

00:16:05.452 --> 00:16:08.173 8 to 12 also show these kind of

NOTE Confidence: 0.845772302222222

00:16:08.173 --> 00:16:09.781 similar activations of lateral

NOTE Confidence: 0.845772302222222

00:16:09.781 --> 00:16:11.585 frontoparrietal and singular insular

NOTE Confidence: 0.845772302222222

00:16:11.585 --> 00:16:13.920 networks during flexible item selection

NOTE Confidence: 0.845772302222222

00:16:13.920 --> 00:16:15.456 and task modulated connectivity.

NOTE Confidence: 0.845772302222222

00:16:15.456 --> 00:16:17.376 The inferior frontal junction seems

NOTE Confidence: 0.845772302222222

00:16:17.376 --> 00:16:19.282 to be particularly important for

NOTE Confidence: 0.845772302222222

00:16:19.282 --> 00:16:21.112 this type of flexible behavior.

NOTE Confidence: 0.845772302222222

00:16:21.120 --> 00:16:21.702 And I won't,

NOTE Confidence: 0.845772302222222

00:16:21.702 --> 00:16:23.332 I'll show you at the end of the

NOTE Confidence: 0.845772302222222

00:16:23.332 --> 00:16:24.830 talk some of the work we're doing

NOTE Confidence: 0.845772302222222

00:16:24.830 --> 00:16:26.684 now to bring this task to kids with

NOTE Confidence: 0.845772302222222

00:16:26.684 --> 00:16:28.395 autism and look at the brains of

NOTE Confidence: 0.845772302222222

00:16:28.395 --> 00:16:29.985 children between the ages of 8:00

NOTE Confidence: 0.845772302222222

00:16:29.985 --> 00:16:31.597 and 12:00 as they're doing this

NOTE Confidence: 0.845772302222222

00:16:31.597 --> 00:16:34.280 type of of flexible behavior task.

NOTE Confidence: 0.845772302222222

00:16:34.280 --> 00:16:36.396 And we, well, I'll show you,

NOTE Confidence: 0.845772302222222

00:16:36.396 --> 00:16:37.950 I don't remember if I included

NOTE Confidence: 0.845772302222222

00:16:38.002 --> 00:16:39.780 this slide but I'll I'll come back

NOTE Confidence: 0.845772302222222

00:16:39.780 --> 00:16:41.000 to this towards the end.

NOTE Confidence: 0.845772302222222

00:16:41.000 --> 00:16:43.880 So as we kind of develop these tasks,

NOTE Confidence: 0.845772302222222

00:16:43.880 --> 00:16:46.771 try to use them in clinical populations

NOTE Confidence: 0.845772302222222

00:16:46.771 --> 00:16:48.561 and developmental populations at the

NOTE Confidence: 0.845772302222222

00:16:48.561 --> 00:16:50.521 same time we try to focus on these

NOTE Confidence: 0.845772302222222

00:16:50.586 --> 00:16:52.642 big data sets that can help us look

NOTE Confidence: 0.845772302222222

00:16:52.642 --> 00:16:56.360 at sort of the adults neurotypical brain.

NOTE Confidence: 0.845772302222222

00:16:56.360 --> 00:16:57.977 And then the nice thing about some

NOTE Confidence: 0.845772302222222

00:16:57.977 --> 00:16:59.228 of these publicly shared large

NOTE Confidence: 0.845772302222222

00:16:59.228 --> 00:17:00.972 data sets is they're, you know,

NOTE Confidence: 0.845772302222222

00:17:00.972 --> 00:17:02.436 hundreds of subjects large.

NOTE Confidence: 0.845772302222222

00:17:02.440 --> 00:17:04.078 There are lots more data points

NOTE Confidence: 0.845772302222222

00:17:04.078 --> 00:17:05.592 than we typically can collect

NOTE Confidence: 0.845772302222222

00:17:05.592 --> 00:17:07.036 in the clinical population.

NOTE Confidence: 0.845772302222222

00:17:07.040 --> 00:17:09.924 So we can do a lot more with the

NOTE Confidence: 0.845772302222222

00:17:09.924 --> 00:17:11.856 the methods and the inferences and

NOTE Confidence: 0.845772302222222

00:17:11.856 --> 00:17:13.624 the replication here because for

NOTE Confidence: 0.845772302222222

00:17:13.624 --> 00:17:15.399 example in human connection project

NOTE Confidence: 0.845772302222222

00:17:15.399 --> 00:17:17.421 you actually have one hour of resting

NOTE Confidence: 0.845772302222222

00:17:17.421 --> 00:17:19.586 state F MRI data from each person.

NOTE Confidence: 0.845772302222222

00:17:19.586 --> 00:17:21.398 So a lot more,

NOTE Confidence: 0.910446164

00:17:21.400 --> 00:17:24.505 you know, signal in there so we can

NOTE Confidence: 0.910446164

00:17:24.505 --> 00:17:25.870 do things like look at moment to

NOTE Confidence: 0.910446164

00:17:25.924 --> 00:17:27.680 moment functional connectivity or

NOTE Confidence: 0.910446164

00:17:27.680 --> 00:17:28.997 dynamic functional connectivity.

NOTE Confidence: 0.910446164

00:17:29.000 --> 00:17:30.124 So in this process,

NOTE Confidence: 0.910446164

00:17:30.124 --> 00:17:31.810 instead of saying what areas are

NOTE Confidence: 0.910446164

00:17:31.867 --> 00:17:33.757 connected to each other on average,

NOTE Confidence: 0.910446164

00:17:33.760 --> 00:17:36.424 we're saying if you break down

NOTE Confidence: 0.910446164

00:17:36.424 --> 00:17:39.260 this data into 45 second chunks

NOTE Confidence: 0.910446164

00:17:39.260 --> 00:17:41.824 or 62nd windows and you look at

NOTE Confidence: 0.910446164

00:17:41.824 --> 00:17:43.154 reoccurring patterns of whole brain

NOTE Confidence: 0.910446164

00:17:43.154 --> 00:17:44.431 functional connectivity and you use

NOTE Confidence: 0.910446164

00:17:44.431 --> 00:17:46.293 some kind of clustering to say, OK,

NOTE Confidence: 0.910446164

00:17:46.293 --> 00:17:48.358 here's some different brain states.

NOTE Confidence: 0.910446164

00:17:48.360 --> 00:17:50.214 You can then start to quantify

NOTE Confidence: 0.910446164

00:17:50.214 --> 00:17:51.832 dynamic metrics like the frequency

NOTE Confidence: 0.910446164

00:17:51.832 --> 00:17:53.457 of occurrence of a particular

NOTE Confidence: 0.910446164

00:17:53.457 --> 00:17:55.440 brain state or the dwell time,

NOTE Confidence: 0.910446164

00:17:55.440 --> 00:17:57.306 which means how long does this

NOTE Confidence: 0.910446164

00:17:57.306 --> 00:17:59.136 brain state persist once it comes

NOTE Confidence: 0.910446164

00:17:59.136 --> 00:18:00.932 along and the state transitions,

NOTE Confidence: 0.910446164

00:18:00.932 --> 00:18:02.464 how much switching between

NOTE Confidence: 0.910446164

00:18:02.464 --> 00:18:04.279 brain states can you quantify?

NOTE Confidence: 0.910446164

00:18:04.280 --> 00:18:05.953 So in the human connection project is

NOTE Confidence: 0.910446164

00:18:05.953 --> 00:18:07.969 that this is just showing you a couple

NOTE Confidence: 0.910446164

00:18:07.969 --> 00:18:09.840 100 subjects do split half replication,

NOTE Confidence: 0.910446164

00:18:09.840 --> 00:18:10.652 various things.

NOTE Confidence: 0.910446164

00:18:10.652 --> 00:18:13.088 You can use independent component analysis

NOTE Confidence: 0.910446164

00:18:13.088 --> 00:18:15.677 to breakdown the brain into little regions.

NOTE Confidence: 0.910446164

00:18:15.680 --> 00:18:17.472 And then the nice thing is that

NOTE Confidence: 0.910446164

00:18:17.472 --> 00:18:19.175 all there's all kinds of other

NOTE Confidence: 0.910446164

00:18:19.175 --> 00:18:20.640 data on these same subjects,

NOTE Confidence: 0.910446164

00:18:20.640 --> 00:18:23.080 information about their processing speed,

NOTE Confidence: 0.910446164

00:18:23.080 --> 00:18:24.472 inhibition, cognitive flexibility,

NOTE Confidence: 0.910446164

00:18:24.472 --> 00:18:25.400 fluid intelligence,

NOTE Confidence: 0.910446164

00:18:25.400 --> 00:18:26.270 working memory,

NOTE Confidence: 0.910446164

00:18:26.270 --> 00:18:29.315 lots of scores to play around with.

NOTE Confidence: 0.910446164

00:18:29.320 --> 00:18:31.416 And So what we found is that typically

NOTE Confidence: 0.910446164

00:18:31.416 --> 00:18:33.718 the the brain enters different states,

NOTE Confidence: 0.910446164

00:18:33.720 --> 00:18:35.435 but it's got most of its time,

NOTE Confidence: 0.910446164

00:18:35.440 --> 00:18:38.504 about 36% of its time in this loosely

NOTE Confidence: 0.910446164

00:18:38.504 --> 00:18:40.678 connected kind of flexible state.

NOTE Confidence: 0.910446164

00:18:40.680 --> 00:18:43.344 And about 10% of the time it's really

NOTE Confidence: 0.910446164

00:18:43.344 --> 00:18:46.240 in this more cohere or really tightly

NOTE Confidence: 0.910446164

00:18:46.240 --> 00:18:48.600 correlated state that you see on the right.

NOTE Confidence: 0.910446164

00:18:48.600 --> 00:18:50.602 And it turns out that those individuals

NOTE Confidence: 0.910446164

00:18:50.602 --> 00:18:53.172 who do better on tests of working memory

NOTE Confidence: 0.910446164

00:18:53.172 --> 00:18:54.822 and tests of cognitive flexibility

NOTE Confidence: 0.910446164

00:18:54.878 --> 00:18:56.880 like the Wisconsin Card sort of test,

NOTE Confidence: 0.910446164

00:18:56.880 --> 00:18:58.252 those are the ones who are spending

NOTE Confidence: 0.910446164

00:18:58.252 --> 00:18:59.672 sort of or showing more frequent

NOTE Confidence: 0.910446164

00:18:59.672 --> 00:19:01.238 occurrence of states one and two,

NOTE Confidence: 0.910446164

00:19:01.240 --> 00:19:03.415 the loose connectivity states with

NOTE Confidence: 0.910446164

00:19:03.415 --> 00:19:05.590 more variability actually in their

NOTE Confidence: 0.910446164

00:19:05.655 --> 00:19:08.035 connection patterns and less time in the

NOTE Confidence: 0.910446164

00:19:08.035 --> 00:19:11.080 tight sort of inflexible states on the right.

NOTE Confidence: 0.910446164

00:19:11.080 --> 00:19:13.000 And so this is just,

NOTE Confidence: 0.910446164

00:19:13.000 --> 00:19:13.548 you know,

NOTE Confidence: 0.910446164

00:19:13.548 --> 00:19:16.232 showing us how we can get at sort of

NOTE Confidence: 0.910446164

00:19:16.232 --> 00:19:18.200 the basic neuroscience of of brain

NOTE Confidence: 0.910446164

00:19:18.276 --> 00:19:20.958 flexibility using these large data sets.

NOTE Confidence: 0.910446164

00:19:20.960 --> 00:19:22.423 And here we're just showing an example

NOTE Confidence: 0.910446164

00:19:22.423 --> 00:19:23.960 of how greater cognitive flexibility,

NOTE Confidence: 0.910446164

00:19:23.960 --> 00:19:25.200 which is measured outside of

NOTE Confidence: 0.910446164

00:19:25.200 --> 00:19:26.440 the scanner in this case,

NOTE Confidence: 0.910446164

00:19:26.440 --> 00:19:28.696 are associated with the propensity to

NOTE Confidence: 0.910446164

00:19:28.696 --> 00:19:30.803 occupy these more frequently occurring

NOTE Confidence: 0.910446164

00:19:30.803 --> 00:19:32.947 brain configurations characterized by

NOTE Confidence: 0.910446164

00:19:32.947 --> 00:19:35.091 attenuated correlations and greater

NOTE Confidence: 0.910446164

00:19:35.091 --> 00:19:37.120 functional connectivity variability.

NOTE Confidence: 0.910446164

00:19:37.120 --> 00:19:39.388 And it's just showing how we can

NOTE Confidence: 0.910446164

00:19:39.388 --> 00:19:41.583 think about using dynamic functional

NOTE Confidence: 0.910446164

00:19:41.583 --> 00:19:43.891 connectivity approaches to reveal

NOTE Confidence: 0.910446164

00:19:43.891 --> 00:19:45.622 relationships between brain

NOTE Confidence: 0.910446164

00:19:45.622 --> 00:19:47.759 dynamics and flexible cognition.

NOTE Confidence: 0.910446164

00:19:47.760 --> 00:19:48.123 So,

NOTE Confidence: 0.910446164

00:19:48.123 --> 00:19:48.486 OK,

NOTE Confidence: 0.910446164

00:19:48.486 --> 00:19:51.390 So what I talked about in the last

NOTE Confidence: 0.910446164

00:19:51.479 --> 00:19:55.351 study was really a whole brain kind of

NOTE Confidence: 0.910446164

00:19:55.351 --> 00:19:58.366 agnostic approach to thinking about the

NOTE Confidence: 0.910446164

00:19:58.366 --> 00:20:00.796 how flexibility might be implemented.

NOTE Confidence: 0.910446164

00:20:00.800 --> 00:20:01.720 But there's also of course,

NOTE Confidence: 0.910446164

00:20:01.720 --> 00:20:03.800 decades of cognitive neuroscience

NOTE Confidence: 0.910446164

00:20:03.800 --> 00:20:07.200 literature that that we all sort of

NOTE Confidence: 0.910446164

00:20:07.200 --> 00:20:09.648 rely on to to think about what are the

NOTE Confidence: 0.910446164

00:20:09.648 --> 00:20:11.245 more specific brain networks that might

NOTE Confidence: 0.910446164

00:20:11.245 --> 00:20:13.360 be involved in some of these processes.

NOTE Confidence: 0.910446164

00:20:13.360 --> 00:20:15.070 I already sort of mentioned

NOTE Confidence: 0.910446164

00:20:15.070 --> 00:20:16.780 the central executive or sort

NOTE Confidence: 0.79638161

00:20:16.840 --> 00:20:19.000 of lateral frontal parietal systems,

NOTE Confidence: 0.79638161

00:20:19.000 --> 00:20:20.920 the salience or mid single

NOTE Confidence: 0.79638161

00:20:20.920 --> 00:20:22.840 insular systems anchored in the

NOTE Confidence: 0.79638161

00:20:22.915 --> 00:20:24.839 cingulate and insular cortex,

NOTE Confidence: 0.79638161

00:20:24.840 --> 00:20:26.940 and the default mode network which has

NOTE Confidence: 0.79638161

00:20:26.940 --> 00:20:29.263 key nodes in the medial prefrontal

NOTE Confidence: 0.79638161

00:20:29.263 --> 00:20:31.079 and posterior parietal cortices.

NOTE Confidence: 0.79638161

00:20:31.080 --> 00:20:32.000 A number of years ago,

NOTE Confidence: 0.79638161

00:20:32.000 --> 00:20:34.328 we started to notice some interesting

NOTE Confidence: 0.79638161

00:20:34.328 --> 00:20:35.492 patterns of interrelationships

NOTE Confidence: 0.79638161

00:20:35.492 --> 00:20:37.039 among these three networks.

NOTE Confidence: 0.79638161

00:20:37.040 --> 00:20:39.000 They show up a lot in cognitive neuroscience.

NOTE Confidence: 0.79638161

00:20:39.000 --> 00:20:40.316 They show up a lot in psychiatry.

NOTE Confidence: 0.79638161

00:20:40.320 --> 00:20:42.220 But it turns out there's

NOTE Confidence: 0.79638161

00:20:42.220 --> 00:20:43.683 interrelatedness between them, right?

NOTE Confidence: 0.79638161

00:20:43.683 --> 00:20:45.944 So you can have usually when signals

NOTE Confidence: 0.79638161

00:20:45.944 --> 00:20:48.400 in the default mode network go up,

NOTE Confidence: 0.79638161

00:20:48.400 --> 00:20:50.065 the lateral front file goes

NOTE Confidence: 0.79638161

00:20:50.065 --> 00:20:51.397 down and vice versa.

NOTE Confidence: 0.79638161

00:20:51.400 --> 00:20:53.269 But it turns out you can often

NOTE Confidence: 0.79638161

00:20:53.269 --> 00:20:54.945 predict what's going to happen in

NOTE Confidence: 0.79638161

00:20:54.945 --> 00:20:56.670 these networks based on signals

NOTE Confidence: 0.79638161

00:20:56.670 --> 00:20:58.402 from the anterior insular cortex

NOTE Confidence: 0.79638161

00:20:58.402 --> 00:21:00.453 which we think of almost as a

NOTE Confidence: 0.79638161

00:21:00.453 --> 00:21:02.593 causal outflow hub like driving or

NOTE Confidence: 0.79638161

00:21:02.593 --> 00:21:04.085 orchestrating the changes between

NOTE Confidence: 0.79638161

00:21:04.085 --> 00:21:05.650 these other large scale networks.

NOTE Confidence: 0.79638161

00:21:05.650 --> 00:21:07.871 So it's a a model we've been playing

NOTE Confidence: 0.79638161

00:21:07.871 --> 00:21:10.079 around with now for a number of years.

NOTE Confidence: 0.79638161

00:21:10.080 --> 00:21:12.978 And if we think about the development

NOTE Confidence: 0.79638161

00:21:12.978 --> 00:21:14.668 of some of these networks and

NOTE Confidence: 0.79638161

00:21:14.668 --> 00:21:16.160 development of cognitive flexibility,

NOTE Confidence: 0.79638161

00:21:16.160 --> 00:21:18.194 again I mentioned this nice data

NOTE Confidence: 0.79638161

00:21:18.194 --> 00:21:19.930 set that includes several 100

NOTE Confidence: 0.79638161

00:21:19.930 --> 00:21:21.510 participants between 6 and 85

NOTE Confidence: 0.79638161

00:21:21.510 --> 00:21:23.359 resting to data from Rai data.

NOTE Confidence: 0.79638161

00:21:23.360 --> 00:21:25.635 And we can actually look at relationships

NOTE Confidence: 0.79638161

00:21:25.635 --> 00:21:27.855 between their brain dynamics and some

NOTE Confidence: 0.79638161

00:21:27.855 --> 00:21:29.439 other executive function measures.

NOTE Confidence: 0.79638161

00:21:29.440 --> 00:21:31.160 In this particular data set,

NOTE Confidence: 0.79638161

00:21:31.160 --> 00:21:33.160 the Dallas Kaplan executive

NOTE Confidence: 0.79638161

00:21:33.160 --> 00:21:35.160 function test was conducted.

NOTE Confidence: 0.79638161

00:21:35.160 --> 00:21:37.488 So participants are kind of going

NOTE Confidence: 0.79638161

00:21:37.488 --> 00:21:39.640 from letters to numbers in sequential

NOTE Confidence: 0.79638161

00:21:39.640 --> 00:21:42.153 order and we were interested here in

NOTE Confidence: 0.79638161

00:21:42.153 --> 00:21:43.883 the relationship between the brain

NOTE Confidence: 0.79638161

00:21:43.883 --> 00:21:46.040 dynamics of those three systems I

NOTE Confidence: 0.79638161

00:21:46.040 --> 00:21:48.152 mentioned and performance on this task.

NOTE Confidence: 0.79638161

00:21:48.160 --> 00:21:50.160 And so we used a different instead

NOTE Confidence: 0.79638161

00:21:50.160 --> 00:21:51.000 of sliding window,

NOTE Confidence: 0.79638161

00:21:51.000 --> 00:21:52.680 we used a Co activation pattern

NOTE Confidence: 0.79638161

00:21:52.730 --> 00:21:53.600 analysis approach,

NOTE Confidence: 0.79638161

00:21:53.600 --> 00:21:55.694 which also allows you to kind

NOTE Confidence: 0.79638161

00:21:55.694 --> 00:21:58.055 of cluster time frames based on

NOTE Confidence: 0.79638161

00:21:58.055 --> 00:22:00.300 their spatial similarity and look

NOTE Confidence: 0.79638161

00:22:00.300 --> 00:22:02.096 at functionally relevant patterns

NOTE Confidence: 0.79638161

00:22:02.096 --> 00:22:03.596 at the whole brain,

NOTE Confidence: 0.79638161

00:22:03.600 --> 00:22:05.000 not using a sliding window.

NOTE Confidence: 0.79638161

00:22:05.000 --> 00:22:07.360 But you can still get things like dwell

NOTE Confidence: 0.79638161

00:22:07.360 --> 00:22:09.052 time transitions between States and

NOTE Confidence: 0.79638161

00:22:09.052 --> 00:22:10.797 frequency of occurrence of states.

NOTE Confidence: 0.79638161

00:22:10.800 --> 00:22:13.054 And we found for example that there's

NOTE Confidence: 0.79638161

00:22:13.054 --> 00:22:14.817 some patterns like involving the

NOTE Confidence: 0.79638161

00:22:14.817 --> 00:22:16.657 lateral front to parietal executive

NOTE Confidence: 0.79638161

00:22:16.657 --> 00:22:18.800 and the medial front to parietal

NOTE Confidence: 0.79638161

00:22:18.800 --> 00:22:21.236 default mode that show AU shaped kind

NOTE Confidence: 0.79638161

00:22:21.236 --> 00:22:23.120 of trajectory across the lifespan.

NOTE Confidence: 0.79638161

00:22:23.120 --> 00:22:25.512 So you see kind of Co activation of

NOTE Confidence: 0.79638161

00:22:25.512 --> 00:22:27.666 these networks a lot more in midlife

NOTE Confidence: 0.79638161

00:22:27.666 --> 00:22:29.999 than in young individuals or in older age.

NOTE Confidence: 0.79638161

00:22:30.000 --> 00:22:32.196 And also this transitions or the

NOTE Confidence: 0.79638161

00:22:32.196 --> 00:22:33.660 switching between brain states

NOTE Confidence: 0.79638161

00:22:33.719 --> 00:22:35.879 seems to be linked with individual

NOTE Confidence: 0.79638161

00:22:35.879 --> 00:22:37.752 differences in the behavior on

NOTE Confidence: 0.79638161

00:22:37.752 --> 00:22:39.240 that executive function test.

NOTE Confidence: 0.79638161

00:22:39.240 --> 00:22:42.096 So in in middle age essentially you

NOTE Confidence: 0.79638161

00:22:42.096 --> 00:22:44.606 know between 25 and 45 or thereabouts,

NOTE Confidence: 0.79638161

00:22:44.606 --> 00:22:47.522 you actually you have pretty high

NOTE Confidence: 0.79638161

00:22:47.522 --> 00:22:48.980 flexibility performance regardless

NOTE Confidence: 0.79638161

00:22:49.040 --> 00:22:51.200 of what's happening in terms of

NOTE Confidence: 0.79638161

00:22:51.200 --> 00:22:52.640 the brain state transitions.

NOTE Confidence: 0.79638161

00:22:52.640 --> 00:22:54.915 But in children and in older adults,

NOTE Confidence: 0.79638161

00:22:54.920 --> 00:22:56.860 greater number of transitions between

NOTE Confidence: 0.79638161

00:22:56.860 --> 00:22:59.232 brain states is associated with better

NOTE Confidence: 0.79638161

00:22:59.232 --> 00:23:00.960 levels of cognitive flexibility.

NOTE Confidence: 0.79638161

00:23:00.960 --> 00:23:02.455 So there's like really different

NOTE Confidence: 0.79638161

00:23:02.455 --> 00:23:04.274 things going on at different points

NOTE Confidence: 0.79638161

00:23:04.274 --> 00:23:06.164 in life where at some some junctures

NOTE Confidence: 0.79638161

00:23:06.164 --> 00:23:07.474 it's really important to have

NOTE Confidence: 0.79638161

00:23:07.474 --> 00:23:09.154 a lot more of these brain state

NOTE Confidence: 0.874359212

00:23:09.160 --> 00:23:11.480 transitions to support flexible behaviors.

NOTE Confidence: 0.874359212

00:23:11.480 --> 00:23:14.805 But at other points they're not really as

NOTE Confidence: 0.874359212

00:23:14.805 --> 00:23:18.760 dependent on this type of brain flexibility.

NOTE Confidence: 0.874359212

00:23:18.760 --> 00:23:22.018 So this is an example where we used Co

NOTE Confidence: 0.874359212

00:23:22.018 --> 00:23:24.751 activation patterns to show that executive

NOTE Confidence: 0.874359212

00:23:24.751 --> 00:23:27.814 and default networks change in terms of

NOTE Confidence: 0.874359212

00:23:27.814 --> 00:23:29.724 their representation across the lifespan,

NOTE Confidence: 0.874359212

00:23:29.724 --> 00:23:32.960 in terms of their frequency of of occurrence.

NOTE Confidence: 0.874359212

00:23:32.960 --> 00:23:35.264 And that the brain state transitions

NOTE Confidence: 0.874359212

00:23:35.264 --> 00:23:37.922 between these networks seem to be related

NOTE Confidence: 0.874359212

00:23:37.922 --> 00:23:39.692 to cognitive flexibility in different

NOTE Confidence: 0.874359212

00:23:39.692 --> 00:23:42.440 ways at different stages of the lifespan.

NOTE Confidence: 0.874359212

00:23:42.440 --> 00:23:44.200 So if you if you don't mind now

NOTE Confidence: 0.874359212

00:23:44.200 --> 00:23:45.802 we'll go straight basic neuroscience

NOTE Confidence: 0.874359212

00:23:45.802 --> 00:23:47.278 for a little while.

NOTE Confidence: 0.874359212

00:23:47.280 --> 00:23:48.722 Because I think part of you know

NOTE Confidence: 0.874359212

00:23:48.722 --> 00:23:50.135 when you have these findings

NOTE Confidence: 0.874359212

00:23:50.135 --> 00:23:51.623 you see different developmental

NOTE Confidence: 0.874359212

00:23:51.623 --> 00:23:53.111 differences or clinical differences.

NOTE Confidence: 0.874359212

00:23:53.120 --> 00:23:54.600 It's tempting to, you know,

NOTE Confidence: 0.874359212

00:23:54.600 --> 00:23:57.800 go forth and, you know,

NOTE Confidence: 0.874359212

00:23:57.800 --> 00:23:59.250 make inferences and go straight

NOTE Confidence: 0.874359212

00:23:59.250 --> 00:24:00.576 to intervention or, you know,

NOTE Confidence: 0.874359212

00:24:00.576 --> 00:24:01.716 whatever the case may be.

NOTE Confidence: 0.874359212

00:24:01.720 --> 00:24:03.099 But I also think it's it's nice

NOTE Confidence: 0.874359212

00:24:03.099 --> 00:24:04.680 to to take a step back and say,

NOTE Confidence: 0.874359212

00:24:04.680 --> 00:24:06.432 OK, what are these brain regions

NOTE Confidence: 0.874359212

00:24:06.432 --> 00:24:08.120 doing in a broader context?

NOTE Confidence: 0.874359212

00:24:08.120 --> 00:24:10.038 What do we know about the anatomy

NOTE Confidence: 0.874359212

00:24:10.038 --> 00:24:11.900 and function of some of these areas

NOTE Confidence: 0.874359212

00:24:11.900 --> 00:24:14.320 that we seem to be implicated,

NOTE Confidence: 0.874359212

00:24:14.320 --> 00:24:17.200 you know, trans diagnostically

NOTE Confidence: 0.874359212

00:24:17.200 --> 00:24:18.708 across flexibility deficits.

NOTE Confidence: 0.874359212

00:24:18.708 --> 00:24:21.072 So the ancillar cortex in particular

NOTE Confidence: 0.874359212

00:24:21.072 --> 00:24:23.277 has kind of caught my attention.

NOTE Confidence: 0.874359212

00:24:23.280 --> 00:24:25.262 If you look at the, you know,

NOTE Confidence: 0.874359212

00:24:25.262 --> 00:24:26.004 neuroimaging literature,

NOTE Confidence: 0.874359212

00:24:26.004 --> 00:24:28.879 it often shows up in studies of affect,

NOTE Confidence: 0.874359212

00:24:28.880 --> 00:24:29.930 empathy, pain, emotion.

NOTE Confidence: 0.874359212

00:24:29.930 --> 00:24:32.924 You'll see often a talk of an empathy

NOTE Confidence: 0.874359212

00:24:32.924 --> 00:24:35.756 network that involves these brain regions.

NOTE Confidence: 0.874359212

00:24:35.760 --> 00:24:38.035 You'll also see a subject of awareness,

NOTE Confidence: 0.874359212

00:24:38.040 --> 00:24:38.480 Introception,

NOTE Confidence: 0.874359212

00:24:38.480 --> 00:24:39.800 somatic sensory processes.

NOTE Confidence: 0.874359212

00:24:39.800 --> 00:24:43.039 I I forgot to put disgust in here.

NOTE Confidence: 0.874359212

00:24:43.040 --> 00:24:44.976 But you know a lot of things happen

NOTE Confidence: 0.874359212

00:24:44.976 --> 00:24:47.107 in the insular cortex that are a lot

NOTE Confidence: 0.874359212

00:24:47.107 --> 00:24:49.319 to do with basic sensory processing,

NOTE Confidence: 0.874359212

00:24:49.320 --> 00:24:53.430 but also very high level cognitive

NOTE Confidence: 0.874359212

00:24:53.430 --> 00:24:55.299 processing, things like inhibition,

NOTE Confidence: 0.874359212

00:24:55.299 --> 00:24:56.871 attention switching and conflict

NOTE Confidence: 0.874359212

00:24:56.871 --> 00:24:58.726 executive function as we've been

NOTE Confidence: 0.874359212

00:24:58.726 --> 00:25:00.574 talking about all of those processes

NOTE Confidence: 0.874359212

00:25:00.574 --> 00:25:02.198 also activate the insular cortex.

NOTE Confidence: 0.874359212

00:25:02.200 --> 00:25:04.587 So it's it's one of those areas

NOTE Confidence: 0.874359212

00:25:04.587 --> 00:25:06.390 where everybody has their favorite

NOTE Confidence: 0.874359212

00:25:06.390 --> 00:25:08.160 thing to say about it.

NOTE Confidence: 0.874359212

00:25:08.160 --> 00:25:08.772 And so there,

NOTE Confidence: 0.874359212

00:25:08.772 --> 00:25:10.549 there tends to be a lot of literature

NOTE Confidence: 0.874359212

00:25:10.549 --> 00:25:12.295 that doesn't really talk to each

NOTE Confidence: 0.874359212

00:25:12.295 --> 00:25:14.350 other when we talk about the insular

NOTE Confidence: 0.874359212

00:25:14.350 --> 00:25:16.036 cortex because it's a little bit

NOTE Confidence: 0.874359212

00:25:16.040 --> 00:25:18.840 siloed in these different fields.

NOTE Confidence: 0.874359212

00:25:18.840 --> 00:25:21.160 But if you look at just a question of like,

NOTE Confidence: 0.874359212

00:25:21.160 --> 00:25:23.320 are there subdivisions within the insula?

NOTE Confidence: 0.874359212

00:25:23.320 --> 00:25:25.156 There's anywhere between 2 and 27

NOTE Confidence: 0.874359212

00:25:25.156 --> 00:25:27.080 depending on what study you look at.

NOTE Confidence: 0.874359212

00:25:27.080 --> 00:25:28.022 But it's true,

NOTE Confidence: 0.874359212

00:25:28.022 --> 00:25:30.720 there's a lot of subdivisions in the insula.

NOTE Confidence: 0.874359212

00:25:30.720 --> 00:25:32.743 If you look at just resting state

NOTE Confidence: 0.874359212

00:25:32.743 --> 00:25:35.030 F MRI and ask the question which

NOTE Confidence: 0.874359212

00:25:35.030 --> 00:25:36.380 voxels in the insular cortex

NOTE Confidence: 0.874359212

00:25:36.380 --> 00:25:37.922 have similar patterns of whole

NOTE Confidence: 0.874359212

00:25:37.922 --> 00:25:39.158 brain functional connectivity.

NOTE Confidence: 0.874359212

00:25:39.160 --> 00:25:40.455 So you're clustering the voxels

NOTE Confidence: 0.874359212

00:25:40.455 --> 00:25:42.200 based on their whole brain patterns.

NOTE Confidence: 0.874359212

00:25:42.200 --> 00:25:43.760 There's two studies from Bendine

NOTE Confidence: 0.874359212

00:25:43.760 --> 00:25:45.644 and Luke Chang that suggest you

NOTE Confidence: 0.874359212

00:25:45.644 --> 00:25:47.534 can at least find evidence for a

NOTE Confidence: 0.874359212

00:25:47.534 --> 00:25:49.119 dorsal anterior insula subdivision,

NOTE Confidence: 0.874359212

00:25:49.120 --> 00:25:50.740 a ventral anterior insula,

NOTE Confidence: 0.874359212

00:25:50.740 --> 00:25:51.955 a posterior insula.

NOTE Confidence: 0.874359212

00:25:51.960 --> 00:25:52.833 Like I said,

NOTE Confidence: 0.874359212

00:25:52.833 --> 00:25:54.579 maybe up to 27 depending on

NOTE Confidence: 0.874359212

00:25:54.579 --> 00:25:56.079 which Atlas you look at.

NOTE Confidence: 0.874359212

00:25:56.080 --> 00:25:59.635 So right now let's go with three for now.

NOTE Confidence: 0.874359212

00:25:59.640 --> 00:26:02.000 So if you look at these subdivisions there,

NOTE Confidence: 0.926438081818182

00:26:02.000 --> 00:26:05.120 they do seem to be some kind of

NOTE Confidence: 0.926438081818182

00:26:05.120 --> 00:26:07.310 structure to their their their

NOTE Confidence: 0.926438081818182

00:26:07.310 --> 00:26:10.355 division of of Labor in the sense.

NOTE Confidence: 0.926438081818182

00:26:10.360 --> 00:26:12.565 So in Luke Chang's meta analysis he

NOTE Confidence: 0.926438081818182

00:26:12.565 --> 00:26:14.709 found that the ventral anterior insula

NOTE Confidence: 0.926438081818182

00:26:14.709 --> 00:26:17.355 seems to be more involved in studies

NOTE Confidence: 0.926438081818182

00:26:17.421 --> 00:26:19.878 in the using the terms that are in red.

NOTE Confidence: 0.926438081818182

00:26:19.880 --> 00:26:21.053 So emotion, face,

NOTE Confidence: 0.926438081818182

00:26:21.053 --> 00:26:23.008 anxiety sort of affective types

NOTE Confidence: 0.926438081818182

00:26:23.008 --> 00:26:25.127 of terminology tend to go along

NOTE Confidence: 0.926438081818182

00:26:25.127 --> 00:26:26.717 with the ventral anterior insula

NOTE Confidence: 0.926438081818182

00:26:26.717 --> 00:26:28.318 in terms of activation.

NOTE Confidence: 0.926438081818182

00:26:28.320 --> 00:26:30.588 On the right is a meta analytic

NOTE Confidence: 0.926438081818182

00:26:30.588 --> 00:26:31.902 connectivity modeling study that

NOTE Confidence: 0.926438081818182

00:26:31.902 --> 00:26:33.594 we conducted some 10 years ago,

NOTE Confidence: 0.926438081818182

00:26:33.600 --> 00:26:35.820 which was just asking the question

NOTE Confidence: 0.926438081818182

00:26:35.820 --> 00:26:37.792 across many, many F MRI studies.

NOTE Confidence: 0.926438081818182

00:26:37.792 --> 00:26:40.080 When you see ventral anterior insula active,

NOTE Confidence: 0.926438081818182

00:26:40.080 --> 00:26:42.502 what else in the brain tends to

NOTE Confidence: 0.926438081818182

00:26:42.502 --> 00:26:43.920 coactive coactivate with that?

NOTE Confidence: 0.926438081818182

00:26:43.920 --> 00:26:46.458 It does tend to be the sort of limbic

NOTE Confidence: 0.926438081818182

00:26:46.458 --> 00:26:48.718 kinds of regions that are coactive.

NOTE Confidence: 0.926438081818182

00:26:48.720 --> 00:26:50.520 If you go ahead then to look at

NOTE Confidence: 0.926438081818182

00:26:50.520 --> 00:26:51.360 dorsal anterior insula,

NOTE Confidence: 0.926438081818182

00:26:51.360 --> 00:26:54.064 that's the one that seems to show up

NOTE Confidence: 0.926438081818182

00:26:54.064 --> 00:26:56.477 in studies with the term switching

NOTE Confidence: 0.926438081818182

00:26:56.480 --> 00:26:57.818 error processing inhibition.

NOTE Confidence: 0.926438081818182

00:26:57.818 --> 00:27:00.940 Those are the sort of higher cognitive

NOTE Confidence: 0.926438081818182

00:27:01.013 --> 00:27:03.278 executive function types of terms.

NOTE Confidence: 0.926438081818182

00:27:03.280 --> 00:27:04.596 And if you look on the right,

NOTE Confidence: 0.926438081818182

00:27:04.600 --> 00:27:06.796 that's the coactivation map of dorsal,

NOTE Confidence: 0.926438081818182

00:27:06.800 --> 00:27:08.040 anterior and slow which tends

NOTE Confidence: 0.926438081818182

00:27:08.040 --> 00:27:09.032 to coactivate with frontal,

NOTE Confidence: 0.926438081818182

00:27:09.040 --> 00:27:12.436 parietal cortices and temporal as well.

NOTE Confidence: 0.926438081818182

00:27:12.440 --> 00:27:13.928 And then if you go back a little

NOTE Confidence: 0.926438081818182

00:27:13.928 --> 00:27:15.360 bit to the posterior insula,

NOTE Confidence: 0.926438081818182

00:27:15.360 --> 00:27:17.000 that tends to be the one for pain,

NOTE Confidence: 0.926438081818182

00:27:17.000 --> 00:27:17.537 somatosensory,

NOTE Confidence: 0.926438081818182

00:27:17.537 --> 00:27:20.759 that kind of more sensory based

NOTE Confidence: 0.926438081818182

00:27:20.759 --> 00:27:22.292 kind of cognition.

NOTE Confidence: 0.926438081818182

00:27:22.292 --> 00:27:25.004 And it also seems to coactivate

NOTE Confidence: 0.926438081818182

00:27:25.004 --> 00:27:26.360 with somatosensory cortices.

NOTE Confidence: 0.926438081818182

00:27:26.360 --> 00:27:28.096 So on first glance,

NOTE Confidence: 0.926438081818182

00:27:28.096 --> 00:27:30.266 there are the patterns of

NOTE Confidence: 0.926438081818182

00:27:30.266 --> 00:27:32.523 coactivation and meta analytic types

NOTE Confidence: 0.926438081818182

00:27:32.523 --> 00:27:34.648 of analysis give us some evidence

NOTE Confidence: 0.926438081818182

00:27:34.648 --> 00:27:36.520 that the insular cortex can be

NOTE Confidence: 0.926438081818182

00:27:36.580 --> 00:27:38.508 subdivided a little bit even still,

NOTE Confidence: 0.926438081818182

00:27:38.508 --> 00:27:40.152 like all of these subdivisions are

NOTE Confidence: 0.926438081818182

00:27:40.152 --> 00:27:41.852 actually active across all of these

NOTE Confidence: 0.926438081818182

00:27:41.852 --> 00:27:42.956 cognitive domains I mentioned.

NOTE Confidence: 0.926438081818182

00:27:42.960 --> 00:27:45.645 So there's there's kind of a convergence

NOTE Confidence: 0.926438081818182

00:27:45.645 --> 00:27:48.075 and divergent at the same time.

NOTE Confidence: 0.926438081818182

00:27:48.080 --> 00:27:49.753 If you go ahead and look at

NOTE Confidence: 0.926438081818182

00:27:49.753 --> 00:27:51.461 the dynamics of the functional

NOTE Confidence: 0.926438081818182

00:27:51.461 --> 00:27:53.317 connectivity of these subdivisions,

NOTE Confidence: 0.926438081818182

00:27:53.320 --> 00:27:54.880 there's four here instead of three.

NOTE Confidence: 0.926438081818182

00:27:54.880 --> 00:27:56.340 It's independent component analysis,

NOTE Confidence: 0.926438081818182

00:27:56.340 --> 00:27:57.800 it's not too important.

NOTE Confidence: 0.926438081818182

00:27:57.800 --> 00:27:59.151 But if you again if you look

NOTE Confidence: 0.926438081818182

00:27:59.151 --> 00:28:00.520 at the dorsal anterior insula,

NOTE Confidence: 0.926438081818182

00:28:00.520 --> 00:28:01.800 it's doing something different here.

NOTE Confidence: 0.926438081818182

00:28:01.800 --> 00:28:04.716 That's the one in red in this top figure.

NOTE Confidence: 0.926438081818182

00:28:04.720 --> 00:28:06.704 And if you look at the pattern of

NOTE Confidence: 0.926438081818182

00:28:06.704 --> 00:28:08.578 the these subdivisions and how they

NOTE Confidence: 0.926438081818182

00:28:08.578 --> 00:28:10.960 connect with other parts of the brain,

NOTE Confidence: 0.926438081818182

00:28:10.960 --> 00:28:12.008 there's sometimes this is

NOTE Confidence: 0.926438081818182

00:28:12.008 --> 00:28:13.318 resting state up from rye.

NOTE Confidence: 0.926438081818182

00:28:13.320 --> 00:28:15.147 Again the there's some states in which

NOTE Confidence: 0.926438081818182

00:28:15.147 --> 00:28:16.962 all of the subdivisions are very

NOTE Confidence: 0.926438081818182

00:28:16.962 --> 00:28:19.237 similar like state three in the middle.

NOTE Confidence: 0.926438081818182

00:28:19.240 --> 00:28:20.920 But other states like state 2

NOTE Confidence: 0.926438081818182

00:28:20.920 --> 00:28:22.970 which only occur 5% of the time,

NOTE Confidence: 0.926438081818182

00:28:22.970 --> 00:28:24.520 which are much more divergent,

NOTE Confidence: 0.926438081818182

00:28:24.520 --> 00:28:26.410 which means the insular subdivisions

NOTE Confidence: 0.926438081818182

00:28:26.410 --> 00:28:28.300 are acting differently during that

NOTE Confidence: 0.926438081818182

00:28:28.360 --> 00:28:29.959 particular connectivity state.

NOTE Confidence: 0.926438081818182

00:28:29.960 --> 00:28:31.664 And the dorsal anterior insula is

NOTE Confidence: 0.926438081818182

00:28:31.664 --> 00:28:32.800 the most functionally flexible

NOTE Confidence: 0.926438081818182

00:28:32.846 --> 00:28:33.998 of all these subdivisions.

NOTE Confidence: 0.926438081818182

00:28:34.000 --> 00:28:36.012 So that's the one where if you

NOTE Confidence: 0.926438081818182

00:28:36.012 --> 00:28:36.836 look at different states,

NOTE Confidence: 0.926438081818182

00:28:36.840 --> 00:28:38.520 it's interacting with different brain region,

NOTE Confidence: 0.926438081818182

00:28:38.520 --> 00:28:40.000 has more connectivity partners

NOTE Confidence: 0.926438081818182

00:28:40.000 --> 00:28:42.738 with the rest of the cortex than

NOTE Confidence: 0.926438081818182

00:28:42.738 --> 00:28:44.079 the other subdivisions.

NOTE Confidence: 0.926438081818182

00:28:44.080 --> 00:28:45.595 And that's actually the same

NOTE Confidence: 0.926438081818182

00:28:45.595 --> 00:28:47.110 dorsal anterior insula as that

NOTE Confidence: 0.926438081818182

00:28:47.162 --> 00:28:48.467 same subdivision where we found

NOTE Confidence: 0.926438081818182

00:28:48.467 --> 00:28:49.772 that it you can use

NOTE Confidence: 0.862940841

00:28:49.832 --> 00:28:51.584 signals from that area to estimate

NOTE Confidence: 0.862940841

00:28:51.584 --> 00:28:53.456 what's going to happen at later time

NOTE Confidence: 0.862940841

00:28:53.456 --> 00:28:55.080 points in other parts of the brain.

NOTE Confidence: 0.862940841

00:28:55.080 --> 00:28:57.355 So that's that causal outflow hub that

NOTE Confidence: 0.862940841

00:28:57.355 --> 00:28:59.504 we identified many years ago using

NOTE Confidence: 0.862940841

00:28:59.504 --> 00:29:01.359 things like Granger causal analysis.

NOTE Confidence: 0.862940841

00:29:01.360 --> 00:29:02.728 So there's something curious

NOTE Confidence: 0.862940841

00:29:02.728 --> 00:29:04.438 about the dorsal anterior insula.

NOTE Confidence: 0.862940841

00:29:04.440 --> 00:29:06.840 I'll leave it at that.

NOTE Confidence: 0.862940841

00:29:06.840 --> 00:29:08.285 And again, there's some interesting

NOTE Confidence: 0.862940841

00:29:08.285 --> 00:29:09.730 structural connections there that you

NOTE Confidence: 0.862940841

00:29:09.774 --> 00:29:11.358 don't see in other parts of the insulin.

NOTE Confidence: 0.862940841

00:29:11.360 --> 00:29:14.141 There's some frontal and and subcortical

NOTE Confidence: 0.862940841

00:29:14.141 --> 00:29:16.446 projections that are detectable from

NOTE Confidence: 0.862940841

00:29:16.446 --> 00:29:19.043 the dorsal anterior insula that we

NOTE Confidence: 0.862940841

00:29:19.043 --> 00:29:21.113 don't see for the other subdivisions.

NOTE Confidence: 0.862940841

00:29:21.120 --> 00:29:23.649 So I I wanted to take that little segue

NOTE Confidence: 0.862940841

00:29:23.649 --> 00:29:26.112 into anatomy and and you know just

NOTE Confidence: 0.862940841

00:29:26.112 --> 00:29:28.352 the basic architecture of some brain

NOTE Confidence: 0.862940841

00:29:28.352 --> 00:29:30.504 areas because sometimes I think we'll

NOTE Confidence: 0.862940841

00:29:30.504 --> 00:29:32.234 see something like insula activation,

NOTE Confidence: 0.862940841

00:29:32.240 --> 00:29:35.039 but we may not look very carefully at which

NOTE Confidence: 0.862940841

00:29:35.039 --> 00:29:36.997 subdivision right or left what you know,

NOTE Confidence: 0.862940841

00:29:37.000 --> 00:29:38.236 what are we actually talking about.

NOTE Confidence: 0.862940841

00:29:38.240 --> 00:29:40.640 So I think being a little more precise

NOTE Confidence: 0.862940841

00:29:40.640 --> 00:29:43.448 on on where these things are going on

NOTE Confidence: 0.862940841

00:29:43.448 --> 00:29:45.955 really helps us you know hone in on

NOTE Confidence: 0.862940841

00:29:45.955 --> 00:29:47.880 what what the functional or dysfunction

NOTE Confidence: 0.862940841

00:29:47.880 --> 00:29:50.400 might be in a particular population.

NOTE Confidence: 0.862940841

00:29:50.400 --> 00:29:52.600 And so the ancillary cortex in adults can

NOTE Confidence: 0.862940841

00:29:52.600 --> 00:29:54.800 be divided into at least dorsal anterior,

NOTE Confidence: 0.862940841

00:29:54.800 --> 00:29:57.680 posterior and ventral anterior subdivision,

NOTE Confidence: 0.862940841

00:29:57.680 --> 00:29:59.624 probably more with the dorsal seeming

NOTE Confidence: 0.862940841

00:29:59.624 --> 00:30:02.444 to be more involved in the high level

NOTE Confidence: 0.862940841

00:30:02.444 --> 00:30:04.274 cognitive control or executive function.

NOTE Confidence: 0.862940841

00:30:04.280 --> 00:30:06.513 Things we've been talking about with the

NOTE Confidence: 0.862940841

00:30:06.513 --> 00:30:08.936 ventral a little bit more involved in

NOTE Confidence: 0.862940841

00:30:08.936 --> 00:30:11.048 the affective and emotional processing and

NOTE Confidence: 0.862940841

00:30:11.112 --> 00:30:13.416 the posterior more involved in somatic

NOTE Confidence: 0.862940841

00:30:13.416 --> 00:30:15.200 sensation and the dorsal anterior insulin.

NOTE Confidence: 0.862940841

00:30:15.200 --> 00:30:17.472 To me that's the special one which shows

NOTE Confidence: 0.862940841

00:30:17.472 --> 00:30:19.959 the most variable functional connections,

NOTE Confidence: 0.862940841

00:30:19.960 --> 00:30:22.473 kind of the greatest level of functional

NOTE Confidence: 0.862940841

00:30:22.473 --> 00:30:24.961 dynamics if you will and the greatest

NOTE Confidence: 0.862940841

00:30:24.961 --> 00:30:27.264 diversity in terms of the the brain

NOTE Confidence: 0.862940841

00:30:27.264 --> 00:30:29.448 regions it interacts with and and the

NOTE Confidence: 0.862940841

00:30:29.448 --> 00:30:31.888 test domains in which it's engaged and

NOTE Confidence: 0.862940841

00:30:31.888 --> 00:30:33.528 has some unique structural connections

NOTE Confidence: 0.862940841

00:30:33.528 --> 00:30:35.691 that we think might underlie some

NOTE Confidence: 0.862940841

00:30:35.691 --> 00:30:37.279 of that functional flexibility.

NOTE Confidence: 0.862940841

00:30:37.280 --> 00:30:39.488 So I was very heartened to see this

NOTE Confidence: 0.862940841

00:30:39.488 --> 00:30:41.546 paper from insulin and cut birth a

NOTE Confidence: 0.862940841

00:30:41.546 --> 00:30:43.737 while ago where you know they start

NOTE Confidence: 0.862940841

00:30:43.737 --> 00:30:45.789 talking about R doc and dimensional

NOTE Confidence: 0.862940841

00:30:45.789 --> 00:30:48.124 models and thinking about breaking

NOTE Confidence: 0.862940841

00:30:48.124 --> 00:30:50.864 down symptom based categories in

NOTE Confidence: 0.862940841

00:30:50.864 --> 00:30:52.876 psychiatry into a process where we

NOTE Confidence: 0.862940841

00:30:52.876 --> 00:30:54.520 where we're now all very familiar with.

NOTE Confidence: 0.862940841

00:30:54.520 --> 00:30:56.398 We're thinking about using genetic risk,

NOTE Confidence: 0.862940841

00:30:56.400 --> 00:30:57.236 brain activity,

NOTE Confidence: 0.862940841

00:30:57.236 --> 00:30:59.326 other markers to stratify samples

NOTE Confidence: 0.862940841

00:30:59.326 --> 00:31:00.990 into more data-driven categories

NOTE Confidence: 0.862940841

00:31:00.990 --> 00:31:03.419 which with the idea that this will

NOTE Confidence: 0.862940841

00:31:03.419 --> 00:31:05.830 eventually be good for us to identify

NOTE Confidence: 0.862940841

00:31:05.830 --> 00:31:07.791 subgroups that are more amenable to

NOTE Confidence: 0.862940841

00:31:07.791 --> 00:31:10.279 treatment on in one form or the other.

NOTE Confidence: 0.862940841

00:31:10.280 --> 00:31:12.304 The only reason I show this slide though

NOTE Confidence: 0.862940841

00:31:12.304 --> 00:31:14.397 is because in that figure from that paper,

NOTE Confidence: 0.862940841

00:31:14.400 --> 00:31:15.965 they have the insular cortex

NOTE Confidence: 0.862940841

00:31:15.965 --> 00:31:17.960 and I didn't plant that there.

NOTE Confidence: 0.862940841

00:31:17.960 --> 00:31:19.920 I had nothing to do with this,

NOTE Confidence: 0.862940841

00:31:19.920 --> 00:31:21.492 and I think it's probably just

NOTE Confidence: 0.862940841

00:31:21.492 --> 00:31:22.278 a random coincidence.

NOTE Confidence: 0.862940841

00:31:22.280 --> 00:31:23.760 But if I were them,

NOTE Confidence: 0.862940841

00:31:23.760 --> 00:31:26.496 I would also focus on the insular cortex

NOTE Confidence: 0.862940841

00:31:26.496 --> 00:31:29.064 in in all of my studies because it it

NOTE Confidence: 0.862940841

00:31:29.064 --> 00:31:31.222 does seem to be very much you know,

NOTE Confidence: 0.862940841

00:31:31.222 --> 00:31:32.677 whether you're interested in schizophrenia,

NOTE Confidence: 0.862940841

00:31:32.680 --> 00:31:33.912 anxiety, addiction,

NOTE Confidence: 0.862940841

00:31:33.912 --> 00:31:35.760 I mean autism,

NOTE Confidence: 0.862940841

00:31:35.760 --> 00:31:37.180 it doesn't matter you'll you

NOTE Confidence: 0.862940841

00:31:37.180 --> 00:31:38.600 can find papers that talk

NOTE Confidence: 0.879818397333333

00:31:38.660 --> 00:31:40.712 about the insula structure and function

NOTE Confidence: 0.879818397333333

00:31:40.712 --> 00:31:42.720 and connectivity that are aberrant or

NOTE Confidence: 0.879818397333333

00:31:42.720 --> 00:31:45.040 atypical or what have you in that disorder.

NOTE Confidence: 0.879818397333333

00:31:45.040 --> 00:31:47.610 So I I think part of my sort of crusade

NOTE Confidence: 0.879818397333333

00:31:47.685 --> 00:31:50.538 nowadays is to try to get people to read

NOTE Confidence: 0.879818397333333

00:31:50.538 --> 00:31:52.941 outside of their favorite disorder and

NOTE Confidence: 0.879818397333333

00:31:52.941 --> 00:31:55.249 and think about bigger picture models

NOTE Confidence: 0.879818397333333

00:31:55.249 --> 00:31:57.272 of brain function that can help us

NOTE Confidence: 0.879818397333333

00:31:57.272 --> 00:31:59.280 understand in a more domain general way.

NOTE Confidence: 0.879818397333333

00:31:59.280 --> 00:32:01.534 Like what could be the consequence of

NOTE Confidence: 0.879818397333333

00:32:01.534 --> 00:32:03.719 of something going wrong in this system

NOTE Confidence: 0.879818397333333

00:32:03.720 --> 00:32:05.320 and how would that look in early life?

NOTE Confidence: 0.879818397333333

00:32:05.320 --> 00:32:06.636 How would that look in late life?

NOTE Confidence: 0.879818397333333

00:32:06.640 --> 00:32:08.510 Which subdivision are we talking

NOTE Confidence: 0.879818397333333

00:32:08.510 --> 00:32:10.380 about and what how consequential

NOTE Confidence: 0.879818397333333

00:32:10.442 --> 00:32:12.398 is that for a particular behavior?

NOTE Confidence: 0.879818397333333

00:32:12.400 --> 00:32:14.920 So I love this figure had nothing

NOTE Confidence: 0.879818397333333

00:32:14.920 --> 00:32:15.560 to do with it.

NOTE Confidence: 0.879818397333333

00:32:15.560 --> 00:32:20.930 But I promise so now just to to get back

NOTE Confidence: 0.879818397333333

00:32:21.073 --> 00:32:23.920 to the the autism arm of of things we do.

NOTE Confidence: 0.879818397333333

00:32:23.920 --> 00:32:26.840 If I have time, OK, I do.

NOTE Confidence: 0.879818397333333

00:32:26.840 --> 00:32:29.112 I I like to think about flexibility and

NOTE Confidence: 0.879818397333333

00:32:29.112 --> 00:32:31.007 autism because I know there's so much

NOTE Confidence: 0.879818397333333

00:32:31.007 --> 00:32:33.105 great work done on social cognition and

NOTE Confidence: 0.879818397333333

00:32:33.105 --> 00:32:35.439 social communication and language and autism.

NOTE Confidence: 0.879818397333333

00:32:35.440 --> 00:32:37.246 But but I think a little bit

NOTE Confidence: 0.879818397333333

00:32:37.246 --> 00:32:39.200 less is known about flexibility,

NOTE Confidence: 0.879818397333333

00:32:39.200 --> 00:32:41.100 repetitive behaviors and their

NOTE Confidence: 0.879818397333333

00:32:41.100 --> 00:32:43.475 brain bases for various reasons.

NOTE Confidence: 0.879818397333333

00:32:43.480 --> 00:32:45.076 And now we're thinking more about this.

NOTE Confidence: 0.879818397333333

00:32:45.080 --> 00:32:47.680 And I think when you get into this

NOTE Confidence: 0.879818397333333

00:32:47.680 --> 00:32:49.957 transition to adulthood in in autism,

NOTE Confidence: 0.879818397333333

00:32:49.960 --> 00:32:52.648 you see some of these outcomes

NOTE Confidence: 0.879818397333333

00:32:52.648 --> 00:32:54.770 that are surprisingly not optimal.

NOTE Confidence: 0.879818397333333

00:32:54.770 --> 00:32:57.366 So you see things like 80% of

NOTE Confidence: 0.879818397333333

00:32:57.366 --> 00:32:58.796 individuals who are diagnosed with

NOTE Confidence: 0.879818397333333

00:32:58.796 --> 00:33:00.494 autism don't live outside the home

NOTE Confidence: 0.879818397333333

00:33:00.494 --> 00:33:01.759 or live independently as they,

NOTE Confidence: 0.879818397333333

00:33:01.760 --> 00:33:03.956 you know, become 18 and older.

NOTE Confidence: 0.879818397333333

00:33:03.960 --> 00:33:06.300 You also see these kind of

NOTE Confidence: 0.879818397333333

00:33:06.300 --> 00:33:08.072 surprisingly low employment rates.

NOTE Confidence: 0.879818397333333

00:33:08.072 --> 00:33:10.712 So you know kind of 80% unemployment

NOTE Confidence: 0.879818397333333

00:33:10.712 --> 00:33:12.773 in in young adults with autism and

NOTE Confidence: 0.879818397333333

00:33:12.773 --> 00:33:14.158 that's that's really shocking and

NOTE Confidence: 0.879818397333333

00:33:14.158 --> 00:33:16.394 and not what we would have hoped for

NOTE Confidence: 0.879818397333333

00:33:16.394 --> 00:33:18.632 especially if you look at some of

NOTE Confidence: 0.879818397333333

00:33:18.632 --> 00:33:21.493 these other early life disabilities

NOTE Confidence: 0.879818397333333

00:33:21.493 --> 00:33:23.158 where you see better outcomes.

NOTE Confidence: 0.879818397333333

00:33:23.160 --> 00:33:25.206 It's it's surprising to see these

NOTE Confidence: 0.879818397333333

00:33:25.206 --> 00:33:27.716 kinds of stats and and I think

NOTE Confidence: 0.879818397333333

00:33:27.716 --> 00:33:28.796 there are treatments,

NOTE Confidence: 0.879818397333333

00:33:28.800 --> 00:33:30.024 evidence based programs,

NOTE Confidence: 0.879818397333333

00:33:30.024 --> 00:33:32.472 school based programs that help to

NOTE Confidence: 0.879818397333333

00:33:32.472 --> 00:33:35.106 train up executive function and help

NOTE Confidence: 0.879818397333333

00:33:35.106 --> 00:33:36.834 to train cognitive flexibility.

NOTE Confidence: 0.879818397333333

00:33:36.840 --> 00:33:39.081 And I think some of that is is what

NOTE Confidence: 0.879818397333333

00:33:39.081 --> 00:33:41.003 we have to start thinking about

NOTE Confidence: 0.879818397333333

00:33:41.003 --> 00:33:43.622 like when and how to deploy these

NOTE Confidence: 0.879818397333333

00:33:43.622 --> 00:33:45.038 kinds of interventions.

NOTE Confidence: 0.879818397333333

00:33:45.040 --> 00:33:47.227 And we do have a lot of things like

NOTE Confidence: 0.879818397333333

00:33:47.227 --> 00:33:49.512 social skills trading and a lot of

NOTE Confidence: 0.879818397333333

00:33:49.512 --> 00:33:51.654 stuff that's really effective at at

NOTE Confidence: 0.879818397333333

00:33:51.654 --> 00:33:53.554 ameliorating some of those difficulties.

NOTE Confidence: 0.879818397333333

00:33:53.560 --> 00:33:55.320 But there's I think a lot more work

NOTE Confidence: 0.879818397333333

00:33:55.320 --> 00:33:57.316 to be done here in in flexibility.

NOTE Confidence: 0.879818397333333

00:33:57.320 --> 00:33:59.288 And the reason I think that

NOTE Confidence: 0.879818397333333

00:33:59.288 --> 00:34:00.600 flexibility in particular is,

NOTE Confidence: 0.879818397333333

00:34:00.600 --> 00:34:03.029 is what hinders people in that transition

NOTE Confidence: 0.879818397333333

00:34:03.029 --> 00:34:04.622 to independence is because that's

NOTE Confidence: 0.879818397333333

00:34:04.622 --> 00:34:07.180 sort of a a lot of what you do when

NOTE Confidence: 0.879818397333333

00:34:07.180 --> 00:34:09.112 you're like moving out of the home,

NOTE Confidence: 0.879818397333333

00:34:09.120 --> 00:34:10.716 getting a new job, making friends,

NOTE Confidence: 0.879818397333333

00:34:10.720 --> 00:34:11.392 social relationships,

NOTE Confidence: 0.879818397333333

00:34:11.392 --> 00:34:14.080 a lot of that is kind of moment

NOTE Confidence: 0.879818397333333

00:34:14.149 --> 00:34:16.264 to moment adjustment of behavior

NOTE Confidence: 0.879818397333333

00:34:16.264 --> 00:34:17.956 and and flexible cognition.

NOTE Confidence: 0.879818397333333

00:34:17.960 --> 00:34:19.600 Really it's not just social

NOTE Confidence: 0.879818397333333

00:34:19.600 --> 00:34:21.240 cognition but like you know,

NOTE Confidence: 0.879818397333333

00:34:21.240 --> 00:34:22.356 if the bus doesn't show up

NOTE Confidence: 0.879818397333333

00:34:22.356 --> 00:34:23.797 today and I need to get to work,

NOTE Confidence: 0.9455095025

00:34:23.800 --> 00:34:25.851 I better scramble to find a different

NOTE Confidence: 0.9455095025

00:34:25.851 --> 00:34:27.485 way to get to work. Otherwise,

NOTE Confidence: 0.9455095025

00:34:27.485 --> 00:34:28.920 you know you're going to get fired.

NOTE Confidence: 0.9455095025

00:34:28.920 --> 00:34:32.028 So. So things like that I think

NOTE Confidence: 0.9455095025

00:34:32.028 --> 00:34:34.456 really do come into Stark.

NOTE Confidence: 0.9455095025

00:34:34.456 --> 00:34:37.657 You know, we, we kind of noticed them more

NOTE Confidence: 0.9455095025

00:34:37.657 --> 00:34:39.478 during these transition phases of life.

NOTE Confidence: 0.9455095025

00:34:39.480 --> 00:34:41.240 But there's also these issues,

NOTE Confidence: 0.9455095025

00:34:41.240 --> 00:34:42.146 not a clinician,

NOTE Confidence: 0.9455095025

00:34:42.146 --> 00:34:45.159 but those who are will tell me that there's,

NOTE Confidence: 0.9455095025

00:34:45.160 --> 00:34:46.798 you know, clearly heterogeneity and autism.

NOTE Confidence: 0.9455095025

00:34:46.800 --> 00:34:48.200 So not everyone has flexibility,

NOTE Confidence: 0.9455095025

00:34:48.200 --> 00:34:50.400 deficits, not everyone even shows,

NOTE Confidence: 0.9455095025

00:34:50.400 --> 00:34:52.638 you know, executive function on problems,

NOTE Confidence: 0.9455095025

00:34:52.640 --> 00:34:54.998 on these sort of parent reports,

NOTE Confidence: 0.9455095025

00:34:55.000 --> 00:34:57.080 classic measures like the Behavioral

NOTE Confidence: 0.9455095025

00:34:57.080 --> 00:34:59.160 Rating Inventory of Executive function.

NOTE Confidence: 0.9455095025

00:34:59.160 --> 00:35:01.197 This is a data set from Stuart

NOTE Confidence: 0.9455095025

00:35:01.200 --> 00:35:02.520 Mostofsky's group at Kennedy Krieger,

NOTE Confidence: 0.9455095025

00:35:02.520 --> 00:35:05.520 and he's got kids between 8:00 and 12:00.

NOTE Confidence: 0.9455095025

00:35:05.520 --> 00:35:06.878 Some of them are diagnosed with autism,

NOTE Confidence: 0.9455095025

00:35:06.880 --> 00:35:07.870 some with ADHD,

NOTE Confidence: 0.9455095025

00:35:07.870 --> 00:35:09.850 some with autism and ADHD and

NOTE Confidence: 0.9455095025

00:35:09.850 --> 00:35:11.640 some typically developing.

NOTE Confidence: 0.9455095025

00:35:11.640 --> 00:35:13.551 And if you do a latent profile

NOTE Confidence: 0.9455095025

00:35:13.551 --> 00:35:14.871 analysis across these behavioral

NOTE Confidence: 0.9455095025

00:35:14.871 --> 00:35:16.639 measures of executive function,

NOTE Confidence: 0.9455095025

00:35:16.640 --> 00:35:18.872 you'll I like to focus here on the

NOTE Confidence: 0.9455095025

00:35:18.872 --> 00:35:21.324 middle pie just to show you that a lot

NOTE Confidence: 0.9455095025

00:35:21.324 --> 00:35:23.158 of kids with these diagnosis have just

NOTE Confidence: 0.9455095025

00:35:23.158 --> 00:35:24.838 totally average executive function.

NOTE Confidence: 0.9455095025

00:35:24.840 --> 00:35:25.761 They're not impaired.

NOTE Confidence: 0.9455095025

00:35:25.761 --> 00:35:27.603 They're doing as well as a

NOTE Confidence: 0.9455095025

00:35:27.603 --> 00:35:28.759 typically developing kid.

NOTE Confidence: 0.9455095025

00:35:28.760 --> 00:35:29.506 In fact,

NOTE Confidence: 0.9455095025

00:35:29.506 --> 00:35:31.744 the impaired kids tend to be

NOTE Confidence: 0.9455095025

00:35:31.744 --> 00:35:33.359 those ASDADHD Comorbid kids.

NOTE Confidence: 0.9455095025

00:35:33.359 --> 00:35:34.598 Perhaps not surprisingly,

NOTE Confidence: 0.9455095025

00:35:34.600 --> 00:35:37.224 that double diagnosis really

NOTE Confidence: 0.9455095025

00:35:37.224 --> 00:35:39.460 impairs or is associated with

NOTE Confidence: 0.9455095025

00:35:39.460 --> 00:35:41.040 the impaired executive function.

NOTE Confidence: 0.9455095025

00:35:41.040 --> 00:35:42.916 We found this kind of mixed bag

NOTE Confidence: 0.9455095025

00:35:42.916 --> 00:35:44.880 as well in our own data set,

NOTE Confidence: 0.9455095025

00:35:44.880 --> 00:35:46.204 typically developing kids and

NOTE Confidence: 0.9455095025

00:35:46.204 --> 00:35:47.197 kids with autism.

NOTE Confidence: 0.9455095025

00:35:47.200 --> 00:35:49.150 This was an honors thesis student

NOTE Confidence: 0.9455095025

00:35:49.150 --> 00:35:50.604 from a student, Adriana Baez,

NOTE Confidence: 0.9455095025

00:35:50.604 --> 00:35:52.760 who then went on to Med school.

NOTE Confidence: 0.9455095025

00:35:52.760 --> 00:35:54.470 So I had a lot of, just incidentally,

NOTE Confidence: 0.9455095025

00:35:54.470 --> 00:35:56.360 a lot of great undergrads who

NOTE Confidence: 0.9455095025

00:35:56.360 --> 00:35:57.879 write papers as first author,

NOTE Confidence: 0.9455095025

00:35:57.880 --> 00:36:00.440 and so that's been really exciting to see.

NOTE Confidence: 0.9455095025

00:36:00.440 --> 00:36:00.908 But anyway,

NOTE Confidence: 0.9455095025

00:36:00.908 --> 00:36:02.078 this was her honors thesis,

NOTE Confidence: 0.9455095025

00:36:02.080 --> 00:36:05.670 and she showed again that a lot of kids with

NOTE Confidence: 0.9455095025

00:36:05.761 --> 00:36:08.440 autism do have average executive functions.

NOTE Confidence: 0.9455095025

00:36:08.440 --> 00:36:10.640 So it's there's heterogeneity there,

NOTE Confidence: 0.9455095025

00:36:10.640 --> 00:36:11.840 as one might have expected.

NOTE Confidence: 0.9455095025

00:36:11.840 --> 00:36:13.465 Not everyone needs the same

NOTE Confidence: 0.9455095025

00:36:13.465 --> 00:36:14.440 kinds of interventions,

NOTE Confidence: 0.9455095025

00:36:14.440 --> 00:36:14.870 right?

NOTE Confidence: 0.9455095025

00:36:14.870 --> 00:36:18.508 So what if we could figure out what are

NOTE Confidence: 0.9455095025

00:36:18.508 --> 00:36:20.078 the signatures of this heterogeneity?

NOTE Confidence: 0.9455095025

00:36:20.080 --> 00:36:22.078 Is it something as simple as

NOTE Confidence: 0.9455095025

00:36:22.080 --> 00:36:24.145 brain state transitions that are

NOTE Confidence: 0.9455095025

00:36:24.145 --> 00:36:25.797 related to flexible behaviors?

NOTE Confidence: 0.9455095025

00:36:25.800 --> 00:36:27.972 Is that something that's a marker

NOTE Confidence: 0.9455095025

00:36:27.972 --> 00:36:30.005 of flexibility and can we see

NOTE Confidence: 0.9455095025

00:36:30.005 --> 00:36:31.553 that in in our data sets?

NOTE Confidence: 0.9455095025

00:36:31.560 --> 00:36:33.037 So the first thing we tested was,

NOTE Confidence: 0.9455095025

00:36:33.040 --> 00:36:35.068 do kids or individuals who are

NOTE Confidence: 0.9455095025

00:36:35.068 --> 00:36:36.848 diagnosed with autism show a

NOTE Confidence: 0.9455095025

00:36:36.848 --> 00:36:39.020 reduction in the number of brain

NOTE Confidence: 0.9455095025

00:36:39.020 --> 00:36:40.803 state transitions compared to the

NOTE Confidence: 0.9455095025

00:36:40.803 --> 00:36:41.910 typically developing individuals?

NOTE Confidence: 0.9455095025

00:36:41.910 --> 00:36:44.675 And so I know you're probably familiar

NOTE Confidence: 0.9455095025

00:36:44.675 --> 00:36:47.440 with the Autism Brain Imaging Data Exchange.

NOTE Confidence: 0.9455095025

00:36:47.440 --> 00:36:49.438 So this was something that Adriana

NOTE Confidence: 0.9455095025

00:36:49.438 --> 00:36:51.228 Dimartino started a while back

NOTE Confidence: 0.9455095025

00:36:51.228 --> 00:36:53.760 trying to get all of us autism

NOTE Confidence: 0.9455095025

00:36:53.760 --> 00:36:55.480 researchers to share our data,

NOTE Confidence: 0.9455095025

00:36:55.480 --> 00:36:56.956 make them publicly available.

NOTE Confidence: 0.9455095025

00:36:56.956 --> 00:36:59.745 And this has resulted in hundreds of data

NOTE Confidence: 0.9455095025

00:36:59.745 --> 00:37:01.432 sets being now available for download.

NOTE Confidence: 0.9455095025

00:37:01.432 --> 00:37:03.256 So you can do things like

NOTE Confidence: 0.9455095025

00:37:03.256 --> 00:37:04.560 independent component analysis,

NOTE Confidence: 0.9455095025

00:37:04.560 --> 00:37:04.955 lighting,

NOTE Confidence: 0.9455095025

00:37:04.955 --> 00:37:05.745 widow connectivity.

NOTE Confidence: 0.9455095025

00:37:05.745 --> 00:37:08.510 And initially in this data set we

NOTE Confidence: 0.9455095025

00:37:08.579 --> 00:37:11.211 do find some evidence for small but

NOTE Confidence: 0.9455095025

00:37:11.211 --> 00:37:13.145 significant reduction in the number

NOTE Confidence: 0.9455095025

00:37:13.145 --> 00:37:15.353 of brain state transitions for those

NOTE Confidence: 0.9592228

00:37:15.360 --> 00:37:17.610 diagnosed with autism compared to the

NOTE Confidence: 0.9592228

00:37:17.610 --> 00:37:18.755 typically developing individuals.

NOTE Confidence: 0.9592228

00:37:18.755 --> 00:37:21.520 This was another Emily Marshall in our

NOTE Confidence: 0.9592228

00:37:21.520 --> 00:37:24.637 lab as an undergrad honors thesis wrote.

NOTE Confidence: 0.9592228

00:37:24.640 --> 00:37:27.516 A paper is now a Med student doing great.

NOTE Confidence: 0.9592228

00:37:27.516 --> 00:37:30.220 So she looked at the dynamics of this

NOTE Confidence: 0.9592228

00:37:30.291 --> 00:37:32.456 salience or cingular insular network

NOTE Confidence: 0.9592228

00:37:32.456 --> 00:37:35.486 and found again a reduction in the

NOTE Confidence: 0.9592228

00:37:35.486 --> 00:37:37.481 frequency of brain states involving

NOTE Confidence: 0.9592228

00:37:37.481 --> 00:37:40.696 this network and its Co activation with

NOTE Confidence: 0.9592228

00:37:40.696 --> 00:37:43.104 others in a study she did as part of

NOTE Confidence: 0.9592228

00:37:43.104 --> 00:37:45.077 her honors thesis a few years back.

NOTE Confidence: 0.9592228

00:37:45.080 --> 00:37:47.068 So, so you know we are starting

NOTE Confidence: 0.9592228

00:37:47.068 --> 00:37:49.060 to find these signatures in the

NOTE Confidence: 0.9592228

00:37:49.060 --> 00:37:50.840 brain imaging data as well.

NOTE Confidence: 0.9592228

00:37:50.840 --> 00:37:52.505 And if again if you look at a task

NOTE Confidence: 0.9592228

00:37:52.505 --> 00:37:54.047 that was the last one was resting

NOTE Confidence: 0.9592228

00:37:54.047 --> 00:37:55.823 state but this is a task where you've

NOTE Confidence: 0.9592228

00:37:55.823 --> 00:37:58.160 got kids doing a a set shifting task,

NOTE Confidence: 0.9592228

00:37:58.160 --> 00:37:59.640 it's actually pretty easy.

NOTE Confidence: 0.9592228

00:37:59.640 --> 00:38:01.928 This was I think BJ Casey first came

NOTE Confidence: 0.9592228

00:38:01.928 --> 00:38:04.230 up with this paradigm but it's you

NOTE Confidence: 0.9592228

00:38:04.230 --> 00:38:05.840 know you see circles and squares and

NOTE Confidence: 0.9592228

00:38:05.840 --> 00:38:07.479 you have to pick the odd one out.

NOTE Confidence: 0.9592228

00:38:07.480 --> 00:38:09.040 Sometimes it's the odd one out

NOTE Confidence: 0.9592228

00:38:09.040 --> 00:38:10.480 is different based on shapes,

NOTE Confidence: 0.9592228

00:38:10.480 --> 00:38:11.818 sometimes it's color and in mixed

NOTE Confidence: 0.9592228

00:38:11.818 --> 00:38:13.398 blocks it could be shape or color.

NOTE Confidence: 0.9592228

00:38:13.400 --> 00:38:15.716 So that's the set shifting kind

NOTE Confidence: 0.9592228

00:38:15.716 --> 00:38:17.346 of part of it.

NOTE Confidence: 0.9592228

00:38:17.346 --> 00:38:19.676 It's a cognitive flexibility test.

NOTE Confidence: 0.9592228

00:38:19.680 --> 00:38:21.440 It's relatively easy to do and in fact

NOTE Confidence: 0.9592228

00:38:21.440 --> 00:38:23.195 all of our kids can do it easily.

NOTE Confidence: 0.9592228

00:38:23.200 --> 00:38:25.600 So behaviorally this isn't too challenging.

NOTE Confidence: 0.9592228

00:38:25.600 --> 00:38:27.589 But what we find is that if you look

NOTE Confidence: 0.9592228

00:38:27.589 --> 00:38:29.835 at Co activation patterns between the

NOTE Confidence: 0.9592228

00:38:29.835 --> 00:38:31.795 executive and salience and default

NOTE Confidence: 0.9592228

00:38:31.800 --> 00:38:34.480 three kind of networks I've been focusing on,

NOTE Confidence: 0.9592228

00:38:34.480 --> 00:38:36.230 kids with autism can do the task

NOTE Confidence: 0.9592228

00:38:36.230 --> 00:38:37.999 and their brains are doing the task.

NOTE Confidence: 0.9592228

00:38:38.000 --> 00:38:39.036 Similarly to typically developing

NOTE Confidence: 0.9592228

00:38:39.036 --> 00:38:41.227 kids as they go on and on and get

NOTE Confidence: 0.9592228

00:38:41.227 --> 00:38:42.585 into the fourth run of the task

NOTE Confidence: 0.9592228

00:38:42.640 --> 00:38:44.264 they actually have to engage more of

NOTE Confidence: 0.9592228

00:38:44.264 --> 00:38:46.576 this front of pride all there's more

NOTE Confidence: 0.9592228

00:38:46.576 --> 00:38:49.000 frequent patterns of that network occurring.

NOTE Confidence: 0.9592228

00:38:49.000 --> 00:38:50.656 So it's like they they can do things

NOTE Confidence: 0.9592228

00:38:50.656 --> 00:38:52.365 but the strategies might be different

NOTE Confidence: 0.9592228

00:38:52.365 --> 00:38:54.231 or the brain networks involved might

NOTE Confidence: 0.9592228

00:38:54.279 --> 00:38:55.975 change over time in ways that we can't

NOTE Confidence: 0.9592228

00:38:55.975 --> 00:38:57.960 see it with a whole brain activation

NOTE Confidence: 0.9592228

00:38:57.960 --> 00:39:00.300 analysis and we actually can't even see

NOTE Confidence: 0.9592228

00:39:00.300 --> 00:39:02.120 with a functional connectivity analysis.

NOTE Confidence: 0.9592228

00:39:02.120 --> 00:39:04.451 But we can see with these like

NOTE Confidence: 0.9592228

00:39:04.451 --> 00:39:06.460 smaller wind approaches that look at

NOTE Confidence: 0.9592228

00:39:06.460 --> 00:39:08.470 dynamics and don't look at averages

NOTE Confidence: 0.9592228

00:39:08.534 --> 00:39:10.634 but look at like changes across time.

NOTE Confidence: 0.9592228

00:39:10.640 --> 00:39:12.734 So that's something we've we found

NOTE Confidence: 0.9592228

00:39:12.734 --> 00:39:15.318 and are sort of following up on.

NOTE Confidence: 0.9592228

00:39:15.320 --> 00:39:18.767 So this is kind of a full circle about

NOTE Confidence: 0.9592228

00:39:18.767 --> 00:39:20.483 thinking about dynamic functional

NOTE Confidence: 0.9592228

00:39:20.483 --> 00:39:22.659 connectivity approaches to reveal a

NOTE Confidence: 0.9592228

00:39:22.659 --> 00:39:25.137 typical patterns of brain dynamics in

NOTE Confidence: 0.9592228

00:39:25.137 --> 00:39:26.451 prevalent neurodevelopmental conditions

NOTE Confidence: 0.9592228

00:39:26.451 --> 00:39:28.167 characterized by cognitive inflexibility

NOTE Confidence: 0.9592228

00:39:28.167 --> 00:39:30.658 like autism as I mentioned here.

NOTE Confidence: 0.9592228

00:39:30.658 --> 00:39:33.024 And in the extent to which these

NOTE Confidence: 0.9592228

00:39:33.024 --> 00:39:34.997 individual differences in brain dynamics

NOTE Confidence: 0.9592228

00:39:34.997 --> 00:39:36.641 underlie individual differences in

NOTE Confidence: 0.9592228

00:39:36.641 --> 00:39:38.607 flexible behaviors is is something

NOTE Confidence: 0.9592228

00:39:38.607 --> 00:39:40.297 we're we're actively investigating as

NOTE Confidence: 0.9592228

00:39:40.297 --> 00:39:43.290 well as as I'll mention in a moment

NOTE Confidence: 0.9592228

00:39:43.290 --> 00:39:45.680 other moderators or mediators of these

NOTE Confidence: 0.9592228

00:39:45.680 --> 00:39:48.160 relationships between brain and behavior.

NOTE Confidence: 0.9592228

00:39:48.160 --> 00:39:51.640 So this whole time before 2021 we

NOTE Confidence: 0.9592228

00:39:51.640 --> 00:39:53.680 were conducting this work in Miami,

NOTE Confidence: 0.9592228

00:39:53.680 --> 00:39:56.560 which has a huge bilingual population.

NOTE Confidence: 0.9592228

00:39:56.560 --> 00:39:58.780 So most of our participants actually

NOTE Confidence: 0.9592228

00:39:58.780 --> 00:39:59.520 were Spanish,

NOTE Confidence: 0.923400529230769

00:39:59.520 --> 00:40:02.166 English, bilingual and so one one thing

NOTE Confidence: 0.923400529230769

00:40:02.166 --> 00:40:05.200 we did which was completely unplanned.

NOTE Confidence: 0.923400529230769

00:40:05.200 --> 00:40:07.504 Was that we were able to test the

NOTE Confidence: 0.923400529230769

00:40:07.504 --> 00:40:08.474 relationship between bilingual

NOTE Confidence: 0.923400529230769

00:40:08.474 --> 00:40:09.838 exposure and executive function

NOTE Confidence: 0.923400529230769

00:40:09.838 --> 00:40:11.920 in our children in the study.

NOTE Confidence: 0.923400529230769

00:40:11.920 --> 00:40:13.492 So the RO one was focused

NOTE Confidence: 0.923400529230769

00:40:13.492 --> 00:40:14.278 on cognitive flexibility.

NOTE Confidence: 0.923400529230769

00:40:14.280 --> 00:40:16.478 Not just nothing to do with language,

NOTE Confidence: 0.923400529230769

00:40:16.480 --> 00:40:17.600 nothing to do with bilingualism,

NOTE Confidence: 0.923400529230769

00:40:17.600 --> 00:40:19.600 but just the way the the sampling occurred.

NOTE Confidence: 0.923400529230769

00:40:19.600 --> 00:40:21.520 We had a lot of this

NOTE Confidence: 0.923400529230769

00:40:21.520 --> 00:40:22.800 population in our sample.

NOTE Confidence: 0.923400529230769

00:40:22.800 --> 00:40:26.175 So it turns out there's a lot of controversy

NOTE Confidence: 0.923400529230769

00:40:26.175 --> 00:40:28.862 about whether or not raising a child

NOTE Confidence: 0.923400529230769

00:40:28.862 --> 00:40:30.438 with developmental language delays,

NOTE Confidence: 0.923400529230769

00:40:30.440 --> 00:40:32.318 whether raising them in a bilingual

NOTE Confidence: 0.923400529230769

00:40:32.318 --> 00:40:34.478 home will result in slowing down of

NOTE Confidence: 0.923400529230769

00:40:34.480 --> 00:40:36.152 language and cognitive development.

NOTE Confidence: 0.923400529230769

00:40:36.152 --> 00:40:39.179 But there's been a lot more work

NOTE Confidence: 0.923400529230769

00:40:39.179 --> 00:40:41.885 recently suggesting not only are there

NOTE Confidence: 0.923400529230769

00:40:41.885 --> 00:40:43.695 no negative consequences of either

NOTE Confidence: 0.923400529230769

00:40:43.695 --> 00:40:44.970 in cognitive or language development

NOTE Confidence: 0.923400529230769

00:40:44.970 --> 00:40:46.719 for being raised in a bilingual home,

NOTE Confidence: 0.923400529230769

00:40:46.720 --> 00:40:48.664 but there might even be mitigation

NOTE Confidence: 0.923400529230769

00:40:48.664 --> 00:40:49.960 of some flexibility deficits.

NOTE Confidence: 0.923400529230769

00:40:49.960 --> 00:40:51.019 And in fact,

NOTE Confidence: 0.923400529230769

00:40:51.019 --> 00:40:53.490 some folks are starting to report fewer

NOTE Confidence: 0.923400529230769

00:40:53.566 --> 00:40:56.061 executive function problems in dual

NOTE Confidence: 0.923400529230769

00:40:56.061 --> 00:40:58.165 language households or autism kids with

NOTE Confidence: 0.923400529230769

00:40:58.165 --> 00:41:00.360 autism raised in dual language household.

NOTE Confidence: 0.923400529230769

00:41:00.360 --> 00:41:02.888 So this is to me a really exciting

NOTE Confidence: 0.923400529230769

00:41:02.888 --> 00:41:05.346 kind of untapped potential to explore.

NOTE Confidence: 0.923400529230769

00:41:05.346 --> 00:41:07.638 It's almost like a natural intervention.

NOTE Confidence: 0.923400529230769

00:41:07.640 --> 00:41:09.520 So in the earlier days,

NOTE Confidence: 0.923400529230769

00:41:09.520 --> 00:41:11.840 I think social or sorry,

NOTE Confidence: 0.923400529230769

00:41:11.840 --> 00:41:12.912 communication disorders,

NOTE Confidence: 0.923400529230769

00:41:12.912 --> 00:41:14.770 clinicians would say, OK,

NOTE Confidence: 0.923400529230769

00:41:14.770 --> 00:41:16.520 if your child is having language delay,

NOTE Confidence: 0.923400529230769

00:41:16.520 --> 00:41:18.476 don't expose them to multiple languages,

NOTE Confidence: 0.923400529230769

00:41:18.480 --> 00:41:19.536 just stick with one.

NOTE Confidence: 0.923400529230769

00:41:19.536 --> 00:41:21.120 We don't want to confuse them.

NOTE Confidence: 0.923400529230769

00:41:21.120 --> 00:41:23.874 But it turns out that wasn't the best wisdom.

NOTE Confidence: 0.923400529230769

00:41:23.880 --> 00:41:25.560 I mean, there's really no negative effect.

NOTE Confidence: 0.923400529230769

00:41:25.560 --> 00:41:28.040 There might even be these boosts in executive

NOTE Confidence: 0.923400529230769

00:41:28.040 --> 00:41:30.178 function that we we can encourage with this.

NOTE Confidence: 0.923400529230769

00:41:30.178 --> 00:41:31.552 Not to mention all the other

NOTE Confidence: 0.923400529230769

00:41:31.552 --> 00:41:32.640 benefits of bilingualism.

NOTE Confidence: 0.923400529230769

00:41:32.640 --> 00:41:32.946 Right.

NOTE Confidence: 0.923400529230769

00:41:32.946 --> 00:41:34.476 So we found, you know,

NOTE Confidence: 0.923400529230769

00:41:34.480 --> 00:41:37.077 in our initial study with Celia Romero,

NOTE Confidence: 0.923400529230769

00:41:37.080 --> 00:41:39.586 she's just about to hopefully have this

NOTE Confidence: 0.923400529230769

00:41:39.586 --> 00:41:41.759 paper accepted just initial evidence.

NOTE Confidence: 0.923400529230769

00:41:41.760 --> 00:41:43.797 When you get to typically developing kids,

NOTE Confidence: 0.923400529230769

00:41:43.800 --> 00:41:45.132 there's almost a ceiling effect if

NOTE Confidence: 0.923400529230769

00:41:45.132 --> 00:41:46.400 they're good at executive function.

NOTE Confidence: 0.923400529230769

00:41:46.400 --> 00:41:49.640 The bilingualism doesn't really change that.

NOTE Confidence: 0.923400529230769

00:41:49.640 --> 00:41:50.480 It sort of, you know,

NOTE Confidence: 0.923400529230769

00:41:50.480 --> 00:41:52.760 doesn't affect anything at all.

NOTE Confidence: 0.923400529230769

00:41:52.760 --> 00:41:53.480 But if you look here,

NOTE Confidence: 0.923400529230769

00:41:53.480 --> 00:41:55.181 it's just one scale of the behavior

NOTE Confidence: 0.923400529230769

00:41:55.181 --> 00:41:56.799 rating inventory of executive function.

NOTE Confidence: 0.923400529230769

00:41:56.800 --> 00:41:57.480 If you look at it,

NOTE Confidence: 0.923400529230769

00:41:57.480 --> 00:41:59.784 the kids with autism being from

NOTE Confidence: 0.923400529230769

00:41:59.784 --> 00:42:01.946 a bilingual home was associated

NOTE Confidence: 0.923400529230769

00:42:01.946 --> 00:42:04.142 with better inhibitory control

NOTE Confidence: 0.923400529230769

00:42:04.142 --> 00:42:06.748 than being from a monolingual home

NOTE Confidence: 0.923400529230769

00:42:06.748 --> 00:42:08.633 in in that particular population.

NOTE Confidence: 0.923400529230769

00:42:08.640 --> 00:42:10.775 So there may be some boosts or

NOTE Confidence: 0.923400529230769

00:42:10.775 --> 00:42:12.518 protective effects or what have you

NOTE Confidence: 0.923400529230769

00:42:12.520 --> 00:42:14.254 in certain conditions that we don't

NOTE Confidence: 0.923400529230769

00:42:14.254 --> 00:42:16.085 see in a typically developing case

NOTE Confidence: 0.923400529230769

00:42:16.085 --> 00:42:18.227 because they may already be at ceiling

NOTE Confidence: 0.923400529230769

00:42:18.227 --> 00:42:20.674 or they may not be affected in such a way.

NOTE Confidence: 0.923400529230769

00:42:20.680 --> 00:42:22.795 So this is something we finally

NOTE Confidence: 0.923400529230769

00:42:22.795 --> 00:42:25.315 got an R21 to do and believe me,

NOTE Confidence: 0.923400529230769

00:42:25.320 --> 00:42:27.520 nobody wanted to fund this for some reason.

NOTE Confidence: 0.923400529230769

00:42:27.520 --> 00:42:29.175 But we're finally starting to

NOTE Confidence: 0.923400529230769

00:42:29.175 --> 00:42:30.830 collect data to really explore

NOTE Confidence: 0.923400529230769

00:42:30.888 --> 00:42:32.600 the links between bilingualism,

NOTE Confidence: 0.923400529230769

00:42:32.600 --> 00:42:33.892 executive function and brain

NOTE Confidence: 0.923400529230769

00:42:33.892 --> 00:42:36.239 development in 8 to 12 year old

NOTE Confidence: 0.923400529230769

00:42:36.239 --> 00:42:37.970 children with autism now at UCLA.

NOTE Confidence: 0.923400529230769

00:42:37.970 --> 00:42:40.446 And we put in an RO one to look

NOTE Confidence: 0.923400529230769

00:42:40.446 --> 00:42:41.637 at this longitudinally.

NOTE Confidence: 0.923400529230769

00:42:41.640 --> 00:42:43.008 So we're doing the data collection

NOTE Confidence: 0.923400529230769

00:42:43.008 --> 00:42:43.920 on the first set

NOTE Confidence: 0.869424624545454

00:42:43.971 --> 00:42:45.413 and then we want to follow them

NOTE Confidence: 0.869424624545454

00:42:45.413 --> 00:42:46.840 up across that adolescent phase,

NOTE Confidence: 0.869424624545454

00:42:46.840 --> 00:42:48.195 keep keep them going into

NOTE Confidence: 0.869424624545454

00:42:48.195 --> 00:42:49.279 young adulthood if possible.

NOTE Confidence: 0.869424624545454

00:42:49.280 --> 00:42:52.102 But we want to see how, you know,

NOTE Confidence: 0.869424624545454

00:42:52.102 --> 00:42:53.872 the initial bilingual exposure kind

NOTE Confidence: 0.869424624545454

00:42:53.872 --> 00:42:56.200 of plays out across this interesting

NOTE Confidence: 0.869424624545454

00:42:56.200 --> 00:42:58.540 period of adolescence when things are

NOTE Confidence: 0.869424624545454

00:42:58.600 --> 00:43:00.940 changing executive function, you know,

NOTE Confidence: 0.869424624545454

00:43:00.940 --> 00:43:02.920 deficits might be becoming more prevalent.

NOTE Confidence: 0.869424624545454

00:43:02.920 --> 00:43:04.360 We want to see if there

NOTE Confidence: 0.869424624545454

00:43:04.360 --> 00:43:05.080 are protective effect.

NOTE Confidence: 0.869424624545454

00:43:05.080 --> 00:43:06.440 Is there a bilingual advantage?

NOTE Confidence: 0.869424624545454

00:43:06.440 --> 00:43:07.612 Is there a boost?

NOTE Confidence: 0.869424624545454

00:43:07.612 --> 00:43:08.198 Nobody knows.

NOTE Confidence: 0.869424624545454

00:43:08.200 --> 00:43:10.272 And there's like no studies at all

NOTE Confidence: 0.869424624545454

00:43:10.272 --> 00:43:11.894 about bilingualism and the influence

NOTE Confidence: 0.869424624545454

00:43:11.894 --> 00:43:13.599 on brain development and autism.

NOTE Confidence: 0.869424624545454

00:43:13.600 --> 00:43:15.804 There's nothing that exists.

NOTE Confidence: 0.869424624545454

00:43:15.804 --> 00:43:18.559 So that's something we're really,

NOTE Confidence: 0.869424624545454

00:43:18.560 --> 00:43:20.000 as far as data collection goes,

NOTE Confidence: 0.869424624545454

00:43:20.000 --> 00:43:21.404 that's where we're going

NOTE Confidence: 0.869424624545454

00:43:21.404 --> 00:43:23.159 in the next few years.

NOTE Confidence: 0.869424624545454

00:43:23.160 --> 00:43:24.792 The last thing I wanted to

NOTE Confidence: 0.869424624545454

00:43:24.792 --> 00:43:26.240 mention was this is like,

NOTE Confidence: 0.869424624545454

00:43:26.240 --> 00:43:28.838 and now for something completely different.

NOTE Confidence: 0.869424624545454

00:43:28.840 --> 00:43:30.856 So we have so many of you know I've

NOTE Confidence: 0.869424624545454

00:43:30.856 --> 00:43:33.269 I've become super involved with the

NOTE Confidence: 0.869424624545454

00:43:33.269 --> 00:43:35.399 adolescent brain cognitive development study.

NOTE Confidence: 0.869424624545454

00:43:35.400 --> 00:43:37.269 So I'm the one of the associate

NOTE Confidence: 0.869424624545454

00:43:37.269 --> 00:43:38.560 directors now for justice,

NOTE Confidence: 0.869424624545454

00:43:38.560 --> 00:43:39.530 equity, diversity,

NOTE Confidence: 0.869424624545454

00:43:39.530 --> 00:43:41.955 inclusion for the entire consortium.

NOTE Confidence: 0.869424624545454

00:43:41.960 --> 00:43:44.102 In addition to the 20 hours of

NOTE Confidence: 0.869424624545454

00:43:44.102 --> 00:43:46.041 meetings a week that entails also

NOTE Confidence: 0.869424624545454

00:43:46.041 --> 00:43:48.196 a lot of knowledge about the ABCD

NOTE Confidence: 0.869424624545454

00:43:48.196 --> 00:43:50.637 data set that now we can use as a

NOTE Confidence: 0.869424624545454

00:43:50.637 --> 00:43:52.480 lab to to further our own goals.

NOTE Confidence: 0.869424624545454

00:43:52.480 --> 00:43:54.450 So this is the study of, you know,

NOTE Confidence: 0.869424624545454

00:43:54.450 --> 00:43:56.280 10,000 youth, Yale as a site,

NOTE Confidence: 0.869424624545454

00:43:56.280 --> 00:43:57.624 UCLA as a site.

NOTE Confidence: 0.869424624545454

00:43:57.624 --> 00:44:00.005 They're started in 2016 and now the

NOTE Confidence: 0.869424624545454

00:44:00.005 --> 00:44:02.293 kids were 9 and 10 at the first

NOTE Confidence: 0.869424624545454

00:44:02.293 --> 00:44:04.804 wave and now they're about 16/17/18.

NOTE Confidence: 0.869424624545454

00:44:04.804 --> 00:44:08.024 So it's 10 year longitudinal

NOTE Confidence: 0.869424624545454

00:44:08.024 --> 00:44:09.956 study imaging neurocog,

NOTE Confidence: 0.869424624545454

00:44:09.960 --> 00:44:12.640 substance abuse substance use data.

NOTE Confidence: 0.869424624545454

00:44:12.640 --> 00:44:13.564 So and I won't.

NOTE Confidence: 0.869424624545454

00:44:13.564 --> 00:44:15.335 I won't try to embarrass myself by

NOTE Confidence: 0.869424624545454

00:44:15.335 --> 00:44:17.315 pretending to know anything about addiction.

NOTE Confidence: 0.869424624545454

00:44:17.320 --> 00:44:19.080 This crowd knows about addiction.

NOTE Confidence: 0.869424624545454

00:44:19.080 --> 00:44:19.482 I don't.

NOTE Confidence: 0.869424624545454

00:44:19.482 --> 00:44:21.090 But what I do want to do is

NOTE Confidence: 0.869424624545454

00:44:21.147 --> 00:44:22.320 think about salience,

NOTE Confidence: 0.869424624545454

00:44:22.320 --> 00:44:24.826 network dynamics and how they might be

NOTE Confidence: 0.869424624545454

00:44:24.826 --> 00:44:26.880 related to substance use initiation.

NOTE Confidence: 0.869424624545454

00:44:26.880 --> 00:44:28.560 And I swear this wasn't my idea.

NOTE Confidence: 0.869424624545454

00:44:28.560 --> 00:44:30.837 A program officer asked me to do this study.

NOTE Confidence: 0.869424624545454

00:44:30.840 --> 00:44:33.368 So we're trying to do is is look

NOTE Confidence: 0.869424624545454

00:44:33.368 --> 00:44:35.289 at precursors of substance use

NOTE Confidence: 0.869424624545454

00:44:35.289 --> 00:44:37.719 initiation using this ABCD data set.

NOTE Confidence: 0.869424624545454

00:44:37.720 --> 00:44:38.944 Cause at 9:00 and 10:00 the

NOTE Confidence: 0.869424624545454

00:44:38.944 --> 00:44:40.000 kids aren't really doing much.

NOTE Confidence: 0.869424624545454

00:44:40.000 --> 00:44:40.532 They might,

NOTE Confidence: 0.869424624545454

00:44:40.532 --> 00:44:42.394 a few of them report sipping alcohol,

NOTE Confidence: 0.869424624545454

00:44:42.400 --> 00:44:44.129 but as you follow them up over

NOTE Confidence: 0.869424624545454

00:44:44.129 --> 00:44:45.620 time you can see, you know,

NOTE Confidence: 0.869424624545454

00:44:45.620 --> 00:44:47.920 they start to do things like try out smoking,

NOTE Confidence: 0.869424624545454

00:44:47.920 --> 00:44:49.911 try out this and that, and things change.

NOTE Confidence: 0.869424624545454

00:44:49.911 --> 00:44:51.914 And that's what this study has meant to

NOTE Confidence: 0.869424624545454

00:44:51.914 --> 00:44:53.399 track like mental health trajectories

NOTE Confidence: 0.869424624545454

00:44:53.399 --> 00:44:55.200 and substance use initiation trajectories.

NOTE Confidence: 0.869424624545454

00:44:55.200 --> 00:44:57.280 And what we want to do is use

NOTE Confidence: 0.869424624545454

00:44:57.280 --> 00:44:57.800 predictive modeling.

NOTE Confidence: 0.869424624545454

00:44:57.800 --> 00:44:58.322 Of course,

NOTE Confidence: 0.869424624545454

00:44:58.322 --> 00:44:59.105 connectome based predictive

NOTE Confidence: 0.869424624545454

00:44:59.105 --> 00:45:00.640 modeling was invented here at Yale,

NOTE Confidence: 0.869424624545454

00:45:00.640 --> 00:45:01.640 you all know about it.

NOTE Confidence: 0.869424624545454

00:45:01.640 --> 00:45:04.328 But we want to use dynamic connectome

NOTE Confidence: 0.869424624545454

00:45:04.328 --> 00:45:06.501 based predictive modeling to try to

NOTE Confidence: 0.869424624545454

00:45:06.501 --> 00:45:08.403 see if anything about the salience

NOTE Confidence: 0.869424624545454

00:45:08.403 --> 00:45:10.423 network and its initial state

NOTE Confidence: 0.869424624545454

00:45:10.423 --> 00:45:12.059 predicts vulnerability to later

NOTE Confidence: 0.869424624545454

00:45:12.059 --> 00:45:14.203 substance use initiation using the

NOTE Confidence: 0.869424624545454

00:45:14.203 --> 00:45:16.849 machine learning and some of the

NOTE Confidence: 0.869424624545454

00:45:16.849 --> 00:45:19.237 connectivity approaches that I mentioned.

NOTE Confidence: 0.869424624545454

00:45:19.240 --> 00:45:20.913 And we think this will be interesting

NOTE Confidence: 0.869424624545454

00:45:20.913 --> 00:45:22.877 because as far as I know about addiction,

NOTE Confidence: 0.869424624545454

00:45:22.880 --> 00:45:24.371 most of a lot of the studies

NOTE Confidence: 0.869424624545454

00:45:24.371 --> 00:45:25.010 that are done

NOTE Confidence: 0.824975718

00:45:25.063 --> 00:45:27.016 in adults aren't able to really tease

NOTE Confidence: 0.824975718

00:45:27.016 --> 00:45:28.484 apart whether the brain difference

NOTE Confidence: 0.824975718

00:45:28.484 --> 00:45:30.218 is seen are the consequence or

NOTE Confidence: 0.824975718

00:45:30.218 --> 00:45:32.640 the cause of the of the addiction.

NOTE Confidence: 0.824975718

00:45:32.640 --> 00:45:34.803 So you see kind of what happens

NOTE Confidence: 0.824975718

00:45:34.803 --> 00:45:36.550 after years of of, you know,

NOTE Confidence: 0.824975718

00:45:36.550 --> 00:45:38.200 being a user of some substance,

NOTE Confidence: 0.824975718

00:45:38.200 --> 00:45:40.504 but we don't know necessarily if

NOTE Confidence: 0.824975718

00:45:40.504 --> 00:45:42.040 there's like some vulnerability

NOTE Confidence: 0.824975718

00:45:42.100 --> 00:45:44.044 in some circuits or things like

NOTE Confidence: 0.824975718

00:45:44.044 --> 00:45:46.000 that that pre preceded the onset.

NOTE Confidence: 0.824975718

00:45:46.000 --> 00:45:47.668 And so the adolescent brain cognitive

NOTE Confidence: 0.824975718

00:45:47.668 --> 00:45:48.780 development study actually allows

NOTE Confidence: 0.824975718

00:45:48.823 --> 00:45:49.957 you to do that 'cause you'll,

NOTE Confidence: 0.824975718

00:45:49.960 --> 00:45:51.136 you might, you know,

NOTE Confidence: 0.824975718

00:45:51.136 --> 00:45:53.332 be able to predict what some of

NOTE Confidence: 0.824975718

00:45:53.332 --> 00:45:54.820 these vulnerabilities are related

NOTE Confidence: 0.824975718

00:45:54.820 --> 00:45:57.040 to inhibition and and you know,

NOTE Confidence: 0.824975718

00:45:57.040 --> 00:45:58.923 the networks that are involved in in

NOTE Confidence: 0.824975718

00:45:58.923 --> 00:46:00.239 flexibility and things like that.

NOTE Confidence: 0.824975718

00:46:00.240 --> 00:46:02.022 So this is something we're trying

NOTE Confidence: 0.824975718

00:46:02.022 --> 00:46:03.919 to get funding to do as well.

NOTE Confidence: 0.824975718

00:46:03.920 --> 00:46:07.105 Just pure data analysis of the ABCD

NOTE Confidence: 0.824975718

00:46:07.105 --> 00:46:10.080 study and we'll see how that goes.

NOTE Confidence: 0.824975718

00:46:10.080 --> 00:46:12.264 But basically as I start out talking

NOTE Confidence: 0.824975718

00:46:12.264 --> 00:46:14.760 about why we're interested in flexibility

NOTE Confidence: 0.824975718

00:46:14.760 --> 00:46:17.600 deficits and flexible behaviors can

NOTE Confidence: 0.824975718

00:46:17.600 --> 00:46:19.872 be impact day-to-day activities,

NOTE Confidence: 0.824975718

00:46:19.880 --> 00:46:21.900 forming and maintaining relationships,

NOTE Confidence: 0.824975718

00:46:21.900 --> 00:46:23.920 employment and independent living.

NOTE Confidence: 0.824975718

00:46:23.920 --> 00:46:26.587 So we think that understanding the neural

NOTE Confidence: 0.824975718

00:46:26.587 --> 00:46:28.240 mechanisms underlying flexibility deficits,

NOTE Confidence: 0.824975718

00:46:28.240 --> 00:46:30.440 you know across autism is our big focus.

NOTE Confidence: 0.824975718

00:46:30.440 --> 00:46:32.195 But across lots of clinical

NOTE Confidence: 0.824975718

00:46:32.195 --> 00:46:34.578 conditions we think can be important

NOTE Confidence: 0.824975718

00:46:34.578 --> 00:46:36.240 for tailoring therapies,

NOTE Confidence: 0.824975718

00:46:36.240 --> 00:46:37.288 predicting responses,

NOTE Confidence: 0.824975718

00:46:37.288 --> 00:46:40.432 thinking about risk and resilience for

NOTE Confidence: 0.824975718

00:46:40.432 --> 00:46:43.159 for various things like addiction.

NOTE Confidence: 0.824975718

00:46:43.160 --> 00:46:44.291 And so eventually,

NOTE Confidence: 0.824975718

00:46:44.291 --> 00:46:46.897 you know our kids can can focus

NOTE Confidence: 0.824975718

00:46:46.897 --> 00:46:48.582 more about their interactions in

NOTE Confidence: 0.824975718

00:46:48.582 --> 00:46:51.145 the world and less less on the

NOTE Confidence: 0.824975718

00:46:51.145 --> 00:46:52.681 specific repetitive behaviors and

NOTE Confidence: 0.824975718

00:46:52.681 --> 00:46:54.644 routines that might hold them back.

NOTE Confidence: 0.824975718

00:46:54.644 --> 00:46:57.570 And so this is the lab at UCLA who does

NOTE Confidence: 0.824975718

00:46:57.570 --> 00:46:59.859 all the work and my collaboration at

NOTE Confidence: 0.824975718

00:46:59.927 --> 00:47:02.400 work on the right some of the funding

NOTE Confidence: 0.824975718

00:47:02.400 --> 00:47:06.278 and the people who have donated time data,

NOTE Confidence: 0.824975718

00:47:06.280 --> 00:47:07.666 code of resources,

NOTE Confidence: 0.824975718

00:47:07.666 --> 00:47:09.052 mentorship and collaboration

NOTE Confidence: 0.824975718

00:47:09.052 --> 00:47:11.360 and friendship over the years.

NOTE Confidence: 0.824975718

00:47:11.360 --> 00:47:14.280 And this is the not where I do my work,

NOTE Confidence: 0.824975718

00:47:14.280 --> 00:47:16.278 but this is, this is UCLA.

NOTE Confidence: 0.824975718

00:47:16.280 --> 00:47:17.904 And I'm really happy to take any

NOTE Confidence: 0.824975718

00:47:17.904 --> 00:47:19.200 questions and have discussions.

NOTE Confidence: 0.824975718

00:47:19.200 --> 00:47:21.000 Thanks again.