WEBVTT

NOTE duration:"00:59:09.6960000"

NOTE language:en-us

NOTE Confidence: 0.8588221

00:00:21.210 --> 00:00:23.088 Alright, I think we'll get started.

NOTE Confidence: 0.8588221

00:00:23.090 --> 00:00:25.040 Hello everyone, my name is Lauren

NOTE Confidence: 0.8588221

00:00:25.040 --> 00:00:26.840 Tobias and I'd like you to,

NOTE Confidence: 0.8588221

00:00:26.840 --> 00:00:28.562 well would like to welcome everyone

NOTE Confidence: 0.8588221

00:00:28.562 --> 00:00:30.456 to wear Yale Sleep seminar this

NOTE Confidence: 0.8588221

00:00:30.456 --> 00:00:32.166 afternoon before we get started.

NOTE Confidence: 0.8588221

00:00:32.170 --> 00:00:34.036 I have a few brief announcements.

NOTE Confidence: 0.8588221

00:00:34.040 --> 00:00:35.864 First, please take a moment to

NOTE Confidence: 0.8588221

00:00:35.864 --> 00:00:38.090 ensure that you're muted in order to

NOTE Confidence: 0.8588221

00:00:38.090 --> 00:00:39.680 receive CME credit for attendance,

NOTE Confidence: 0.8588221

00:00:39.680 --> 00:00:41.426 please see the chat room for

NOTE Confidence: 0.8588221

00:00:41.426 --> 00:00:43.296 instructions and you can text the

NOTE Confidence: 0.8588221

00:00:43.296 --> 00:00:45.240 unique ID listed there for this

NOTE Confidence: 0.8588221

00:00:45.240 --> 00:00:46.879 conference anytime until 3:15 today.

NOTE Confidence: 0.8588221

00:00:46.880 --> 00:00:48.440 If you're not already registered

NOTE Confidence: 0.8588221

00:00:48.440 --> 00:00:49.760 with yield, see me.

NOTE Confidence: 0.8588221

00:00:49.760 --> 00:00:52.175 You will need to do that first.

NOTE Confidence: 0.8588221

00:00:52.180 --> 00:00:53.050 And today, specifically,

NOTE Confidence: 0.8588221

00:00:53.050 --> 00:00:54.790 I'm hearing that the CME Office

NOTE Confidence: 0.8588221

00:00:54.790 --> 00:00:56.437 might be having some difficulties.

NOTE Confidence: 0.8588221

00:00:56.440 --> 00:00:58.627 So if you send that text and you do

NOTE Confidence: 0.8588221

00:00:58.627 --> 00:01:00.999 not receive a confirmation text back,

NOTE Confidence: 0.8588221

00:01:01.000 --> 00:01:02.818 then please look at the chat.

NOTE Confidence: 0.8588221

00:01:02.820 --> 00:01:04.692 There's actually a second ID listed

NOTE Confidence: 0.8588221

00:01:04.692 --> 00:01:06.574 there and being told by Debbie

NOTE Confidence: 0.8588221

00:01:06.574 --> 00:01:08.290 and if this still doesn't work,

NOTE Confidence: 0.8588221

00:01:08.290 --> 00:01:10.714 then you can send Debbie Lovejoy an email.

NOTE Confidence: 0.8588221

00:01:10.720 --> 00:01:12.596 Her email will also be listed there

NOTE Confidence: 0.8588221

00:01:12.596 --> 00:01:14.979 as well as on our announcement email.

NOTE Confidence: 0.8588221

00:01:14.980 --> 00:01:16.798 If you have any questions during

NOTE Confidence: 0.8588221

00:01:16.798 --> 00:01:17.404 the presentation,

NOTE Confidence: 0.8588221

00:01:17.410 --> 00:01:20.074 I encourage you to make use of the

NOTE Confidence: 0.8588221

00:01:20.074 --> 00:01:22.910 chat room and we can invite you to

NOTE Confidence: 0.8588221

00:01:22.910 --> 00:01:25.220 unmute and read those at the end.

NOTE Confidence: 0.8588221

00:01:25.220 --> 00:01:28.397 Or to ask them for you if you prefer.

NOTE Confidence: 0.8588221

00:01:28.400 --> 00:01:30.392 We're going to have recorded versions

NOTE Confidence: 0.8588221

00:01:30.392 --> 00:01:32.528 of all of these lectures available

NOTE Confidence: 0.8588221

00:01:32.528 --> 00:01:34.748 online within a couple weeks at

NOTE Confidence: 0.8588221

00:01:34.748 --> 00:01:36.868 the link provided in the chat.

NOTE Confidence: 0.8588221

00:01:36.870 --> 00:01:37.598 And finally,

NOTE Confidence: 0.8588221

00:01:37.598 --> 00:01:39.782 feel free to share announcements about

NOTE Confidence: 0.8588221

00:01:39.782 --> 00:01:41.917 our weekly lecture series to anyone

NOTE Confidence: 0.8588221

00:01:41.917 --> 00:01:43.927 who you think may be interested.

NOTE Confidence: 0.8588221

00:01:43.930 --> 00:01:46.048 Or contact Debbie to be added

NOTE Confidence: 0.8588221

00:01:46.048 --> 00:01:47.460 to our email list.

NOTE Confidence: 0.8588221

00:01:47.460 --> 00:01:49.578 So now I am really delighted

NOTE Confidence: 0.8588221

00:01:49.578 --> 00:01:50.990 to introduce today's speaker,

NOTE Confidence: 0.8588221

00:01:50.990 --> 00:01:52.322 Doctor Aaron Flynn Evans.

NOTE Confidence: 0.8588221

00:01:52.322 --> 00:01:54.320 Dr Flynn Evans is a research

NOTE Confidence: 0.8588221

00:01:54.386 --> 00:01:56.441 psychologist at the NASA Ames

NOTE Confidence: 0.8588221

00:01:56.441 --> 00:01:58.085 Research Center in California.

NOTE Confidence: 0.8588221

00:01:58.090 --> 00:02:00.292 Where she is director of the

NOTE Confidence: 0.8588221

00:02:00.292 --> 00:02:01.393 Fatigue Countermeasures Laboratory.

NOTE Confidence: 0.8588221

00:02:01.400 --> 00:02:03.530 She received her PhD from the

NOTE Confidence: 0.8588221

00:02:03.530 --> 00:02:06.332 University of Siri in the UK an her

NOTE Confidence: 0.8588221

00:02:06.332 --> 00:02:08.294 Masters in Public Health from the

NOTE Confidence: 0.8588221

00:02:08.370 --> 00:02:10.600 Harvard School of Public Health.

NOTE Confidence: 0.8588221

00:02:10.600 --> 00:02:13.600 She was also certified as an RP Sgt

NOTE Confidence: 0.8588221

00:02:13.600 --> 00:02:16.768 from 2002 to 2012 and Prior to joining NASA.

NOTE Confidence: 0.8588221

00:02:16.768 --> 00:02:18.712 She was an instructor of medicine

NOTE Confidence: 0.8588221

00:02:18.712 --> 00:02:20.912 in the Division of Sleep Medicine

NOTE Confidence: 0.8588221

00:02:20.912 --> 00:02:22.772 at Brigham and Women's Hospital

NOTE Confidence: 0.8588221

00:02:22.772 --> 00:02:24.588 and Harvard Medical School.

NOTE Confidence: 0.8588221

00:02:24.590 --> 00:02:26.600 Doctor Flynn Evans has extensive

NOTE Confidence: 0.8588221

00:02:26.600 --> 00:02:28.208 research experience and examining

NOTE Confidence: 0.8588221

00:02:28.208 --> 00:02:29.819 the short and long term.

NOTE Confidence: 0.8588221

00:02:29.820 --> 00:02:32.706 Effects of sleep loss and circadian

NOTE Confidence: 0.8588221

00:02:32.710 --> 00:02:34.159 desynchrony in occupational

NOTE Confidence: 0.8588221

00:02:34.160 --> 00:02:36.084 settings including among astronauts,

NOTE Confidence: 0.8588221

00:02:36.084 --> 00:02:37.532 airline pilots, physicians,

NOTE Confidence: 0.8588221

00:02:37.532 --> 00:02:39.460 and other shift workers.

NOTE Confidence: 0.8588221

00:02:39.460 --> 00:02:42.352 She is involved in both laboratory

NOTE Confidence: 0.8588221

00:02:42.352 --> 00:02:44.280 and field based research.

NOTE Confidence: 0.8588221

00:02:44.280 --> 00:02:46.380 Her laboratory based research has

NOTE Confidence: 0.8588221

00:02:46.380 --> 00:02:49.109 focused on the effects of light

NOTE Confidence: 0.8588221

00:02:49.109 --> 00:02:51.329 on circadian neuroendocrine and

NOTE Confidence: 0.8588221

00:02:51.329 --> 00:02:53.549 neurobehavioural responses in humans

NOTE Confidence: 0.8588221

00:02:53.549 --> 00:02:56.911 and how these might relate to the

NOTE Confidence: 0.8588221

00:02:56.911 --> 00:02:58.276 development of countermeasures

NOTE Confidence: 0.8588221

00:02:58.276 --> 00:02:59.502 for shift work.

NOTE Confidence: 0.8588221

00:02:59.502 --> 00:03:01.788 Her field research has integrated these

NOTE Confidence: 0.8588221

00:03:01.788 --> 00:03:04.235 measures of fatigue and countermeasure

NOTE Confidence: 0.8588221

00:03:04.235 --> 00:03:06.391 of fatigue countermeasures into

NOTE Confidence: 0.8588221

00:03:06.391 --> 00:03:08.008 complex occupational settings.

NOTE Confidence: 0.8588221

00:03:08.010 --> 00:03:10.464 She's very active with the American

NOTE Confidence: 0.8588221

00:03:10.464 --> 00:03:12.593 Academy of Sleep Medicine and

NOTE Confidence: 0.8588221

00:03:12.593 --> 00:03:14.257 the Sleep Research Society.

NOTE Confidence: 0.8588221

00:03:14.260 --> 00:03:17.543 She's served as a member of their

NOTE Confidence: 0.8588221

00:03:17.543 --> 00:03:19.700 Public Safety Committee as well

NOTE Confidence: 0.8588221

00:03:19.700 --> 00:03:21.765 as on the shift work duration,

NOTE Confidence: 0.8588221

00:03:21.765 --> 00:03:22.621 consensus committee,

NOTE Confidence: 0.8588221

00:03:22.621 --> 00:03:25.267 and although we may not regularly

NOTE Confidence: 0.8588221

00:03:25.267 --> 00:03:26.590 encounter patients who

NOTE Confidence: 0.857955

00:03:26.660 --> 00:03:28.928 are pilots or astronauts in our

NOTE Confidence: 0.857955

00:03:28.928 --> 00:03:30.965 own practices, Doctor Flynn Evans.

NOTE Confidence: 0.857955

00:03:30.965 --> 00:03:32.665 Work on circadian disruption,

NOTE Confidence: 0.857955

00:03:32.670 --> 00:03:34.595 an fatigue mitigation in these

NOTE Confidence: 0.857955

00:03:34.595 --> 00:03:35.750 populations has important

NOTE Confidence: 0.857955

00:03:35.750 --> 00:03:37.498 application to our own patients,

NOTE Confidence: 0.857955

00:03:37.500 --> 00:03:39.679 so I'm really excited for her

NOTE Confidence: 0.857955

00:03:39.679 --> 00:03:41.653 talk and with that I'll turn

NOTE Confidence: 0.857955

00:03:41.653 --> 00:03:44.178 it over to Doctor Flynn Evans.

NOTE Confidence: 0.8415087

00:03:47.350 --> 00:03:49.538 Awesome, thank you. Thank you

NOTE Confidence: 0.8415087

00:03:49.538 --> 00:03:52.160 so much Lord for inviting me.

NOTE Confidence: 0.8415087

00:03:52.160 --> 00:03:54.911 I'm very excited to be here and

NOTE Confidence: 0.8415087

00:03:54.911 --> 00:03:57.399 thank you all for attending,

NOTE Confidence: 0.8415087

00:03:57.400 --> 00:03:59.292 especially after the inauguration.

NOTE Confidence: 0.8415087

00:03:59.292 --> 00:04:02.600 I didn't realize until after I picked

NOTE Confidence: 0.8415087

00:04:02.600 --> 00:04:04.958 the date when Lauren reminded me

NOTE Confidence: 0.8415087

00:04:04.958 --> 00:04:07.448 that today was an operation day.

NOTE Confidence: 0.8415087

00:04:07.450 --> 00:04:10.166 So again, thank you for taking the

NOTE Confidence: 0.8415087

00:04:10.166 --> 00:04:12.699 time after after the inauguration.

NOTE Confidence: 0.8415087

00:04:12.700 --> 00:04:15.759 To hear this talk. So to begin,

NOTE Confidence: 0.8415087

00:04:15.760 --> 00:04:19.584 I just like to give you a little.

NOTE Confidence: 0.8415087

00:04:19.590 --> 00:04:20.658 Primer on NASA,

NOTE Confidence: 0.8415087

00:04:20.658 --> 00:04:23.698 and I think you know you may have

NOTE Confidence: 0.8415087

00:04:23.698 --> 00:04:26.464 seen the advertisement for this talk

NOTE Confidence: 0.8415087

00:04:26.464 --> 00:04:29.176 and thought why someone from NASA

NOTE Confidence: 0.8415087

00:04:29.176 --> 00:04:32.067 coming to talk to us about sleep.

NOTE Confidence: 0.8415087

00:04:32.070 --> 00:04:33.374 But as you heard,

NOTE Confidence: 0.8415087

00:04:33.374 --> 00:04:35.988 I have a long background in Sleep

NOTE Confidence: 0.8415087

00:04:35.988 --> 00:04:38.308 Medicine and circadian Physiology.

NOTE Confidence: 0.8415087

00:04:38.310 --> 00:04:39.897 Also in Epidemiology,

NOTE Confidence: 0.8415087

00:04:39.897 --> 00:04:44.220 and I was recruited to come to NASA.

NOTE Confidence: 0.8415087

00:04:44.220 --> 00:04:46.428 Several years ago,

NOTE Confidence: 0.8415087

00:04:46.428 --> 00:04:50.108 after working on some grants.

NOTE Confidence: 0.8415087

00:04:50.110 --> 00:04:51.022 At Harvard,

NOTE Confidence: 0.8415087

00:04:51.022 --> 00:04:53.758 where we were studying sleep in

NOTE Confidence: 0.8415087

00:04:53.758 --> 00:04:57.171 space and NASA has a long history

NOTE Confidence: 0.8415087

00:04:57.171 --> 00:04:59.581 of doing fatigue risk management

NOTE Confidence: 0.8415087

00:04:59.670 --> 00:05:02.340 in aviation and in spaceflight,

NOTE Confidence: 0.8415087

00:05:02.340 --> 00:05:03.753 and Mark Rosekind,

NOTE Confidence: 0.8415087

00:05:03.753 --> 00:05:07.050 who some of you may know who

NOTE Confidence: 0.8415087

00:05:07.160 --> 00:05:09.670 was an NTSB board member.

NOTE Confidence: 0.8415087

00:05:09.670 --> 00:05:11.820 And then during the Obama

NOTE Confidence: 0.8415087

00:05:11.820 --> 00:05:13.540 administration was the National

NOTE Confidence: 0.8415087

00:05:13.540 --> 00:05:16.029 Highway Transportation Authority lead,

NOTE Confidence: 0.8415087

00:05:16.030 --> 00:05:18.620 which is a presidential appointment

NOTE Confidence: 0.8415087

00:05:18.620 --> 00:05:22.220 he founded the lab at NASA Ames.

NOTE Confidence: 0.8415087

00:05:22.220 --> 00:05:24.836 And really established the you know

NOTE Confidence: 0.8415087

00:05:24.836 --> 00:05:27.026 sort of fatigue, risk management,

NOTE Confidence: 0.8415087

00:05:27.026 --> 00:05:28.778 best practices for aviation.

NOTE Confidence: 0.8415087

00:05:28.780 --> 00:05:32.492 So after he left there were a few

NOTE Confidence: 0.8415087

00:05:32.492 --> 00:05:34.458 different iterations of the lab,

NOTE Confidence: 0.8415087

00:05:34.460 --> 00:05:38.428 but really it kind of went dormant for

NOTE Confidence: 0.8415087

00:05:38.428 --> 00:05:42.457 many years and after we were doing work.

NOTE Confidence: 0.8415087

00:05:42.460 --> 00:05:45.268 On Space Flight, when I was in Boston,

NOTE Confidence: 0.8415087

00:05:45.270 --> 00:05:46.323 there was interest.

NOTE Confidence: 0.8415087

00:05:46.323 --> 00:05:48.078 Renewed interest in asset to,

NOTE Confidence: 0.8415087

00:05:48.080 --> 00:05:50.180 you know, really redeveloped the lab.

NOTE Confidence: 0.8415087

00:05:50.180 --> 00:05:52.301 And so I was very honored and

NOTE Confidence: 0.8415087

00:05:52.301 --> 00:05:54.590 excited to be able to take over

NOTE Confidence: 0.8415087

00:05:54.590 --> 00:05:57.020 and then rebuild and forge a new

NOTE Confidence: 0.8415087

00:05:57.020 --> 00:05:59.065 path forward for what fatigue

NOTE Confidence: 0.8415087

00:05:59.065 --> 00:06:01.061 risk management means at NASA.

NOTE Confidence: 0.8415087

00:06:01.061 --> 00:06:04.220 So what we have here are 10 NASA centers,

NOTE Confidence: 0.8415087

00:06:04.220 --> 00:06:07.379 so you may not realize that there are 10.

NOTE Confidence: 0.8415087

00:06:07.380 --> 00:06:09.837 But you can see we have Houston,

NOTE Confidence: 0.8415087

00:06:09.840 --> 00:06:12.556 in which I'm sure you all know

NOTE Confidence: 0.8415087

00:06:12.556 --> 00:06:13.720 that in Kennedy.

NOTE Confidence: 0.8415087

00:06:13.720 --> 00:06:17.584 You have lunches, but we also have.

NOTE Confidence: 0.8415087

00:06:17.590 --> 00:06:19.615 Spaceflight focused centers with Mission

NOTE Confidence: 0.8415087

00:06:19.615 --> 00:06:22.110 Control and a rocket building center.

NOTE Confidence: 0.8415087

00:06:22.110 --> 00:06:24.580 Here we have NASA Langley, Goddard,

NOTE Confidence: 0.8415087

00:06:24.580 --> 00:06:27.040 NASA, Glenn, and then we have,

NOTE Confidence: 0.8415087

00:06:27.040 --> 00:06:29.506 of course JPL in Southern California,

NOTE Confidence: 0.8415087

00:06:29.510 --> 00:06:30.286 NASA, Armstrong,

NOTE Confidence: 0.8415087

00:06:30.286 --> 00:06:33.390 and then I'm right up here in the

NOTE Confidence: 0.8415087

00:06:33.469 --> 00:06:35.887 Bay Area at NASA Ames Research

NOTE Confidence: 0.8415087

00:06:35.887 --> 00:06:38.447 Center and our center acts must

NOTE Confidence: 0.8415087

00:06:38.447 --> 00:06:40.607 much like an academic campus.

NOTE Confidence: 0.8415087

00:06:40.610 --> 00:06:42.238 It's really entirely research.

NOTE Confidence: 0.8415087

00:06:42.238 --> 00:06:45.540 Research is in the name of our center,

NOTE Confidence: 0.8415087

00:06:45.540 --> 00:06:48.487 and we do a lot of the.

NOTE Confidence: 0.8415087

00:06:48.490 --> 00:06:49.898 The foundational support for

NOTE Confidence: 0.8415087

00:06:49.898 --> 00:06:51.658 all of the other centers.

NOTE Confidence: 0.8415087

00:06:51.660 --> 00:06:54.468 So we're doing research not just on humans,

NOTE Confidence: 0.8415087

00:06:54.470 --> 00:06:56.576 but there's a lot of molecular

NOTE Confidence: 0.8415087

00:06:56.576 --> 00:06:58.699 biology that happens at NASA Ames.

NOTE Confidence: 0.8415087

00:06:58.700 --> 00:07:00.765 And then there's also material

NOTE Confidence: 0.8415087

00:07:00.765 --> 00:07:02.830 scientists who were doing things

NOTE Confidence: 0.8415087

00:07:02.902 --> 00:07:05.200 like testing the heat Shields that.

NOTE Confidence: 0.8415087

00:07:05.200 --> 00:07:07.486 Will help protect vehicles when they

NOTE Confidence: 0.8415087

00:07:07.486 --> 00:07:09.780 re enter the atmosphere from space.

NOTE Confidence: 0.8415087

00:07:09.780 --> 00:07:12.076 And here's a picture of our campus

NOTE Confidence: 0.8415087

00:07:12.076 --> 00:07:14.770 so I would say the biggest defining

NOTE Confidence: 0.8415087

00:07:14.770 --> 00:07:17.810 feature here is this giant wind tunnel.

NOTE Confidence: 0.8415087

00:07:17.810 --> 00:07:20.096 It's the world's largest wind tunnel,

NOTE Confidence: 0.8415087

00:07:20.100 --> 00:07:22.194 can fit a very large airplane

NOTE Confidence: 0.8415087

00:07:22.194 --> 00:07:24.621 inside it and my lab is right

NOTE Confidence: 0.8415087

00:07:24.621 --> 00:07:26.847 back here you can see the San

NOTE Confidence: 0.8457943

00:07:26.930 --> 00:07:30.171 Francisco Bay in the background and for

NOTE Confidence: 0.8457943

00:07:30.171 --> 00:07:33.020 reference we're about 6 miles from Stanford

NOTE Confidence: 0.8457943

00:07:33.020 --> 00:07:36.230 and so that I have become the adopted.

NOTE Confidence: 0.8457943

00:07:36.230 --> 00:07:38.080 Childhood Stanford since moving to

NOTE Confidence: 0.8457943

00:07:38.080 --> 00:07:40.566 California because I'm the only the sleep

NOTE Confidence: 0.8457943

00:07:40.566 --> 00:07:42.854 lab Sleep Research group at NASA Ames and

NOTE Confidence: 0.8457943

00:07:42.915 --> 00:07:45.043 so to get sort of my intellectual fix,

NOTE Confidence: 0.8457943

00:07:45.050 --> 00:07:47.178 I spend a lot of time over at

NOTE Confidence: 0.8457943

00:07:47.178 --> 00:07:48.862 Stanford attending their sleep grounds

NOTE Confidence: 0.8457943

00:07:48.862 --> 00:07:50.322 and participating in activities

NOTE Confidence: 0.8457943

00:07:50.322 --> 00:07:51.979 that they have going on.

NOTE Confidence: 0.8457943

00:07:51.980 --> 00:07:53.582 So it's very convenient to be

NOTE Confidence: 0.8457943

00:07:53.582 --> 00:07:55.450 in such a rich environment.

NOTE Confidence: 0.8457943

00:07:55.450 --> 00:07:56.642 And then of course,

NOTE Confidence: 0.8457943

00:07:56.642 --> 00:07:58.910 we're in the middle of Silicon Valley,

NOTE Confidence: 0.8457943

00:07:58.910 --> 00:08:01.934 so we have a lot of exciting

NOTE Confidence: 0.8457943

00:08:01.934 --> 00:08:03.230 tech happening too.

NOTE Confidence: 0.8457943

00:08:03.230 --> 00:08:04.903 In terms of what we do in

NOTE Confidence: 0.8457943

00:08:04.903 --> 00:08:06.440 my lab in particular,

NOTE Confidence: 0.8457943

00:08:06.440 --> 00:08:08.484 I mentioned that we do spaceflight work,

NOTE Confidence: 0.8457943

00:08:08.490 --> 00:08:09.950 which we'd expect for NASA,

NOTE Confidence: 0.8457943

00:08:09.950 --> 00:08:11.926 but the you know NASA is the National

NOTE Confidence: 0.8457943

00:08:11.926 --> 00:08:13.450 Aeronautics and Space Administration,

NOTE Confidence: 0.8457943

00:08:13.450 --> 00:08:16.078 and so you know the first day is aeronautics,

NOTE Confidence: 0.8457943

00:08:16.080 --> 00:08:19.290 so we do a lot of work in aviation as well.

NOTE Confidence: 0.8457943

00:08:19.290 --> 00:08:21.405 And in my lap we do about a third

NOTE Confidence: 0.8457943

00:08:21.405 --> 00:08:23.669 of our research work in aviation.

NOTE Confidence: 0.8457943

00:08:23.670 --> 00:08:26.204 And then we also have a sleep

NOTE Confidence: 0.8457943

00:08:26.204 --> 00:08:28.070 lab where we do more.

NOTE Confidence: 0.8457943

00:08:28.070 --> 00:08:31.398 Controlled experiments evaluating the

NOTE Confidence: 0.8457943

00:08:31.398 --> 00:08:34.726 effectiveness of different countermeasures.

NOTE Confidence: 0.8457943

00:08:34.730 --> 00:08:37.418 And I think that it's like a playground

NOTE Confidence: 0.8457943

00:08:37.418 --> 00:08:39.768 where we can test new solutions,

NOTE Confidence: 0.8457943

00:08:39.770 --> 00:08:41.912 new tech and then once we

NOTE Confidence: 0.8457943

00:08:41.912 --> 00:08:43.730 have embedded in the lab,

NOTE Confidence: 0.8457943

00:08:43.730 --> 00:08:45.823 we can take them back out into

NOTE Confidence: 0.8457943

00:08:45.823 --> 00:08:48.556 the field and see if they work to

NOTE Confidence: 0.8457943

00:08:48.556 --> 00:08:50.321 help mitigate fatigue or improve

NOTE Confidence: 0.8457943

00:08:50.397 --> 00:08:52.369 performance or improve sleep.

NOTE Confidence: 0.8457943

00:08:52.370 --> 00:08:55.558 Depending on the need.

NOTE Confidence: 0.8457943

00:08:55.560 --> 00:08:57.989 Today I'm going to take you through

NOTE Confidence: 0.8457943

00:08:57.989 --> 00:09:00.119 really just two of these areas,

NOTE Confidence: 0.8457943

00:09:00.120 --> 00:09:02.928 so I'll briefly touch on her laboratory work,

NOTE Confidence: 0.8457943

00:09:02.930 --> 00:09:05.144 but I think the really interesting

NOTE Confidence: 0.8457943

00:09:05.144 --> 00:09:07.848 stuff that we do is in the field,

NOTE Confidence: 0.8457943

00:09:07.850 --> 00:09:10.055 so I'm going to take you through

NOTE Confidence: 0.8457943

00:09:10.055 --> 00:09:12.168 a couple of studies that we've

NOTE Confidence: 0.8457943

00:09:12.168 --> 00:09:14.723 done in aviation to help you get

NOTE Confidence: 0.8457943

00:09:14.798 --> 00:09:17.662 a sense of how we are assessing by

NOTE Confidence: 0.8457943

00:09:17.662 --> 00:09:19.080 pilot alertness and performance,

NOTE Confidence: 0.8457943

00:09:19.080 --> 00:09:20.830 and sleep in the field.

NOTE Confidence: 0.8457943

00:09:20.830 --> 00:09:23.080 I'll take you through a countermeasure

NOTE Confidence: 0.8457943

00:09:23.080 --> 00:09:25.988 study that we did with airline pilots.

NOTE Confidence: 0.8457943

00:09:25.990 --> 00:09:28.454 And then we'll switch gears and talk

NOTE Confidence: 0.8457943

00:09:28.454 --> 00:09:30.969 about spaceflight and here talk about really.

NOTE Confidence: 0.8457943

00:09:30.970 --> 00:09:33.698 Specifically a study that we did that I

NOTE Confidence: 0.8457943

00:09:33.698 --> 00:09:36.492 started when I was in Boston at Harvard

NOTE Confidence: 0.8457943

00:09:36.492 --> 00:09:38.677 looking at sleep duration in space

NOTE Confidence: 0.8457943

00:09:38.677 --> 00:09:40.939 at as well as circadian misalignment.

NOTE Confidence: 0.8457943

00:09:40.940 --> 00:09:43.551 And then I'm just going to give

NOTE Confidence: 0.8457943

00:09:43.551 --> 00:09:46.793 you a little taste of some of the

NOTE Confidence: 0.8457943

00:09:46.793 --> 00:09:49.327 other types of studies that we

NOTE Confidence: 0.8457943

00:09:49.327 --> 00:09:51.799 do is really difficult to pick.

NOTE Confidence: 0.8457943

00:09:51.800 --> 00:09:53.760 What studies to focus on?

NOTE Confidence: 0.8457943

00:09:53.760 --> 00:09:56.896 Because I I find everything that we do

NOTE Confidence: 0.8457943

00:09:56.896 --> 00:10:00.104 interesting, and so if you have a party.

NOTE Confidence: 0.8457943

00:10:00.110 --> 00:10:01.500 Ocular interest in something that

NOTE Confidence: 0.8457943

00:10:01.500 --> 00:10:03.230 I'm not talking about in depth.

NOTE Confidence: 0.8457943

00:10:03.230 --> 00:10:05.510 Feel free to reach out and then happy.

NOTE Confidence: 0.8457943

00:10:05.510 --> 00:10:07.870 Happy, happy to discuss.

NOTE Confidence: 0.8457943

00:10:07.870 --> 00:10:08.654 So firstly,

NOTE Confidence: 0.8457943

00:10:08.654 --> 00:10:10.614 when I came to NASA,

NOTE Confidence: 0.8457943

00:10:10.620 --> 00:10:12.555 one of the biggest challenges

NOTE Confidence: 0.8457943

00:10:12.555 --> 00:10:15.737 that I faced was just how do you

NOTE Confidence: 0.8457943

00:10:15.737 --> 00:10:17.297 do field data collection.

NOTE Confidence: 0.8457943

00:10:17.300 --> 00:10:20.018 So when I was in Boston I was part

NOTE Confidence: 0.8457943

00:10:20.018 --> 00:10:22.581 of the Harvard work hours health

NOTE Confidence: 0.8457943

00:10:22.581 --> 00:10:25.682 and Safety Group and we did a

NOTE Confidence: 0.8457943

00:10:25.682 --> 00:10:27.807 lot of occupational work looking

NOTE Confidence: 0.8457943

00:10:27.807 --> 00:10:29.842 at work hours and different.

NOTE Confidence: 0.8457943

00:10:29.842 --> 00:10:31.722 You know in medicine looking

NOTE Confidence: 0.8457943

00:10:31.722 --> 00:10:32.850 at resident work

NOTE Confidence: 0.85205644

00:10:32.919 --> 00:10:34.989 hours in firefighters and police.

NOTE Confidence: 0.85205644

00:10:34.990 --> 00:10:37.870 So we I had some experience.

NOTE Confidence: 0.85205644

00:10:37.870 --> 00:10:39.462 Assessing alertness and performance

NOTE Confidence: 0.85205644

00:10:39.462 --> 00:10:41.452 and sleep in the field,

NOTE Confidence: 0.85205644

00:10:41.460 --> 00:10:43.896 but we we didn't really do in

NOTE Confidence: 0.85205644

00:10:43.896 --> 00:10:46.407 those studies we had like dedicated

NOTE Confidence: 0.85205644

00:10:46.407 --> 00:10:48.717 control centers in hospital where

NOTE Confidence: 0.85205644

00:10:48.717 --> 00:10:51.202 we could have residents come in

NOTE Confidence: 0.85205644

00:10:51.202 --> 00:10:53.830 and do tests and have more sort

NOTE Confidence: 0.85205644

00:10:53.830 --> 00:10:55.430 of laboratory based assessments.

NOTE Confidence: 0.85205644

00:10:55.430 --> 00:10:57.420 And when we're talking about

NOTE Confidence: 0.85205644

00:10:57.420 --> 00:10:59.012 airline pilots or astronauts,

NOTE Confidence: 0.85205644

00:10:59.020 --> 00:11:01.722 we don't really have the ability to

NOTE Confidence: 0.85205644

00:11:01.722 --> 00:11:04.599 engage with them on a day-to-day basis.

NOTE Confidence: 0.85205644

00:11:04.600 --> 00:11:07.084 Basically, we have to give them

NOTE Confidence: 0.85205644

00:11:07.084 --> 00:11:09.900 all the tools that they need to.

NOTE Confidence: 0.85205644

00:11:09.900 --> 00:11:11.036 Participate in a study,

NOTE Confidence: 0.85205644

00:11:11.036 --> 00:11:12.456 send them on their way,

NOTE Confidence: 0.85205644

00:11:12.460 --> 00:11:14.158 and then hope for the best.

NOTE Confidence: 0.85205644

00:11:14.160 --> 00:11:16.860 And so I wanted to make sure that the

NOTE Confidence: 0.85205644

00:11:16.860 --> 00:11:19.318 measures that we were using would really.

NOTE Confidence: 0.85205644

00:11:19.320 --> 00:11:21.720 Um, give us the type of the high

NOTE Confidence: 0.85205644

00:11:21.720 --> 00:11:23.833 quality data that we collected that

NOTE Confidence: 0.85205644

00:11:23.833 --> 00:11:25.993 we get from a laboratory study.

NOTE Confidence: 0.85205644

00:11:26.000 --> 00:11:28.076 And also you know what would

NOTE Confidence: 0.85205644

00:11:28.076 --> 00:11:30.010 be meaningful and easy to use.

NOTE Confidence: 0.85205644

00:11:30.010 --> 00:11:32.485 And so the first thing that I did was

NOTE Confidence: 0.85205644

00:11:32.485 --> 00:11:34.677 start to explore different options.

NOTE Confidence: 0.85205644

00:11:34.680 --> 00:11:36.899 So of course we know that self

NOTE Confidence: 0.85205644

00:11:36.899 --> 00:11:38.360 report measures are simple,

NOTE Confidence: 0.85205644

00:11:38.360 --> 00:11:40.928 but you know if you have somebody who's

NOTE Confidence: 0.85205644

00:11:40.928 --> 00:11:43.368 motivated to say that they're doing fine,

NOTE Confidence: 0.85205644

00:11:43.370 --> 00:11:44.702 particularly when we talk

NOTE Confidence: 0.85205644

00:11:44.702 --> 00:11:46.034 about our astronaut community,

NOTE Confidence: 0.85205644

00:11:46.040 --> 00:11:48.454 you know they may say, I'm alert,

NOTE Confidence: 0.85205644

00:11:48.454 --> 00:11:49.198 alert, alert.

NOTE Confidence: 0.85205644

00:11:49.198 --> 00:11:51.430 When you know that they're probably

NOTE Confidence: 0.85205644

00:11:51.501 --> 00:11:53.361 feeling the effects of sleepiness

NOTE Confidence: 0.85205644

00:11:53.361 --> 00:11:55.572 and then we have cognitive tests

NOTE Confidence: 0.85205644

00:11:55.572 --> 00:11:57.525 which I have the Pvt 192 here.

NOTE Confidence: 0.85205644

00:11:57.530 --> 00:11:59.945 I'm not sure how many of you

NOTE Confidence: 0.85205644

00:11:59.945 --> 00:12:01.590 are familiar with the PT.

NOTE Confidence: 0.85205644

00:12:01.590 --> 00:12:03.970 192, but this psycho motor vigilance task,

NOTE Confidence: 0.85205644

00:12:03.970 --> 00:12:06.434 so simple reaction time tests that you've

NOTE Confidence: 0.85205644

00:12:06.434 --> 00:12:08.710 probably read about in many many papers.

NOTE Confidence: 0.85205644

00:12:08.710 --> 00:12:10.750 Probably even use yourself for studies,

NOTE Confidence: 0.85205644

00:12:10.750 --> 00:12:12.899 but the original Pvt when I need

NOTE Confidence: 0.85205644

00:12:12.899 --> 00:12:14.829 to is something that we actually

NOTE Confidence: 0.85205644

00:12:14.829 --> 00:12:17.020 have in NASA Ames and it's giant

NOTE Confidence: 0.85205644

00:12:17.093 --> 00:12:19.398 response box that's really unwieldy.

NOTE Confidence: 0.85205644

00:12:19.400 --> 00:12:21.409 And you can use it and allow,

NOTE Confidence: 0.85205644

00:12:21.410 --> 00:12:24.354 but there's no way you're going to deploy

NOTE Confidence: 0.85205644

00:12:24.354 --> 00:12:27.438 this giant response box out into the field.

NOTE Confidence: 0.85205644

00:12:27.440 --> 00:12:27.705 Ann,

NOTE Confidence: 0.85205644

00:12:27.705 --> 00:12:30.562 and so you know that is sort of sort of

NOTE Confidence: 0.85205644

00:12:30.562 --> 00:12:33.369 challenging to think about how we might

NOTE Confidence: 0.85205644

00:12:33.369 --> 00:12:35.408 collect performance data in the field.

NOTE Confidence: 0.85205644

00:12:35.410 --> 00:12:37.402 And then there was a push

NOTE Confidence: 0.85205644

00:12:37.402 --> 00:12:38.730 for real world measures.

NOTE Confidence: 0.85205644

00:12:38.730 --> 00:12:41.047 So some people at NASA would say,

NOTE Confidence: 0.85205644

00:12:41.050 --> 00:12:41.361 well,

NOTE Confidence: 0.85205644

00:12:41.361 --> 00:12:43.227 why can't you just measure what's

NOTE Confidence: 0.85205644

00:12:43.227 --> 00:12:44.700 happening with the aircraft?

NOTE Confidence: 0.85205644

00:12:44.700 --> 00:12:45.588 But of course,

NOTE Confidence: 0.85205644

00:12:45.588 --> 00:12:47.364 we don't have valid studies showing

NOTE Confidence: 0.85205644

00:12:47.364 --> 00:12:48.875 that measuring changes in you

NOTE Confidence: 0.85205644

00:12:48.875 --> 00:12:51.074 know the way a pilot performs in

NOTE Confidence: 0.85205644

00:12:51.074 --> 00:12:52.666 controlling their aircraft would

NOTE Confidence: 0.85205644

00:12:52.666 --> 00:12:54.656 actually tell us something meaningful,

NOTE Confidence: 0.85205644

00:12:54.660 --> 00:12:56.760 and so we decided that what

NOTE Confidence: 0.85205644

00:12:56.760 --> 00:12:58.380 we really needed was a.

NOTE Confidence: 0.85205644

00:12:58.380 --> 00:13:00.285 A handheld device that would

NOTE Confidence: 0.85205644

00:13:00.285 --> 00:13:01.809 give us reliable information,

NOTE Confidence: 0.85205644

00:13:01.810 --> 00:13:05.620 and so we set out to develop the NASA Pvt.

NOTE Confidence: 0.85205644

00:13:05.620 --> 00:13:08.584 And while there were other PVT's

NOTE Confidence: 0.85205644

00:13:08.584 --> 00:13:11.450 available in the App Store at

NOTE Confidence: 0.85205644

00:13:11.450 --> 00:13:14.208 the time that I came to NASA.

NOTE Confidence: 0.85205644

00:13:14.210 --> 00:13:17.164 There were there are issues with lots

NOTE Confidence: 0.85205644

00:13:17.164 --> 00:13:20.635 of them and and most of the pieces

NOTE Confidence: 0.85205644

00:13:20.635 --> 00:13:23.634 that were available in the App Store

NOTE Confidence: 0.85205644

00:13:23.634 --> 00:13:26.810 were not built with the same sort of

NOTE Confidence: 0.85205644

00:13:26.810 --> 00:13:29.198 rigor and care that the laboratory

NOTE Confidence: 0.85205644

00:13:29.198 --> 00:13:31.430 versions of this test include.

NOTE Confidence: 0.85205644

00:13:31.430 --> 00:13:32.615 So for example,

NOTE Confidence: 0.85205644

00:13:32.615 --> 00:13:35.380 in a typical laboratory Pvt you want

NOTE Confidence: 0.79549015

00:13:35.460 --> 00:13:38.010 a participant to have the ability

NOTE Confidence: 0.79549015

00:13:38.010 --> 00:13:40.250 to respond with either thumb,

NOTE Confidence: 0.79549015

00:13:40.250 --> 00:13:42.038 because responding with the

NOTE Confidence: 0.79549015

00:13:42.038 --> 00:13:44.273 wrong thumb tells you something.

NOTE Confidence: 0.79549015

00:13:44.280 --> 00:13:46.326 Kind of important about their reactivity

NOTE Confidence: 0.79549015

00:13:46.326 --> 00:13:49.063 and many of the PTS would just have

NOTE Confidence: 0.79549015

00:13:49.063 --> 00:13:51.428 like a little simple like flashing light

NOTE Confidence: 0.79549015

00:13:51.428 --> 00:13:53.717 that would have appear on the screen.

NOTE Confidence: 0.79549015

00:13:53.720 --> 00:13:55.068 Similarly, the original Pvt.

NOTE Confidence: 0.79549015

00:13:55.068 --> 00:13:57.090 192 has numbers that scroll up,

NOTE Confidence: 0.79549015

00:13:57.090 --> 00:13:59.106 so that gives you some feedback.

NOTE Confidence: 0.79549015

00:13:59.110 --> 00:14:01.382 So as a person taking the Pvt you

NOTE Confidence: 0.79549015

00:14:01.382 --> 00:14:04.073 can see how your reaction time is

NOTE Confidence: 0.79549015

00:14:04.073 --> 00:14:06.118 changing with each response trial

NOTE Confidence: 0.79549015

00:14:06.195 --> 00:14:08.204 and over the course of a day.

NOTE Confidence: 0.79549015

00:14:08.210 --> 00:14:10.408 And so we felt that having that

NOTE Confidence: 0.79549015

00:14:10.408 --> 00:14:12.626 feedback was pretty important for the

NOTE Confidence: 0.79549015

00:14:12.626 --> 00:14:15.050 participant population that we work with.

NOTE Confidence: 0.79549015

00:14:15.050 --> 00:14:17.227 Because in addition to helping them to

NOTE Confidence: 0.79549015

00:14:17.227 --> 00:14:19.877 just sort of see how they're performing,

NOTE Confidence: 0.79549015

00:14:19.880 --> 00:14:22.106 we wanted them to stay motivated and

NOTE Confidence: 0.79549015

00:14:22.106 --> 00:14:24.230 so often having this feedback helps

NOTE Confidence: 0.79549015

00:14:24.230 --> 00:14:26.432 with motivation to take the tests,

NOTE Confidence: 0.79549015

00:14:26.440 --> 00:14:29.200 and so we we built this touchscreen Pvt.

NOTE Confidence: 0.79549015

00:14:29.200 --> 00:14:31.909 I have a developer or in my lab who

NOTE Confidence: 0.79549015

00:14:31.909 --> 00:14:34.652 told me it would take three days and

NOTE Confidence: 0.79549015

00:14:34.652 --> 00:14:37.477 it took about three years to develop,

NOTE Confidence: 0.79549015

00:14:37.480 --> 00:14:39.200 so is no small task.

NOTE Confidence: 0.79549015

00:14:39.200 --> 00:14:41.937 There are all kinds of issues with

NOTE Confidence: 0.79549015

00:14:41.937 --> 00:14:44.175 touchscreen devices from the way you

NOTE Confidence: 0.79549015

00:14:44.175 --> 00:14:46.492 hold the device to the system latency.

NOTE Confidence: 0.79549015

00:14:46.500 --> 00:14:47.148 That is,

NOTE Confidence: 0.79549015

00:14:47.148 --> 00:14:48.768 changing the response time from

NOTE Confidence: 0.79549015

00:14:48.768 --> 00:14:51.022 the time you hit the screen to

NOTE Confidence: 0.79549015

00:14:51.022 --> 00:14:52.852 the time it requires a response.

NOTE Confidence: 0.79549015

00:14:52.860 --> 00:14:55.407 So it took a lot more work than we

NOTE Confidence: 0.79549015

00:14:55.407 --> 00:14:57.947 ever thought it would need to take,

NOTE Confidence: 0.79549015

00:14:57.950 --> 00:15:00.398 but we were very happy with this final

NOTE Confidence: 0.79549015

00:15:00.398 --> 00:15:02.844 product and we tested it in the lab

NOTE Confidence: 0.79549015

00:15:02.844 --> 00:15:04.433 using a constant routine protocol

NOTE Confidence: 0.79549015

00:15:04.433 --> 00:15:06.848 and compared it to the original Pvt.

NOTE Confidence: 0.79549015

00:15:06.850 --> 00:15:09.290 182 and I won't go through this in

NOTE Confidence: 0.79549015

00:15:09.290 --> 00:15:11.561 detail because this is again not the

NOTE Confidence: 0.79549015

00:15:11.561 --> 00:15:13.530 interesting really part of my talk.

NOTE Confidence: 0.79549015

00:15:13.530 --> 00:15:15.922 But what we found is that you do

NOTE Confidence: 0.79549015

00:15:15.922 --> 00:15:18.296 respond a bit faster with the Pvt.

NOTE Confidence: 0.79549015

00:15:18.300 --> 00:15:19.326 192 because you're.

NOTE Confidence: 0.79549015

00:15:19.326 --> 00:15:21.720 Tom is right on the response button.

NOTE Confidence: 0.79549015

00:15:21.720 --> 00:15:23.736 You can respond with bit faster,

NOTE Confidence: 0.79549015

00:15:23.740 --> 00:15:25.430 but the touchscreen device where

NOTE Confidence: 0.79549015

00:15:25.430 --> 00:15:27.518 you hover your thumb is pretty

NOTE Confidence: 0.79549015

00:15:27.518 --> 00:15:29.486 close and has a nice alignment,

NOTE Confidence: 0.79549015

00:15:29.490 --> 00:15:32.186 and so we were very happy with the.

NOTE Confidence: 0.79549015

00:15:32.190 --> 00:15:34.146 These are just all different metrics

NOTE Confidence: 0.79549015

00:15:34.146 --> 00:15:36.550 from the PBT and they all look

NOTE Confidence: 0.79549015

00:15:36.550 --> 00:15:38.280 pretty similar between the Pvt.

NOTE Confidence: 0.79549015

00:15:38.280 --> 00:15:39.970 182 and the NASA PBT.

NOTE Confidence: 0.79549015

00:15:39.970 --> 00:15:41.998 So we felt good about taking

NOTE Confidence: 0.79549015

00:15:41.998 --> 00:15:43.350 this into the field.

NOTE Confidence: 0.79549015

00:15:43.350 --> 00:15:46.694 And so we built a nap around it.

NOTE Confidence: 0.79549015

00:15:46.700 --> 00:15:47.972 And so again,

NOTE Confidence: 0.79549015

00:15:47.972 --> 00:15:50.516 kind of going back to those

NOTE Confidence: 0.79549015

00:15:50.516 --> 00:15:52.630 fundamental questions that I was

NOTE Confidence: 0.79549015

00:15:52.630 --> 00:15:55.759 looking to answer when I came to NASA.

NOTE Confidence: 0.79549015

00:15:55.760 --> 00:15:59.063 I wanted to have a tool that would make

NOTE Confidence: 0.79549015

00:15:59.063 --> 00:16:01.422 data collection easy for participants

NOTE Confidence: 0.79549015

00:16:01.422 --> 00:16:05.487 and so we built this app so that it

NOTE Confidence: 0.79549015

00:16:05.487 --> 00:16:08.112 would have logic to take our study

NOTE Confidence: 0.79549015

00:16:08.120 --> 00:16:09.776 participants through each activity

NOTE Confidence: 0.79549015

00:16:09.776 --> 00:16:12.660 in the protocol at the right time.

NOTE Confidence: 0.79549015

00:16:12.660 --> 00:16:14.985 So it prompts PVT's when

NOTE Confidence: 0.79549015

00:16:14.985 --> 00:16:17.310 they're supposed to take BTS.

NOTE Confidence: 0.79549015

00:16:17.310 --> 00:16:18.738 Subjective scales when they're

NOTE Confidence: 0.79549015

00:16:18.738 --> 00:16:20.166 supposed to take those.

NOTE Confidence: 0.79549015

00:16:20.170 --> 00:16:22.234 It includes a sleep diary that

NOTE Confidence: 0.79549015

00:16:22.234 --> 00:16:24.470 prompts before bad in the morning,

NOTE Confidence: 0.79549015

00:16:24.470 --> 00:16:26.969 and it has a bunch of baseline

NOTE Confidence: 0.79549015

00:16:26.969 --> 00:16:28.050 questionnaires, workload, ratings,

NOTE Confidence: 0.79549015

00:16:28.050 --> 00:16:28.770 and other.

NOTE Confidence: 0.80979025

00:16:30.920 --> 00:16:32.232 Information relevant to the

NOTE Confidence: 0.80979025

00:16:32.232 --> 00:16:34.533 things that we do and I'm pleased

NOTE Confidence: 0.80979025

00:16:34.533 --> 00:16:36.677 to say that if you need a tool,

NOTE Confidence: 0.80979025

00:16:36.680 --> 00:16:39.096 this is now free in the App Store,

NOTE Confidence: 0.80979025

00:16:39.100 --> 00:16:40.990 and so there's a basic version

NOTE Confidence: 0.80979025

00:16:40.990 --> 00:16:43.039 with just sleep diary in three PT.

NOTE Confidence: 0.80979025

00:16:43.040 --> 00:16:45.296 Today there's a simple PPT and then if

NOTE Confidence: 0.80979025

00:16:45.296 --> 00:16:47.590 you happen to be doing aviation studies,

NOTE Confidence: 0.80979025

00:16:47.590 --> 00:16:49.396 there's also a version for aviation,

NOTE Confidence: 0.80979025

00:16:49.400 --> 00:16:51.514 so feel free to check that out.

NOTE Confidence: 0.80979025

00:16:51.520 --> 00:16:53.040 So armed with this app,

NOTE Confidence: 0.80979025

00:16:53.040 --> 00:16:55.530 we embarked on our first study.

NOTE Confidence: 0.80979025

00:16:55.530 --> 00:16:57.430 And so the first research

NOTE Confidence: 0.80979025

00:16:57.430 --> 00:17:00.090 question that we had is, you know,

NOTE Confidence: 0.80979025

00:17:00.090 --> 00:17:02.750 let's going on the short haul aviation.

NOTE Confidence: 0.80979025

00:17:02.750 --> 00:17:04.784 We have many airline partners at

NOTE Confidence: 0.80979025

00:17:04.784 --> 00:17:07.543 NASA and there's been a lot of study

NOTE Confidence: 0.80979025

00:17:07.543 --> 00:17:08.875 dedicated to longhaul aviation

NOTE Confidence: 0.80979025

00:17:08.875 --> 00:17:10.615 jet lag circadian misalignment

NOTE Confidence: 0.80979025

00:17:10.615 --> 00:17:12.627 when crossing time zones.

NOTE Confidence: 0.80979025

00:17:12.630 --> 00:17:14.880 We have a pretty good understanding

NOTE Confidence: 0.80979025

00:17:14.880 --> 00:17:17.190 of what happens when pilots are,

NOTE Confidence: 0.80979025

00:17:17.190 --> 00:17:18.064 you know,

NOTE Confidence: 0.80979025

00:17:18.064 --> 00:17:20.686 traveling for long distances and we

NOTE Confidence: 0.80979025

00:17:20.686 --> 00:17:23.322 have pretty good rules in place for

NOTE Confidence: 0.80979025

00:17:23.322 --> 00:17:26.387 what they need to do in order to stay.

NOTE Confidence: 0.80979025

00:17:26.390 --> 00:17:28.758 Alert and get the rest that they need,

NOTE Confidence: 0.80979025

00:17:28.760 --> 00:17:31.128 but there are very few short all studies.

NOTE Confidence: 0.80979025

00:17:31.130 --> 00:17:32.310 In short haul flights.

NOTE Confidence: 0.80979025

00:17:32.310 --> 00:17:34.084 You know, while many of them

NOTE Confidence: 0.80979025

00:17:34.084 --> 00:17:35.268 are considered daytime flights,

NOTE Confidence: 0.80979025

00:17:35.270 --> 00:17:37.112 you know we've probably all been

NOTE Confidence: 0.80979025

00:17:37.112 --> 00:17:39.410 on a flight that left at 5:00 AM.

NOTE Confidence: 0.80979025

00:17:39.410 --> 00:17:39.706 Well,

NOTE Confidence: 0.80979025

00:17:39.706 --> 00:17:41.778 if your flight left at 5:00 AM,

NOTE Confidence: 0.80979025

00:17:41.780 --> 00:17:43.831 your pilot probably had to get up

NOTE Confidence: 0.80979025

00:17:43.831 --> 00:17:46.251 at two or three in the morning in

NOTE Confidence: 0.80979025

00:17:46.251 --> 00:17:48.935 order to be fit for duty and be at

NOTE Confidence: 0.80979025

00:17:48.935 --> 00:17:50.956 the airport and be ready to fly.

NOTE Confidence: 0.80979025

00:17:50.956 --> 00:17:52.140 And so you know,

NOTE Confidence: 0.80979025

00:17:52.140 --> 00:17:54.275 I think in the sleep community we

NOTE Confidence: 0.80979025

00:17:54.275 --> 00:17:56.790 wouldn't say you know that's not really a.

NOTE Confidence: 0.80979025

00:17:56.790 --> 00:17:58.710 You know a daytime shift that's

NOTE Confidence: 0.80979025

00:17:58.710 --> 00:18:00.430 really a night time shift,

NOTE Confidence: 0.80979025

00:18:00.430 --> 00:18:02.782 and so we wanted to explore what

NOTE Confidence: 0.80979025

00:18:02.782 --> 00:18:04.802 happens when pilots have to work

NOTE Confidence: 0.80979025

00:18:04.802 --> 00:18:06.391 early in the morning, finish,

NOTE Confidence: 0.80979025

00:18:06.391 --> 00:18:07.053 work late,

NOTE Confidence: 0.80979025

00:18:07.053 --> 00:18:09.370 or work under conditions of high workload.

NOTE Confidence: 0.80979025

00:18:09.370 --> 00:18:11.350 So we worked with an airline,

NOTE Confidence: 0.80979025

00:18:11.350 --> 00:18:13.667 a single airline to develop this protocol,

NOTE Confidence: 0.80979025

00:18:13.670 --> 00:18:15.614 and I'll just draw your attention

NOTE Confidence: 0.80979025

00:18:15.614 --> 00:18:17.640 to this plot on the right,

NOTE Confidence: 0.80979025

00:18:17.640 --> 00:18:19.320 which shows the protocol.

NOTE Confidence: 0.80979025

00:18:19.320 --> 00:18:21.840 So each row represents a day.

NOTE Confidence: 0.80979025

00:18:21.840 --> 00:18:25.158 And so this protocol is 34 days.

NOTE Confidence: 0.80979025

00:18:25.160 --> 00:18:27.897 It's plotted as I bought a 30

NOTE Confidence: 0.80979025

00:18:27.897 --> 00:18:30.130 hour period across the conceit.

NOTE Confidence: 0.80979025

00:18:30.130 --> 00:18:32.794 I'm on the bottom and what we have

NOTE Confidence: 0.80979025

00:18:32.794 --> 00:18:35.917 here is like rare sleep opportunities.

NOTE Confidence: 0.80979025

00:18:35.920 --> 00:18:37.063 This is midnight,

NOTE Confidence: 0.80979025

00:18:37.063 --> 00:18:40.230 so you can see this pilot can sleep

NOTE Confidence: 0.80979025

00:18:40.230 --> 00:18:43.128 around 11 to maybe around 7:00 in

NOTE Confidence: 0.80979025

00:18:43.128 --> 00:18:45.758 the morning and then these darker

NOTE Confidence: 0.80979025

00:18:45.758 --> 00:18:48.758 Gray regions are flights and So what

NOTE Confidence: 0.80979025

00:18:48.758 --> 00:18:52.102 you can see here is we varied their

NOTE Confidence: 0.80979025

00:18:52.102 --> 00:18:55.165 schedule from a baseline block of five.

NOTE Confidence: 0.80979025

00:18:55.170 --> 00:18:57.954 Chefs where they were flying kind of in

NOTE Confidence: 0.80979025

00:18:57.954 --> 00:19:01.119 the late morning to mid to late afternoon.

NOTE Confidence: 0.80979025

00:19:01.120 --> 00:19:01.958 Very easy.

NOTE Confidence: 0.80979025

00:19:01.958 --> 00:19:04.053 Typical schedule for daytime worker

NOTE Confidence: 0.80979025

00:19:04.053 --> 00:19:06.633 and that was our baseline and then

NOTE Confidence: 0.80979025

00:19:06.633 --> 00:19:09.322 we had gave them a few days off

NOTE Confidence: 0.80979025

00:19:09.322 --> 00:19:11.905 and shifted them to an early start

NOTE Confidence: 0.80979025

00:19:11.905 --> 00:19:14.260 schedule where they had five days

NOTE Confidence: 0.80979025

00:19:14.260 --> 00:19:16.727 where they started work at between

NOTE Confidence: 0.80979025

00:19:16.727 --> 00:19:19.187 4:45 and 6:00 in the morning.

NOTE Confidence: 0.80979025

00:19:19.190 --> 00:19:21.526 And then they had a few days off

NOTE Confidence: 0.80979025

00:19:21.526 --> 00:19:24.010 and shifted to a middle of the day

NOTE Confidence: 0.80979025

00:19:24.010 --> 00:19:26.299 schedule where they had longer flights,

NOTE Confidence: 0.80979025

00:19:26.300 --> 00:19:27.588 more ups and downs.

NOTE Confidence: 0.80979025

00:19:27.588 --> 00:19:29.198 They had few days off,

NOTE Confidence: 0.85460716

00:19:29.200 --> 00:19:31.528 then we shifted them to a late schedule

NOTE Confidence: 0.85460716

00:19:31.528 --> 00:19:33.305 where they finished you typically

NOTE Confidence: 0.85460716

00:19:33.305 --> 00:19:35.195 after midnight and we collected

NOTE Confidence: 0.85460716

00:19:35.195 --> 00:19:37.238 the psycho motor vigilance task.

NOTE Confidence: 0.85460716

00:19:37.240 --> 00:19:39.484 At each of the times shown

NOTE Confidence: 0.85460716

00:19:39.484 --> 00:19:40.980 on with these icons.

NOTE Confidence: 0.85460716

00:19:40.980 --> 00:19:43.444 So when they woke up on each

NOTE Confidence: 0.85460716

00:19:43.444 --> 00:19:45.470 flight and then before bed.

NOTE Confidence: 0.85460716

00:19:45.470 --> 00:19:47.997 And then we also collected data on

NOTE Confidence: 0.85460716

00:19:47.997 --> 00:19:50.723 days off and in addition to that

NOTE Confidence: 0.85460716

00:19:50.723 --> 00:19:53.069 we had them do urine collection

NOTE Confidence: 0.85460716

00:19:53.155 --> 00:19:55.979 at the end of each blocks that we

NOTE Confidence: 0.85460716

00:19:55.979 --> 00:19:57.854 could assess circadian phase and

NOTE Confidence: 0.85460716

00:19:57.854 --> 00:20:00.182 we had them collect a variety.

NOTE Confidence: 0.85460716

00:20:00.190 --> 00:20:01.770 Other measures that I won't

NOTE Confidence: 0.85460716

00:20:01.770 --> 00:20:03.350 talk about here and then.

NOTE Confidence: 0.85460716

00:20:03.350 --> 00:20:05.534 The last pieces we had them where

NOTE Confidence: 0.85460716

00:20:05.534 --> 00:20:08.029 at an act watch the entire time

NOTE Confidence: 0.85460716

00:20:08.029 --> 00:20:10.730 so that we could assess sleep in

NOTE Confidence: 0.85460716

00:20:10.730 --> 00:20:12.730 addition to their sleep diary.

NOTE Confidence: 0.85460716

00:20:12.730 --> 00:20:16.540 And overall, the.

NOTE Confidence: 0.85460716

00:20:16.540 --> 00:20:18.790 Pilots, were, you know, relatively young,

NOTE Confidence: 0.85460716

00:20:18.790 --> 00:20:19.759 relatively healthy overall,

NOTE Confidence: 0.85460716

00:20:19.759 --> 00:20:22.507 so we didn't see a lot of indications

NOTE Confidence: 0.85460716

00:20:22.507 --> 00:20:24.637 that there were sleep disorders

NOTE Confidence: 0.85460716

00:20:24.637 --> 00:20:25.915 in this population.

NOTE Confidence: 0.85460716

00:20:25.920 --> 00:20:28.920 I'm showing that I make you score here,

NOTE Confidence: 0.85460716

00:20:28.920 --> 00:20:31.538 they're pretty much squarely in the middle,

NOTE Confidence: 0.85460716

00:20:31.540 --> 00:20:34.165 not know extremes in morning this evening.

NOTE Confidence: 0.85460716

00:20:34.170 --> 00:20:36.420 This which I found very interesting.

NOTE Confidence: 0.85460716

00:20:36.420 --> 00:20:39.596 And then I'm not showing some of the

NOTE Confidence: 0.85460716

00:20:39.596 --> 00:20:41.289 others questionnaires that we use,

NOTE Confidence: 0.85460716

00:20:41.290 --> 00:20:43.690 but the PSQI for example showed

NOTE Confidence: 0.85460716

00:20:43.690 --> 00:20:46.337 that there wasn't a big cause

NOTE Confidence: 0.85460716

00:20:46.337 --> 00:20:48.747 for concern with sleep disorders.

NOTE Confidence: 0.85460716

00:20:48.750 --> 00:20:50.878 When we look at their sleep outcomes

NOTE Confidence: 0.85460716

00:20:50.878 --> 00:20:53.378 over the four different schedule types,

NOTE Confidence: 0.85460716

00:20:53.380 --> 00:20:55.516 we found that they got less

NOTE Confidence: 0.85460716

00:20:55.516 --> 00:20:56.940 sleep during early starts.

NOTE Confidence: 0.85460716

00:20:56.940 --> 00:20:58.720 As you can see here.

NOTE Confidence: 0.85460716

00:20:58.720 --> 00:21:00.764 So at baseline they got around 7

NOTE Confidence: 0.85460716

00:21:00.764 --> 00:21:03.052 hours a night and again we designed

NOTE Confidence: 0.85460716

00:21:03.052 --> 00:21:05.068 the schedule so that they would

NOTE Confidence: 0.85460716

00:21:05.141 --> 00:21:06.841 maximize their sleep opportunity

NOTE Confidence: 0.85460716

00:21:06.841 --> 00:21:09.391 and that remained for their midday

NOTE Confidence: 0.85460716

00:21:09.400 --> 00:21:10.896 in their late schedules.

NOTE Confidence: 0.85460716

00:21:10.896 --> 00:21:13.140 But for their early starts they

NOTE Confidence: 0.85460716

00:21:13.216 --> 00:21:15.088 last about an hour of sleep,

NOTE Confidence: 0.85460716

00:21:15.090 --> 00:21:19.130 and as you can see over here in the plot.

NOTE Confidence: 0.85460716

00:21:19.130 --> 00:21:21.116 By each day on that schedule

NOTE Confidence: 0.85460716

00:21:21.116 --> 00:21:23.020 they they didn't really recover,

NOTE Confidence: 0.85460716

00:21:23.020 --> 00:21:25.000 so their sleep dropped dramatically

NOTE Confidence: 0.85460716

00:21:25.000 --> 00:21:26.980 after the first early morning

NOTE Confidence: 0.85460716

00:21:27.045 --> 00:21:28.869 shift and stayed low across the

NOTE Confidence: 0.85460716

00:21:28.869 --> 00:21:30.460 course of the five days.

NOTE Confidence: 0.85460716

00:21:30.460 --> 00:21:33.700 So this was a concern for us that these

NOTE Confidence: 0.85460716

00:21:33.700 --> 00:21:36.593 early starts were affording them less

NOTE Confidence: 0.85460716

00:21:36.593 --> 00:21:40.238 sleep than they really needed to be able to.

NOTE Confidence: 0.85460716

00:21:40.240 --> 00:21:42.361 Function during the day and then when

NOTE Confidence: 0.85460716

00:21:42.361 --> 00:21:44.499 we looked at performance we found

NOTE Confidence: 0.85460716

00:21:44.499 --> 00:21:46.827 that in fact their performance was

NOTE Confidence: 0.85460716

00:21:46.827 --> 00:21:49.040 affected by this short sleep duration.

NOTE Confidence: 0.85460716

00:21:49.040 --> 00:21:51.520 So what we have here is if you

NOTE Confidence: 0.85460716

00:21:51.520 --> 00:21:53.618 look just across the bottom,

NOTE Confidence: 0.85460716

00:21:53.620 --> 00:21:56.077 SIS is reaction time on the Pvt.

NOTE Confidence: 0.85460716

00:21:56.080 --> 00:21:58.537 So up is bad is a slower reaction time

NOTE Confidence: 0.85460716

00:21:58.537 --> 00:22:00.998 and lapses are response times that

NOTE Confidence: 0.85460716

00:22:00.998 --> 00:22:03.113 are greater than 500 milliseconds.

NOTE Confidence: 0.85460716

00:22:03.120 --> 00:22:06.048 And what we found is that on our

NOTE Confidence: 0.85460716

00:22:06.048 --> 00:22:07.826 baseline schedule it did exactly

NOTE Confidence: 0.85460716

00:22:07.826 --> 00:22:10.080 what we wanted it to for each

NOTE Confidence: 0.85460716

00:22:10.160 --> 00:22:11.700 day on that schedule.

NOTE Confidence: 0.85460716

00:22:11.700 --> 00:22:13.475 They maintained a pretty stable

NOTE Confidence: 0.85460716

00:22:13.475 --> 00:22:14.895 performance which was great.

NOTE Confidence: 0.85460716

00:22:14.900 --> 00:22:17.378 We were very happy to see that,

NOTE Confidence: 0.85460716

00:22:17.380 --> 00:22:19.865 but on each of the other schedules

NOTE Confidence: 0.85460716

00:22:19.865 --> 00:22:20.930 their performance declined,

NOTE Confidence: 0.85460716

00:22:20.930 --> 00:22:23.770 so it didn't matter whether it was early,

NOTE Confidence: 0.85460716

00:22:23.770 --> 00:22:26.610 starts, midday, or late finishes on the head.

NOTE Confidence: 0.85460716

00:22:26.610 --> 00:22:28.475 Poor performance with each day

NOTE Confidence: 0.85460716

00:22:28.475 --> 00:22:30.869 accumulating and getting worse by the day,

NOTE Confidence: 0.85460716

00:22:30.870 --> 00:22:31.582 so again,

NOTE Confidence: 0.85460716

00:22:31.582 --> 00:22:32.650 this is concerning,

NOTE Confidence: 0.85460716

00:22:32.650 --> 00:22:34.486 and it suggests to us that

NOTE Confidence: 0.85460716

00:22:34.486 --> 00:22:35.710 there is a chronic

NOTE Confidence: 0.8639736

00:22:35.782 --> 00:22:37.382 sleep debt accumulating over

NOTE Confidence: 0.8639736

00:22:37.382 --> 00:22:39.382 the course of this time,

NOTE Confidence: 0.8639736

00:22:39.390 --> 00:22:41.520 and perhaps also some circadian influence,

NOTE Confidence: 0.8639736

00:22:41.520 --> 00:22:43.866 particularly for the late finishes well.

NOTE Confidence: 0.8639736

00:22:43.870 --> 00:22:46.060 They were required to stay up

NOTE Confidence: 0.8639736

00:22:46.060 --> 00:22:48.500 and fly until after midnight and

NOTE Confidence: 0.8639736

00:22:48.500 --> 00:22:50.740 we looked at circadian phase.

NOTE Confidence: 0.8639736

00:22:50.740 --> 00:22:53.164 We found that at baseline there

NOTE Confidence: 0.8639736

00:22:53.164 --> 00:22:55.247 means circadian phase was right

NOTE Confidence: 0.8639736

00:22:55.247 --> 00:22:57.197 around 4:00 in the morning,

NOTE Confidence: 0.8639736

00:22:57.200 --> 00:23:00.028 where we would expect it to be,

NOTE Confidence: 0.8639736

00:23:00.030 --> 00:23:02.669 and we found that they did shift

NOTE Confidence: 0.8639736

00:23:02.669 --> 00:23:05.280 some prior to the early starts.

NOTE Confidence: 0.8639736

00:23:05.280 --> 00:23:07.596 Couple of hours early shifted later

NOTE Confidence: 0.8639736

00:23:07.596 --> 00:23:09.730 again during the midday flights,

NOTE Confidence: 0.8639736

00:23:09.730 --> 00:23:12.148 and then later again following the

NOTE Confidence: 0.8639736

00:23:12.148 --> 00:23:15.060 late finishes. So we did see some.

NOTE Confidence: 0.8639736

00:23:15.060 --> 00:23:16.590 A circadian adjustment,

NOTE Confidence: 0.8639736

00:23:16.590 --> 00:23:19.140 probably related to their nap.

NOTE Confidence: 0.8639736

00:23:19.140 --> 00:23:21.516 Trouble a pattern of light exposure,

NOTE Confidence: 0.8639736

00:23:21.520 --> 00:23:24.180 but this didn't seem to help in

NOTE Confidence: 0.8639736

00:23:24.180 --> 00:23:25.956 increasing their sleep duration

NOTE Confidence: 0.8639736

00:23:25.956 --> 00:23:28.208 or improving their performance.

NOTE Confidence: 0.8639736

00:23:28.210 --> 00:23:29.838 And when we look.

NOTE Confidence: 0.8639736

00:23:29.838 --> 00:23:31.466 At this in total,

NOTE Confidence: 0.8639736

00:23:31.470 --> 00:23:33.450 our big concern or big flag

NOTE Confidence: 0.8639736

00:23:33.450 --> 00:23:34.770 was in early start.

NOTE Confidence: 0.8639736

00:23:34.770 --> 00:23:36.856 So well late finishes and the midday

NOTE Confidence: 0.8639736

00:23:36.856 --> 00:23:38.541 high workload flights resulted in

NOTE Confidence: 0.8639736

00:23:38.541 --> 00:23:40.376 poor performance relative to baseline,

NOTE Confidence: 0.8639736

00:23:40.380 --> 00:23:42.445 but it really starts resulted in both

NOTE Confidence: 0.8639736

00:23:42.445 --> 00:23:44.340 short sleep and poor performance,

NOTE Confidence: 0.8639736

00:23:44.340 --> 00:23:45.796 and this isn't particularly

NOTE Confidence: 0.8639736

00:23:45.796 --> 00:23:47.980 surprising because we all know that

NOTE Confidence: 0.8639736

00:23:48.045 --> 00:23:50.355 when you try to sleep during weight

NOTE Confidence: 0.8639736

00:23:50.355 --> 00:23:52.252 maintenance down when you try to

NOTE Confidence: 0.8639736

00:23:52.252 --> 00:23:54.233 sleep a few hours earlier than normal,

NOTE Confidence: 0.8639736

00:23:54.240 --> 00:23:55.890 even if you have to,

NOTE Confidence: 0.8639736

00:23:55.890 --> 00:23:58.527 you know you have to get up early to

NOTE Confidence: 0.8639736

00:23:58.527 --> 00:24:00.940 take a flight yourself, for example.

NOTE Confidence: 0.8639736

00:24:00.940 --> 00:24:03.220 It's very hard to get adequate

NOTE Confidence: 0.8639736

00:24:03.220 --> 00:24:05.363 sleep because your body is just

NOTE Confidence: 0.8639736

00:24:05.363 --> 00:24:07.695 not aligned to have sleep start at

NOTE Confidence: 0.8639736

00:24:07.695 --> 00:24:09.795 that time and so we decided that.

NOTE Confidence: 0.8639736

00:24:09.800 --> 00:24:10.119 Well,

NOTE Confidence: 0.8639736

00:24:10.119 --> 00:24:11.714 actually we didn't decide when

NOTE Confidence: 0.8639736

00:24:11.714 --> 00:24:13.789 we took this to the airline.

NOTE Confidence: 0.8639736

00:24:13.790 --> 00:24:15.788 They said, OK, well, that's terrible.

NOTE Confidence: 0.8639736

00:24:15.790 --> 00:24:18.454 What are you going to do about it?

NOTE Confidence: 0.8639736

00:24:18.460 --> 00:24:20.651 And this was a little bit surprising

NOTE Confidence: 0.8639736

00:24:20.651 --> 00:24:22.707 and exciting to me because coming

NOTE Confidence: 0.8639736

00:24:22.707 --> 00:24:24.115 from an academic world,

NOTE Confidence: 0.8639736

00:24:24.120 --> 00:24:25.780 you're really living from 1

NOTE Confidence: 0.8639736

00:24:25.780 --> 00:24:27.108 grant to the next.

NOTE Confidence: 0.8639736

00:24:27.110 --> 00:24:29.108 And now in the supplied world,

NOTE Confidence: 0.8639736

00:24:29.110 --> 00:24:30.850 you know our partners are

NOTE Confidence: 0.8639736

00:24:30.850 --> 00:24:32.242 really looking for solutions.

NOTE Confidence: 0.8639736

00:24:32.250 --> 00:24:35.594 And so it was very exciting to be

NOTE Confidence: 0.8639736

00:24:35.594 --> 00:24:38.891 able to think about how we might

NOTE Confidence: 0.8639736

00:24:38.891 --> 00:24:42.160 be able to solve this problem.

NOTE Confidence: 0.8639736

00:24:42.160 --> 00:24:45.784 And so after had a good deal of

NOTE Confidence: 0.8639736

00:24:45.784 --> 00:24:48.565 conversation about what we could do

NOTE Confidence: 0.8639736

00:24:48.565 --> 00:24:51.827 and what the best approach would be

NOTE Confidence: 0.8639736

00:24:51.827 --> 00:24:55.320 to try to increase sleep duration and

NOTE Confidence: 0.8639736

00:24:55.320 --> 00:24:57.781 performance on those early starts,

NOTE Confidence: 0.8639736

00:24:57.781 --> 00:25:00.703 we decided to evaluate a lighting

NOTE Confidence: 0.8639736

00:25:00.703 --> 00:25:02.989 countermeasure and as Lauren mentioned.

NOTE Confidence: 0.8639736

00:25:02.990 --> 00:25:05.150 I have a background in basic

NOTE Confidence: 0.8639736

00:25:05.150 --> 00:25:06.590 circadian Physiology and studying

NOTE Confidence: 0.8639736

00:25:06.649 --> 00:25:08.599 the influence of light on the

NOTE Confidence: 0.8639736

00:25:08.599 --> 00:25:10.262 human circadian system and so

NOTE Confidence: 0.8639736

00:25:10.262 --> 00:25:12.074 this is very much aligned with

NOTE Confidence: 0.8639736

00:25:12.074 --> 00:25:13.315 that basic science background,

NOTE Confidence: 0.8639736

00:25:13.315 --> 00:25:15.660 and I thought it was really nice

NOTE Confidence: 0.8639736

00:25:15.660 --> 00:25:17.848 next step for for trying to solve

NOTE Confidence: 0.8639736

00:25:17.848 --> 00:25:20.089 this problem so we know that light

NOTE Confidence: 0.8639736

00:25:20.089 --> 00:25:22.243 follows a phase response curve or

NOTE Confidence: 0.8639736

00:25:22.243 --> 00:25:23.966 the circadian response to light

NOTE Confidence: 0.8639736

00:25:23.966 --> 00:25:25.294 causes phase response curve.

NOTE Confidence: 0.8639736

00:25:25.300 --> 00:25:26.970 I should say so again,

NOTE Confidence: 0.8639736

00:25:26.970 --> 00:25:29.626 I'm sure you're all very familiar with this,

NOTE Confidence: 0.8639736

00:25:29.630 --> 00:25:30.962 but just put simply,

NOTE Confidence: 0.8639736

00:25:30.962 --> 00:25:31.628 you know,

NOTE Confidence: 0.8639736

00:25:31.630 --> 00:25:33.680 light in the biological morning

NOTE Confidence: 0.8639736

00:25:33.680 --> 00:25:35.320 is going to shift.

NOTE Confidence: 0.8639736

00:25:35.320 --> 00:25:37.144 Sleep and wake earlier and allow

NOTE Confidence: 0.8639736

00:25:37.144 --> 00:25:38.900 for a better phase advance.

NOTE Confidence: 0.8639736

00:25:38.900 --> 00:25:41.413 We know that the flight crew that

NOTE Confidence: 0.8639736

00:25:41.413 --> 00:25:44.489 we work with for these early starts

NOTE Confidence: 0.8639736

00:25:44.489 --> 00:25:46.879 often begin work before sunrise.

NOTE Confidence: 0.8533856

00:25:46.880 --> 00:25:48.889 And so you know, if we look

NOTE Confidence: 0.8533856

00:25:48.889 --> 00:25:50.899 at the phase response curve,

NOTE Confidence: 0.8533856

00:25:50.900 --> 00:25:55.660 what we were aiming for was to get a light.

NOTE Confidence: 0.8533856

00:25:55.660 --> 00:25:57.670 Stimulus somewhere around here in

NOTE Confidence: 0.8533856

00:25:57.670 --> 00:26:00.834 order to try to get a maximal phase

NOTE Confidence: 0.8533856

00:26:00.834 --> 00:26:03.804 shift to enable them to be able to

NOTE Confidence: 0.8533856

00:26:03.804 --> 00:26:06.174 fall asleep earlier in the evening

NOTE Confidence: 0.8533856

00:26:06.174 --> 00:26:08.530 to obtain more sleep and then

NOTE Confidence: 0.8533856

00:26:08.530 --> 00:26:10.090 hopefully improve their performance.

NOTE Confidence: 0.8533856

00:26:10.090 --> 00:26:12.820 But in the lab, in my experience,

NOTE Confidence: 0.8533856

00:26:12.820 --> 00:26:14.734 we would often use very large

NOTE Confidence: 0.8533856

00:26:14.734 --> 00:26:16.540 devices like boxes or specialized

NOTE Confidence: 0.8533856

00:26:16.540 --> 00:26:18.855 lighting systems that weren't very

NOTE Confidence: 0.8533856

00:26:18.855 --> 00:26:21.400 conducive to application in the field,

NOTE Confidence: 0.8533856

00:26:21.400 --> 00:26:24.208 and so for this purpose I looked at

NOTE Confidence: 0.8533856

00:26:24.208 --> 00:26:26.149 seasonal affective disorder lighting.

NOTE Confidence: 0.8533856

00:26:26.150 --> 00:26:29.706 In order to have a more portable

NOTE Confidence: 0.8533856

00:26:29.706 --> 00:26:31.590 countermeasure that might be.

NOTE Confidence: 0.8533856

00:26:31.590 --> 00:26:34.698 Useful for pilots in the real world,

NOTE Confidence: 0.8533856

00:26:34.700 --> 00:26:38.330 and so we went back to the airline and we

NOTE Confidence: 0.8533856

00:26:38.427 --> 00:26:41.799 decided just designed a similar study,

NOTE Confidence: 0.8533856

00:26:41.800 --> 00:26:45.072 but this time we had them complete a

NOTE Confidence: 0.8533856

00:26:45.072 --> 00:26:47.863 baseline block followed by an early

NOTE Confidence: 0.8533856

00:26:47.863 --> 00:26:50.701 starts block and then another baseline

NOTE Confidence: 0.8533856

00:26:50.783 --> 00:26:53.345 block and an early starts block,

NOTE Confidence: 0.8533856

00:26:53.350 --> 00:26:55.947 and in each of the early starts

NOTE Confidence: 0.8533856

00:26:55.947 --> 00:26:59.341 lock box we randomize them to either

NOTE Confidence: 0.8533856

00:26:59.341 --> 00:27:02.076 have where placebo glasses that.

NOTE Confidence: 0.8533856

00:27:02.080 --> 00:27:03.643 Um did nothing,

NOTE Confidence: 0.8533856

00:27:03.643 --> 00:27:06.248 so playing unfiltered glasses really

NOTE Confidence: 0.8533856

00:27:06.248 --> 00:27:09.089 safety goggles or illuminate goggles.

NOTE Confidence: 0.8533856

00:27:09.090 --> 00:27:13.394 So if you're not familiar with the luminette,

NOTE Confidence: 0.8533856

00:27:13.400 --> 00:27:14.178 it's a.

NOTE Confidence: 0.8533856

00:27:14.178 --> 00:27:17.290 Just a little looks like a funny little

NOTE Confidence: 0.8533856

00:27:17.379 --> 00:27:20.277 1980s kind of sunglasses type deal,

NOTE Confidence: 0.8533856

00:27:20.280 --> 00:27:23.152 but it shines light in your eyes from

NOTE Confidence: 0.8533856

00:27:23.152 --> 00:27:25.744 the front and you can still walk

NOTE Confidence: 0.8533856

00:27:25.744 --> 00:27:28.382 around and get ready and do things

NOTE Confidence: 0.8533856

00:27:28.382 --> 00:27:30.674 while wearing the luminette and it

NOTE Confidence: 0.8533856

00:27:30.674 --> 00:27:33.666 has a peak in the blue wavelength region,

NOTE Confidence: 0.8533856

00:27:33.670 --> 00:27:36.253 which we know is the most potent

NOTE Confidence: 0.8533856

00:27:36.253 --> 00:27:37.360 for circadian synchronization

NOTE Confidence: 0.8533856

00:27:37.420 --> 00:27:38.896 synchronization and it generates

NOTE Confidence: 0.8533856

00:27:38.896 --> 00:27:41.110 about 1500 that Lux of light.

NOTE Confidence: 0.8533856

00:27:41.110 --> 00:27:43.618 So we're really excited about this

NOTE Confidence: 0.8533856

00:27:43.618 --> 00:27:46.640 as being a nice way to enhance.

NOTE Confidence: 0.8533856

00:27:46.640 --> 00:27:48.914 The pilot light exposure in the

NOTE Confidence: 0.8533856

00:27:48.914 --> 00:27:50.916 morning to hopefully again create

NOTE Confidence: 0.8533856

00:27:50.916 --> 00:27:52.986 a bigger circadian phase shift.

NOTE Confidence: 0.8533856

00:27:52.990 --> 00:27:56.563 We asked them to wear them for 25 minutes.

NOTE Confidence: 0.8533856

00:27:56.570 --> 00:27:59.738 When they woke up before their early starts,

NOTE Confidence: 0.8533856

00:27:59.740 --> 00:28:02.122 and then just some important notes

NOTE Confidence: 0.8533856

00:28:02.122 --> 00:28:03.710 about this particular study.

NOTE Confidence: 0.8533856

00:28:03.710 --> 00:28:06.086 It was conducted in the fall,

NOTE Confidence: 0.8533856

00:28:06.090 --> 00:28:08.472 so during evening darkness and later

NOTE Confidence: 0.8533856

00:28:08.472 --> 00:28:10.860 sunrises, the pilots always returned home.

NOTE Confidence: 0.8533856

00:28:10.860 --> 00:28:13.916 So and that was true for the first

NOTE Confidence: 0.8533856

00:28:13.916 --> 00:28:15.220 study as well.

NOTE Confidence: 0.8533856

00:28:15.220 --> 00:28:17.850 So while they did fly.

NOTE Confidence: 0.8533856

00:28:17.850 --> 00:28:18.191 Tom,

NOTE Confidence: 0.8533856

00:28:18.191 --> 00:28:19.896 you know two different destinations.

NOTE Confidence: 0.8533856

00:28:19.900 --> 00:28:22.434 We didn't want the influence of sleeping

NOTE Confidence: 0.8533856

00:28:22.434 --> 00:28:25.368 in the hotel to add noise to our study,

NOTE Confidence: 0.8533856

00:28:25.370 --> 00:28:27.638 so we had the airline designers so

NOTE Confidence: 0.8533856

00:28:27.638 --> 00:28:30.006 that they would always fly home and

NOTE Confidence: 0.8533856

00:28:30.006 --> 00:28:32.415 sleep in their their local home bed

NOTE Confidence: 0.8533856

00:28:32.415 --> 00:28:34.557 every night and justice before we

NOTE Confidence: 0.8533856

00:28:34.557 --> 00:28:37.688 collected the PBT at all of the same times.

NOTE Confidence: 0.8533856

00:28:37.690 --> 00:28:39.988 Once during each flight and then

NOTE Confidence: 0.8533856

00:28:39.988 --> 00:28:42.779 at the beginning and end of the day

NOTE Confidence: 0.8533856

00:28:42.779 --> 00:28:45.210 and then on their off days as well.

NOTE Confidence: 0.8533856

00:28:45.210 --> 00:28:48.594 And we collected all of the same measures.

NOTE Confidence: 0.8533856

00:28:48.600 --> 00:28:50.664 And we found that this particular

NOTE Confidence: 0.8533856

00:28:50.664 --> 00:28:53.090 group of pilots was pretty similar.

NOTE Confidence: 0.8533856

00:28:53.090 --> 00:28:56.339 So in this case we had 30 in the

NOTE Confidence: 0.8533856

00:28:56.339 --> 00:28:59.442 first study we had 44, and you know,

NOTE Confidence: 0.8533856

00:28:59.442 --> 00:29:00.190 demographically, again,

NOTE Confidence: 0.8533856

00:29:00.190 --> 00:29:02.608 pretty healthy people.

NOTE Confidence: 0.8533856

00:29:02.610 --> 00:29:04.752 The compliance when using both placebo

NOTE Confidence: 0.8533856

00:29:04.752 --> 00:29:07.080 and the light glasses was very good,

NOTE Confidence: 0.8533856

00:29:07.080 --> 00:29:09.592 so we asked them to wear them for

NOTE Confidence: 0.8533856

00:29:09.592 --> 00:29:10.220 25 minutes

NOTE Confidence: 0.86034817

00:29:10.300 --> 00:29:12.586 before each of the early starts.

NOTE Confidence: 0.86034817

00:29:12.590 --> 00:29:16.025 They wore them on 93% of days and they wore

NOTE Confidence: 0.86034817

00:29:16.025 --> 00:29:18.846 them for pretty much the entire time that

NOTE Confidence: 0.86034817

00:29:18.846 --> 00:29:22.219 we asked them to wear them if not more so.

NOTE Confidence: 0.86034817

00:29:22.220 --> 00:29:24.892 We found that the use of the glasses

NOTE Confidence: 0.86034817

00:29:24.892 --> 00:29:27.646 was not at all the hindrance in

NOTE Confidence: 0.86034817

00:29:27.646 --> 00:29:30.190 their ability to complete the study.

NOTE Confidence: 0.86034817

00:29:30.190 --> 00:29:31.118 Unfortunately, though,

NOTE Confidence: 0.86034817

00:29:31.118 --> 00:29:34.366 we didn't find any difference in sleep

NOTE Confidence: 0.86034817

00:29:34.366 --> 00:29:36.888 outcomes and so when we look over here,

NOTE Confidence: 0.86034817

00:29:36.890 --> 00:29:40.178 the main lines that I'll draw your attention

NOTE Confidence: 0.86034817

00:29:40.178 --> 00:29:43.587 to are just the blue and the red line,

NOTE Confidence: 0.86034817

00:29:43.590 --> 00:29:46.526 and so the blue line is the light

NOTE Confidence: 0.86034817

00:29:46.526 --> 00:29:49.496 and the red line is the placebo,

NOTE Confidence: 0.86034817

00:29:49.500 --> 00:29:53.440 and each of these is a day on the schedule.

NOTE Confidence: 0.86034817

00:29:53.440 --> 00:29:55.798 So Day 12345 and so on.

NOTE Confidence: 0.86034817

00:29:55.800 --> 00:29:57.396 This is sleep duration,

NOTE Confidence: 0.86034817

00:29:57.396 --> 00:30:00.290 and this is a little bit tiny.

NOTE Confidence: 0.86034817

00:30:00.290 --> 00:30:01.232 So I apologize,

NOTE Confidence: 0.86034817

00:30:01.232 --> 00:30:03.430 but this is 6 hours right here,

NOTE Confidence: 0.86034817

00:30:03.430 --> 00:30:05.638 and So what you can see is their

NOTE Confidence: 0.86034817

00:30:05.638 --> 00:30:07.508 sleep was basically the same.

NOTE Confidence: 0.86034817

00:30:07.510 --> 00:30:08.138 You know,

NOTE Confidence: 0.86034817

00:30:08.138 --> 00:30:10.650 it doesn't even matter what the duration is.

NOTE Confidence: 0.86034817

00:30:10.650 --> 00:30:12.220 Their sleep really did not

NOTE Confidence: 0.86034817

00:30:12.220 --> 00:30:13.476 improve throughout the schedule.

NOTE Confidence: 0.86034817

00:30:13.480 --> 00:30:15.352 We may have seen a little

NOTE Confidence: 0.86034817

00:30:15.352 --> 00:30:17.559 bit of a bump at the end,

NOTE Confidence: 0.86034817

00:30:17.560 --> 00:30:20.540 but but it was present in the placebo as well

NOTE Confidence: 0.86034817

00:30:20.611 --> 00:30:23.527 and then the same is true for sleep latency.

NOTE Confidence: 0.86034817

00:30:23.530 --> 00:30:24.154 No improvement,

NOTE Confidence: 0.86034817

00:30:24.154 --> 00:30:25.714 but it does decrease overtime,

NOTE Confidence: 0.86034817

00:30:25.720 --> 00:30:27.841 but that's probably a function of them

NOTE Confidence: 0.86034817

00:30:27.841 --> 00:30:29.490 becoming progressively more sleep deprived.

NOTE Confidence: 0.86034817

00:30:29.490 --> 00:30:30.946 No differences in efficiency.

NOTE Confidence: 0.86034817

00:30:30.946 --> 00:30:33.601 And no differences in way so so

NOTE Confidence: 0.86034817

00:30:33.601 --> 00:30:35.209 this was quite disappointing,

NOTE Confidence: 0.86034817

00:30:35.210 --> 00:30:38.207 but of course you know if maybe we were

NOTE Confidence: 0.86034817

00:30:38.207 --> 00:30:41.580 able to further shift their circadian phase.

NOTE Confidence: 0.86034817

00:30:41.580 --> 00:30:43.180 Maybe their performance improved,

NOTE Confidence: 0.86034817

00:30:43.180 --> 00:30:44.380 but unfortunately that

NOTE Confidence: 0.86034817

00:30:44.380 --> 00:30:46.349 was not the case either.

NOTE Confidence: 0.86034817

00:30:46.350 --> 00:30:49.136 So we found that their performance again,

NOTE Confidence: 0.86034817

00:30:49.140 --> 00:30:51.528 the blue is the light glasses,

NOTE Confidence: 0.86034817

00:30:51.530 --> 00:30:54.706 the red is the placebo on their performance,

NOTE Confidence: 0.86034817

00:30:54.710 --> 00:30:58.134 mapped right on top of one another through

NOTE Confidence: 0.86034817

00:30:58.134 --> 00:31:01.599 for each day of the schedule we saw it.

NOTE Confidence: 0.86034817

00:31:01.600 --> 00:31:03.785 No differences whatsoever with the

NOTE Confidence: 0.86034817

00:31:03.785 --> 00:31:05.970 Lunette glasses in the morning,

NOTE Confidence: 0.86034817

00:31:05.970 --> 00:31:08.160 so this was quite disappointing.

NOTE Confidence: 0.86034817

00:31:08.160 --> 00:31:10.155 Quite quite disappointing and so

NOTE Confidence: 0.86034817

00:31:10.155 --> 00:31:12.688 our conclusion here is we don't

NOTE Confidence: 0.86034817

00:31:12.688 --> 00:31:15.028 see any improvement with this

NOTE Confidence: 0.86034817

00:31:15.028 --> 00:31:16.900 enhanced morning light exposure.

NOTE Confidence: 0.86034817

00:31:16.900 --> 00:31:19.945 I didn't show you circadian phase here.

NOTE Confidence: 0.86034817

00:31:19.950 --> 00:31:23.446 We haven't actually assessed all of that yet.

NOTE Confidence: 0.86034817

00:31:23.450 --> 00:31:26.066 This is a fairly new study.

NOTE Confidence: 0.86034817

00:31:26.070 --> 00:31:28.260 It's not published yet either,

NOTE Confidence: 0.86034817

00:31:28.260 --> 00:31:31.242 but I don't even know if we

NOTE Confidence: 0.86034817

00:31:31.242 --> 00:31:33.160 did shift circadian phase.

NOTE Confidence: 0.86034817

00:31:33.160 --> 00:31:35.608 If in this in this real world setting

NOTE Confidence: 0.86034817

00:31:35.608 --> 00:31:38.070 if we didn't improve alertness,

NOTE Confidence: 0.86034817

00:31:38.070 --> 00:31:39.063 performance and sleep,

NOTE Confidence: 0.86034817

00:31:39.063 --> 00:31:41.873 you know it's not likely to be a

NOTE Confidence: 0.86034817

00:31:41.873 --> 00:31:43.160 particularly valuable countermeasure

NOTE Confidence: 0.86034817

00:31:43.160 --> 00:31:44.876 in the long run.

NOTE Confidence: 0.86034817

00:31:44.880 --> 00:31:46.002 So upon reflection,

NOTE Confidence: 0.86034817

00:31:46.002 --> 00:31:48.620 you know we think either the light

NOTE Confidence: 0.86034817

00:31:48.689 --> 00:31:50.849 was maybe not bright enough for

NOTE Confidence: 0.86034817

00:31:50.849 --> 00:31:53.189 the duration was not long enough,

NOTE Confidence: 0.86034817

00:31:53.190 --> 00:31:55.731 but more likely I think that evening

NOTE Confidence: 0.86034817

00:31:55.731 --> 00:31:57.274 light exposure probably inhibited

NOTE Confidence: 0.86034817

00:31:57.274 --> 00:31:59.239 the pilot's ability to sleep,

NOTE Confidence: 0.86034817

00:31:59.240 --> 00:32:01.712 because if we look at the

NOTE Confidence: 0.86034817

00:32:01.712 --> 00:32:03.870 phase response curve to like.

NOTE Confidence: 0.86034817

00:32:03.870 --> 00:32:05.994 You know a lesser amount of

NOTE Confidence: 0.86034817

00:32:05.994 --> 00:32:08.674 light in the evening has a large

NOTE Confidence: 0.86034817

00:32:08.674 --> 00:32:10.654 impact on shifting phase later,

NOTE Confidence: 0.86034817

00:32:10.660 --> 00:32:12.872 and so we suspect that you know

NOTE Confidence: 0.86034817

00:32:12.872 --> 00:32:15.707 we need to do a lot more work

NOTE Confidence: 0.86034817

00:32:15.707 --> 00:32:17.512 educating the pilots on sleep

NOTE Confidence: 0.86034817

00:32:17.597 --> 00:32:19.782 hygiene and the importance of

NOTE Confidence: 0.86034817

00:32:19.782 --> 00:32:21.967 turning off those screens in

NOTE Confidence: 0.87478036

00:32:21.970 --> 00:32:24.226 the evening in order to allow

NOTE Confidence: 0.87478036

00:32:24.226 --> 00:32:26.548 them a longer duration of sleep

NOTE Confidence: 0.87478036

00:32:26.548 --> 00:32:28.762 in order to maximize the benefit

NOTE Confidence: 0.87478036

00:32:28.762 --> 00:32:31.388 that they might get from like that.

NOTE Confidence: 0.87478036

00:32:31.390 --> 00:32:35.149 As things stand now, we don't have.

NOTE Confidence: 0.87478036

00:32:35.150 --> 00:32:37.406 Further, plans to roll this out,

NOTE Confidence: 0.87478036

00:32:37.410 --> 00:32:38.730 although we may,

NOTE Confidence: 0.87478036

00:32:38.730 --> 00:32:41.810 we may conduct another study in the

NOTE Confidence: 0.87478036

00:32:41.898 --> 00:32:44.946 future where we we try to focus more

NOTE Confidence: 0.87478036

00:32:44.946 --> 00:32:47.737 on sleep hygiene in addition to.

NOTE Confidence: 0.87478036

00:32:47.740 --> 00:32:50.440 How to measure that we introduce so

NOTE Confidence: 0.87478036

00:32:50.440 --> 00:32:52.813 that gives you a snapshot of the

NOTE Confidence: 0.87478036

00:32:52.813 --> 00:32:55.533 type of work that we do in aviation

NOTE Confidence: 0.87478036

00:32:55.533 --> 00:32:58.184 we have a variety of other studies

NOTE Confidence: 0.87478036

00:32:58.184 --> 00:33:00.084 happening on different topics

NOTE Confidence: 0.87478036

00:33:00.084 --> 00:33:03.316 but leave leave you here for the

NOTE Confidence: 0.87478036

00:33:03.316 --> 00:33:06.410 aviation and I will switch gears and

NOTE Confidence: 0.87478036

00:33:06.508 --> 00:33:09.490 talk about sleep a little higher.

NOTE Confidence: 0.87478036

00:33:09.490 --> 00:33:11.896 The outside the atmosphere so here

NOTE Confidence: 0.87478036

00:33:11.896 --> 00:33:14.925 will just begin to talk about are

NOTE Confidence: 0.87478036

00:33:14.925 --> 00:33:16.713 there differences between sleep

NOTE Confidence: 0.87478036

00:33:16.713 --> 00:33:19.270 on earth and sleep in space,

NOTE Confidence: 0.87478036

00:33:19.270 --> 00:33:22.238 and so just before I move on,

NOTE Confidence: 0.87478036

00:33:22.240 --> 00:33:25.012 I'll just say this is a picture

NOTE Confidence: 0.87478036

00:33:25.012 --> 00:33:27.845 of Senator John Glenn in the 1990s

NOTE Confidence: 0.87478036

00:33:27.845 --> 00:33:30.734 he returned to space on the space

NOTE Confidence: 0.87478036

00:33:30.734 --> 00:33:34.510 Shuttle in order to test the effect of

NOTE Confidence: 0.87478036

00:33:34.510 --> 00:33:37.120 spaceflight on the aging human body,

NOTE Confidence: 0.87478036

00:33:37.120 --> 00:33:39.778 and we've learned a whole lot.

NOTE Confidence: 0.87478036

00:33:39.780 --> 00:33:41.930 About how spaceflight effects the

NOTE Confidence: 0.87478036

00:33:41.930 --> 00:33:44.940 aging human body from this case study,

NOTE Confidence: 0.87478036

00:33:44.940 --> 00:33:47.090 including on how space affects

NOTE Confidence: 0.87478036

00:33:47.090 --> 00:33:49.240 sleep in an older person.

NOTE Confidence: 0.87478036

00:33:49.240 --> 00:33:53.110 I'm not going to talk about that right now,

NOTE Confidence: 0.87478036

00:33:53.110 --> 00:33:56.318 but I will say you know that that

NOTE Confidence: 0.87478036

00:33:56.318 --> 00:33:59.127 is something that we're working on.

NOTE Confidence: 0.87478036

00:33:59.130 --> 00:34:01.512 We're actually going back and looking

NOTE Confidence: 0.87478036

00:34:01.512 --> 00:34:04.720 at the data from his neurolab mission,

NOTE Confidence: 0.87478036

00:34:04.720 --> 00:34:06.870 the PSG to, you know,

NOTE Confidence: 0.87478036

00:34:06.870 --> 00:34:10.200 sort of further assessed how.

NOTE Confidence: 0.87478036

00:34:10.200 --> 00:34:11.980 State this basically measurement

NOTE Confidence: 0.87478036

00:34:11.980 --> 00:34:14.205 affects sleep architecture in younger

NOTE Confidence: 0.87478036

00:34:14.205 --> 00:34:17.066 and older people, but we're very,

NOTE Confidence: 0.87478036

00:34:17.066 --> 00:34:19.676 very fortunate to have his

NOTE Confidence: 0.87478036

00:34:19.676 --> 00:34:21.789 participation in that study.

NOTE Confidence: 0.87478036

00:34:21.790 --> 00:34:23.090 So to begin with,

NOTE Confidence: 0.87478036

00:34:23.090 --> 00:34:25.909 the study that I'm going to talk about,

NOTE Confidence: 0.87478036

00:34:25.910 --> 00:34:26.299 really,

NOTE Confidence: 0.87478036

00:34:26.299 --> 00:34:28.633 the motivation for this study came

NOTE Confidence: 0.87478036

00:34:28.633 --> 00:34:31.108 about because in all of the studies

NOTE Confidence: 0.87478036

00:34:31.108 --> 00:34:33.350 that have been done on sleep and

NOTE Confidence: 0.87478036

00:34:33.350 --> 00:34:35.246 space or all the studies that

NOTE Confidence: 0.87478036

00:34:35.246 --> 00:34:37.568 have been done up to the point

NOTE Confidence: 0.87478036

00:34:37.568 --> 00:34:39.278 where we started this study,

NOTE Confidence: 0.87478036

00:34:39.280 --> 00:34:41.814 it was pretty clear that sleep in

NOTE Confidence: 0.87478036

00:34:41.814 --> 00:34:44.429 space is shorter than it is on Earth,

NOTE Confidence: 0.87478036

00:34:44.430 --> 00:34:48.000 certainly shorter than it should be.

NOTE Confidence: 0.87478036

00:34:48.000 --> 00:34:50.604 On Earth, and so you can see,

NOTE Confidence: 0.87478036

00:34:50.610 --> 00:34:52.746 no matter how you measure weather

NOTE Confidence: 0.87478036

00:34:52.746 --> 00:34:55.089 with EG or we sleep logs,

NOTE Confidence: 0.87478036

00:34:55.090 --> 00:34:56.830 the astronauts are getting.

NOTE Confidence: 0.87478036

00:34:56.830 --> 00:34:59.971 Less than 7 hours of sleep a

NOTE Confidence: 0.87478036

00:34:59.971 --> 00:35:02.186 night and were typically hovering

NOTE Confidence: 0.87478036

00:35:02.186 --> 00:35:04.530 around the six hour range,

NOTE Confidence: 0.87478036

00:35:04.530 --> 00:35:06.990 and so this is a concern,

NOTE Confidence: 0.87478036

00:35:06.990 --> 00:35:07.742 of course,

NOTE Confidence: 0.87478036

00:35:07.742 --> 00:35:09.998 because when we talk about the

NOTE Confidence: 0.87478036

00:35:09.998 --> 00:35:12.708 need for astronauts to perform at,

NOTE Confidence: 0.87478036

00:35:12.710 --> 00:35:15.132 you know their peak all the time

NOTE Confidence: 0.87478036

00:35:15.132 --> 00:35:17.659 and we think about the potential

NOTE Confidence: 0.87478036

00:35:17.659 --> 00:35:20.479 consequences of a mistake in space.

NOTE Confidence: 0.87478036

00:35:20.480 --> 00:35:22.940 You know this is quite concerning.

NOTE Confidence: 0.87478036

00:35:22.940 --> 00:35:25.694 We want to make sure that

NOTE Confidence: 0.87478036

00:35:25.694 --> 00:35:27.530 the astronauts have the.

NOTE Confidence: 0.87478036

00:35:27.530 --> 00:35:30.842 Rest that they need to be able to perform

NOTE Confidence: 0.87478036

00:35:30.842 --> 00:35:33.900 at the highest level all the time,

NOTE Confidence: 0.87478036

00:35:33.900 --> 00:35:36.288 and so in thinking about this.

NOTE Confidence: 0.87478036

00:35:36.290 --> 00:35:37.882 Of course we wondered.

NOTE Confidence: 0.87478036

00:35:37.882 --> 00:35:38.280 OK,

NOTE Confidence: 0.87478036

00:35:38.280 --> 00:35:38.662 well,

NOTE Confidence: 0.87478036

00:35:38.662 --> 00:35:41.336 you know what are the causes for

NOTE Confidence: 0.87478036

00:35:41.336 --> 00:35:42.650 that short sleep,

NOTE Confidence: 0.87478036

00:35:42.650 --> 00:35:45.338 and so the first thing that as

NOTE Confidence: 0.87478036

00:35:45.338 --> 00:35:46.967 the circadian physiologist and

NOTE Confidence: 0.87478036

00:35:46.967 --> 00:35:48.987 coming from working with checks

NOTE Confidence: 0.87478036

00:35:48.987 --> 00:35:50.603 Eisler and Laura Barger,

NOTE Confidence: 0.800316

00:35:50.610 --> 00:35:55.066 who were my early mentors on this project?

NOTE Confidence: 0.800316

00:35:55.070 --> 00:35:57.114 You know, one potential issue is circadian

NOTE Confidence: 0.800316

00:35:57.114 --> 00:35:58.658 misalignment and so a few things.

NOTE Confidence: 0.800316

00:35:58.660 --> 00:36:00.788 There are a few things about many things

NOTE Confidence: 0.800316

00:36:00.788 --> 00:36:03.070 about space that are different than on Earth,

NOTE Confidence: 0.800316

00:36:03.070 --> 00:36:05.360 but one of the most notable is that the light

NOTE Confidence: 0.800316

00:36:05.412 --> 00:36:08.134 exposure pattern is different, and so on.

NOTE Confidence: 0.800316

00:36:08.134 --> 00:36:10.522 Earth, you know the sun does.

NOTE Confidence: 0.800316

00:36:10.530 --> 00:36:13.050 It does the work for us for entrainment.

NOTE Confidence: 0.800316

00:36:13.050 --> 00:36:15.269 If we stay awake during the day,

NOTE Confidence: 0.800316

00:36:15.270 --> 00:36:16.546 we sleep at night.

NOTE Confidence: 0.800316

00:36:16.546 --> 00:36:18.141 We will generally staying trained

NOTE Confidence: 0.800316

00:36:18.141 --> 00:36:20.221 but in space the shuttle orbits the

NOTE Confidence: 0.800316

00:36:20.221 --> 00:36:22.220 Earth or the State Space Station.

NOTE Confidence: 0.800316

00:36:22.220 --> 00:36:24.320 In this case orbits the Earth every

NOTE Confidence: 0.800316

00:36:24.320 --> 00:36:26.328 45 minutes or every 90 minutes,

NOTE Confidence: 0.800316

00:36:26.330 --> 00:36:28.535 and there's a 45 minute sunrise sunset.

NOTE Confidence: 0.800316

00:36:28.540 --> 00:36:30.759 And if you have Windows which the

NOTE Confidence: 0.800316

00:36:30.759 --> 00:36:32.648 space station and the shells do,

NOTE Confidence: 0.800316

00:36:32.650 --> 00:36:35.476 you can get exposed to light at the wrong

NOTE Confidence: 0.800316

00:36:35.476 --> 00:36:38.330 time or not have light at the right time.

NOTE Confidence: 0.800316

00:36:38.330 --> 00:36:39.638 But there's also schedule

NOTE Confidence: 0.800316

00:36:39.638 --> 00:36:40.619 induced circadian misalignment.

NOTE Confidence: 0.800316

00:36:40.620 --> 00:36:42.780 So this is an active act watch output

NOTE Confidence: 0.800316

00:36:42.780 --> 00:36:44.559 from a special mission and what

NOTE Confidence: 0.800316

00:36:44.559 --> 00:36:46.811 you can see is that the schedule

NOTE Confidence: 0.800316

00:36:46.811 --> 00:36:48.906 shifts earlier every single day,

NOTE Confidence: 0.800316

00:36:48.910 --> 00:36:51.150 and that's a function of orbital dynamics.

NOTE Confidence: 0.800316

00:36:51.150 --> 00:36:53.694 So when we ran the space shuttle missions,

NOTE Confidence: 0.800316

00:36:53.700 --> 00:36:56.171 the shuttle would have to launch and

NOTE Confidence: 0.800316

00:36:56.171 --> 00:36:58.477 land at particular windows of time and

NOTE Confidence: 0.800316

00:36:58.477 --> 00:37:00.906 they in order to orbit the Earth the

NOTE Confidence: 0.800316

00:37:00.906 --> 00:37:03.266 correct number of times to be in the

NOTE Confidence: 0.800316

00:37:03.270 --> 00:37:05.178 right position for launch and landing.

NOTE Confidence: 0.800316

00:37:05.180 --> 00:37:07.094 The crew would have to adjust

NOTE Confidence: 0.800316

00:37:07.094 --> 00:37:08.370 their sleep every day,

NOTE Confidence: 0.800316

00:37:08.370 --> 00:37:10.338 and so we know that phase

NOTE Confidence: 0.800316

00:37:10.338 --> 00:37:11.650 advances are really hard.

NOTE Confidence: 0.800316

00:37:11.650 --> 00:37:13.516 There were many phase advances on

NOTE Confidence: 0.800316

00:37:13.516 --> 00:37:15.514 space Shuttle and then our Apollo

NOTE Confidence: 0.800316

00:37:15.514 --> 00:37:17.259 missions were really know better.

NOTE Confidence: 0.800316

00:37:17.260 --> 00:37:19.752 This is more a function of the

NOTE Confidence: 0.800316

00:37:19.752 --> 00:37:21.865 workload on the astronauts sleep

NOTE Confidence: 0.800316

00:37:21.865 --> 00:37:24.763 which shifted all over the place.

NOTE Confidence: 0.800316

00:37:24.770 --> 00:37:26.756 Apollo missions and so we know

NOTE Confidence: 0.800316

00:37:26.756 --> 00:37:29.229 that we have lots of potential

NOTE Confidence: 0.800316

00:37:29.229 --> 00:37:31.389 causes for circadian misalignment.

NOTE Confidence: 0.800316

00:37:31.390 --> 00:37:33.874 We also know that the prior

NOTE Confidence: 0.800316

00:37:33.874 --> 00:37:35.530 samples were pretty small.

NOTE Confidence: 0.800316

00:37:35.530 --> 00:37:38.020 There were variable machine conditions there,

NOTE Confidence: 0.800316

00:37:38.020 --> 00:37:38.848 stressful workload,

NOTE Confidence: 0.800316

00:37:38.848 --> 00:37:40.504 and particularly on a

NOTE Confidence: 0.800316

00:37:40.504 --> 00:37:42.160 space mission like Mirror.

NOTE Confidence: 0.800316

00:37:42.160 --> 00:37:45.464 There were a lot of near catastrophic events,

NOTE Confidence: 0.800316

00:37:45.470 --> 00:37:46.958 and so you know,

NOTE Confidence: 0.800316

00:37:46.958 --> 00:37:50.440 we really thought to ask the question here.

NOTE Confidence: 0.800316

00:37:50.440 --> 00:37:53.338 Why do astronauts sleep less in space?

NOTE Confidence: 0.800316

00:37:53.340 --> 00:37:56.328 And is that still continuing today?

NOTE Confidence: 0.800316

00:37:56.330 --> 00:38:00.290 Or was that just an artifact of history?

NOTE Confidence: 0.800316

00:38:00.290 --> 00:38:03.615 Is sleep duration longer on

NOTE Confidence: 0.800316

00:38:03.615 --> 00:38:06.275 long duration missions so?

NOTE Confidence: 0.800316

00:38:06.280 --> 00:38:07.380 Is there a here Mike?

NOTE Confidence: 0.800316

00:38:07.380 --> 00:38:08.913 Is there a question or is that

NOTE Confidence: 0.800316

00:38:08.913 --> 00:38:09.780 just an open mic?

NOTE Confidence: 0.7940723

00:38:14.030 --> 00:38:17.920 Sounds like somebody has an open mic. So

NOTE Confidence: 0.84094226

00:38:17.920 --> 00:38:21.448 I'll continue and hopefully

NOTE Confidence: 0.84094226

00:38:21.448 --> 00:38:25.858 hopefully that'll be OK so.

NOTE Confidence: 0.84094226

00:38:25.860 --> 00:38:27.450 So for long duration missions,

NOTE Confidence: 0.84094226

00:38:27.450 --> 00:38:28.714 astronauts don't have quite

NOTE Confidence: 0.84094226

00:38:28.714 --> 00:38:30.294 the workload that they had.

NOTE Confidence: 0.84094226

00:38:30.300 --> 00:38:31.576 In short duration missions,

NOTE Confidence: 0.84094226

00:38:31.576 --> 00:38:33.847 and so we wondered if maybe just

NOTE Confidence: 0.84094226

00:38:33.847 --> 00:38:35.587 being in space for longer would

NOTE Confidence: 0.84094226

00:38:35.587 --> 00:38:37.511 adapt them to the environment and

NOTE Confidence: 0.84094226

00:38:37.511 --> 00:38:39.485 allow them to get longer sleep.

NOTE Confidence: 0.84094226

00:38:39.490 --> 00:38:41.386 And then we wondered what countermeasures,

NOTE Confidence: 0.84094226

00:38:41.390 --> 00:38:43.609 if any, they're using to enhance sleep.

NOTE Confidence: 0.84094226

00:38:43.610 --> 00:38:45.200 And if they're using countermeasures,

NOTE Confidence: 0.84094226

00:38:45.200 --> 00:38:46.148 are they effective.

NOTE Confidence: 0.84094226

00:38:46.148 --> 00:38:46.780 So again,

NOTE Confidence: 0.84094226

00:38:46.780 --> 00:38:48.790 just specific games we wanted to

NOTE Confidence: 0.84094226

00:38:48.790 --> 00:38:51.219 compare sleep duration for in space to Earth.

NOTE Confidence: 0.84094226

00:38:51.220 --> 00:38:53.002 We wanted to compare sleep duration

NOTE Confidence: 0.84094226

00:38:53.002 --> 00:38:55.620 from in long and short duration missions.

NOTE Confidence: 0.84094226

00:38:55.620 --> 00:38:57.852 Look at hypnotic specifically and then

NOTE Confidence: 0.84094226

00:38:57.852 --> 00:39:00.810 we wanted to assess the influence of

NOTE Confidence: 0.84094226

00:39:00.810 --> 00:39:03.140 circadian misalignment on sleep outcomes.

NOTE Confidence: 0.84094226

00:39:03.140 --> 00:39:05.648 So we conducted two different studies,

NOTE Confidence: 0.84094226

00:39:05.650 --> 00:39:07.765 one in short duration astronauts

NOTE Confidence: 0.84094226

00:39:07.765 --> 00:39:10.791 flying on the space shuttle and went

NOTE Confidence: 0.84094226

00:39:10.791 --> 00:39:13.287 on long duration missions with crew

NOTE Confidence: 0.84094226

00:39:13.287 --> 00:39:15.677 members living on the space station.

NOTE Confidence: 0.84094226

00:39:15.680 --> 00:39:17.770 We collected data 90 days

NOTE Confidence: 0.84094226

00:39:17.770 --> 00:39:19.024 before they launched.

NOTE Confidence: 0.84094226

00:39:19.030 --> 00:39:20.386 For two weeks,

NOTE Confidence: 0.84094226

00:39:20.386 --> 00:39:22.646 they completed sleep logs where

NOTE Confidence: 0.84094226

00:39:22.646 --> 00:39:24.857 they indicated their bed and

NOTE Confidence: 0.84094226

00:39:24.857 --> 00:39:26.897 wake times and medication use.

NOTE Confidence: 0.84094226

00:39:26.900 --> 00:39:29.336 And we're an app to watch

NOTE Confidence: 0.84094226

00:39:29.336 --> 00:39:31.480 during this period of time,

NOTE Confidence: 0.84094226

00:39:31.480 --> 00:39:34.280 we collected data for the 11 days

NOTE Confidence: 0.84094226

00:39:34.280 --> 00:39:36.879 prior to launch up until launch,

NOTE Confidence: 0.84094226

00:39:36.880 --> 00:39:39.184 and then throughout the mission and

NOTE Confidence: 0.84094226

00:39:39.184 --> 00:39:41.688 then seven days after they returned

NOTE Confidence: 0.84094226

00:39:41.688 --> 00:39:44.370 and for the circadian phase estimation,

NOTE Confidence: 0.84094226

00:39:44.370 --> 00:39:47.334 we used by mathematical modeling by

NOTE Confidence: 0.84094226

00:39:47.334 --> 00:39:50.338 taking the actigraphy data and modeling

NOTE Confidence: 0.84094226

00:39:50.338 --> 00:39:53.158 circadian phase to assess periods of

NOTE Confidence: 0.84094226

00:39:53.158 --> 00:39:56.580 time when they'd be in and out of phase.

NOTE Confidence: 0.84094226

00:39:56.580 --> 00:39:58.904 But overall we had a very large

NOTE Confidence: 0.84094226

00:39:58.904 --> 00:40:00.340 participation in this study.

NOTE Confidence: 0.84094226

00:40:00.340 --> 00:40:02.410 So in our short duration mission,

NOTE Confidence: 0.84094226

00:40:02.410 --> 00:40:04.993 we had 60 for 64 crew members and in

NOTE Confidence: 0.84094226

00:40:04.993 --> 00:40:07.511 our long duration study we had 21

NOTE Confidence: 0.84094226

00:40:07.511 --> 00:40:10.142 crew members and you can see there's

NOTE Confidence: 0.84094226

00:40:10.142 --> 00:40:12.753 very large number of days in flight.

NOTE Confidence: 0.84094226

00:40:12.760 --> 00:40:14.878 And then of course notably the

NOTE Confidence: 0.84094226

00:40:14.878 --> 00:40:17.031 difference here is that for short

NOTE Confidence: 0.84094226

00:40:17.031 --> 00:40:19.369 duration the crews were in space for

NOTE Confidence: 0.84094226

00:40:19.369 --> 00:40:22.107 just under 2 weeks on average and for

NOTE Confidence: 0.84094226

00:40:22.107 --> 00:40:24.478 long duration they were in space for

NOTE Confidence: 0.84094226

00:40:24.478 --> 00:40:26.910 several months and average about 155 days.

NOTE Confidence: 0.84094226

00:40:26.910 --> 00:40:28.410 Importantly, NASA schedules astronauts

NOTE Confidence: 0.84094226

00:40:28.410 --> 00:40:31.569 for 8 1/2 hours time in bed every day.

NOTE Confidence: 0.84094226

00:40:31.570 --> 00:40:34.130 So the results that I'm going to show

NOTE Confidence: 0.84094226

00:40:34.130 --> 00:40:37.200 you are not simply an artifact of cruise.

NOTE Confidence: 0.84094226

00:40:37.200 --> 00:40:39.545 Choosing to sleep less, they have an

NOTE Confidence: 0.84094226

00:40:39.545 --> 00:40:42.129 allocated out of time specific for sleep.

NOTE Confidence: 0.84094226

00:40:42.130 --> 00:40:43.890 So this is sleep obtained.

NOTE Confidence: 0.84094226

00:40:43.890 --> 00:40:46.010 Given that timing back.

NOTE Confidence: 0.84094226

00:40:46.010 --> 00:40:48.660 So what we found was.

NOTE Confidence: 0.84094226

00:40:48.660 --> 00:40:51.992 Sleep duration is shorter

NOTE Confidence: 0.84094226

00:40:51.992 --> 00:40:55.324 in space relative to.

NOTE Confidence: 0.84094226

00:40:55.330 --> 00:40:56.798 Relative to an earth,

NOTE Confidence: 0.84094226

00:40:56.798 --> 00:40:59.914 and so this is in flight and you

NOTE Confidence: 0.84094226

00:40:59.914 --> 00:41:02.404 can see compared to post flight

NOTE Confidence: 0.84094226

00:41:02.404 --> 00:41:04.945 it's shorter and this is also

NOTE Confidence: 0.84094226

00:41:04.945 --> 00:41:07.387 shorter compared to the pre flight

NOTE Confidence: 0.84094226

00:41:07.390 --> 00:41:09.796 and the 90 days before flight.

NOTE Confidence: 0.84094226

00:41:09.800 --> 00:41:13.013 Just and we didn't see any differences

NOTE Confidence: 0.84094226

00:41:13.013 --> 00:41:15.810 between short which is the light

NOTE Confidence: 0.84094226

00:41:15.810 --> 00:41:18.035 Gray and long duration missions.

NOTE Confidence: 0.84094226

00:41:18.040 --> 00:41:20.212 When we look at the counter

NOTE Confidence: 0.84094226

00:41:20.212 --> 00:41:21.660 measures that they use,

NOTE Confidence: 0.84094226

00:41:21.660 --> 00:41:24.033 we find that there's a high prevalence

NOTE Confidence: 0.84094226

00:41:24.033 --> 00:41:26.368 of hypnotic use in among astronauts,

NOTE Confidence: 0.84094226

00:41:26.370 --> 00:41:29.736 and So what you can see here in this

NOTE Confidence: 0.84094226

00:41:29.736 --> 00:41:32.877 chart is if a box is shaded in Gray,

NOTE Confidence: 0.84094226

00:41:32.880 --> 00:41:35.064 it means that on a particular

NOTE Confidence: 0.84094226

00:41:35.064 --> 00:41:36.520 night crew member didn't

NOTE Confidence: 0.81620944

00:41:36.590 --> 00:41:39.054 take any sleep medication if it shaded

NOTE Confidence: 0.81620944

00:41:39.054 --> 00:41:41.204 in blue, they took medication 11,

NOTE Confidence: 0.81620944

00:41:41.204 --> 00:41:42.287 hypnotic that night,

NOTE Confidence: 0.81620944

00:41:42.290 --> 00:41:44.468 and if it's shaded in red,

NOTE Confidence: 0.81620944

00:41:44.470 --> 00:41:46.636 they took two hypnotics that night,

NOTE Confidence: 0.81620944

00:41:46.640 --> 00:41:50.640 and So what you can see here is.

NOTE Confidence: 0.81620944

00:41:50.640 --> 00:41:52.845 Each box represents a day in space.

NOTE Confidence: 0.81620944

00:41:52.850 --> 00:41:55.370 In each row represents a single crew member.

NOTE Confidence: 0.81620944

00:41:55.370 --> 00:41:58.520 So for example, if we just look at the top,

NOTE Confidence: 0.81620944

00:41:58.520 --> 00:42:01.290 there are two blue boxes at the tops of this

NOTE Confidence: 0.81620944

00:42:01.355 --> 00:42:04.187 person only provided us with two data points.

NOTE Confidence: 0.81620944

00:42:04.190 --> 00:42:07.293 But this is 1 crew member and for both of the

NOTE Confidence: 0.81620944

00:42:07.293 --> 00:42:09.855 days that they completed the sleep diary,

NOTE Confidence: 0.81620944

00:42:09.860 --> 00:42:11.430 this person used a hypnotic.

NOTE Confidence: 0.81620944

00:42:11.430 --> 00:42:13.950 So you don't have to look at every

NOTE Confidence: 0.81620944

00:42:13.950 --> 00:42:15.788 single row, just the general pattern.

NOTE Confidence: 0.81620944

00:42:15.788 --> 00:42:18.363 You can see that there is a widespread

NOTE Confidence: 0.81620944

00:42:18.363 --> 00:42:20.806 use of hypnotics with some crew members.

NOTE Confidence: 0.81620944

00:42:20.810 --> 00:42:23.519 Serve habitually using more than one dose

NOTE Confidence: 0.81620944

00:42:23.519 --> 00:42:26.198 of hypnotic every single night in space.

NOTE Confidence: 0.81620944

00:42:26.200 --> 00:42:28.895 So overall, we found that 78% of

NOTE Confidence: 0.81620944

00:42:28.895 --> 00:42:31.205 participants used hypnotics at least once,

NOTE Confidence: 0.81620944

00:42:31.210 --> 00:42:34.070 and they were using them 52% of

NOTE Confidence: 0.81620944

00:42:34.070 --> 00:42:37.370 all nights in space and then.

NOTE Confidence: 0.81620944

00:42:37.370 --> 00:42:40.337 Creates more than windows on 18% next.

NOTE Confidence: 0.81620944

00:42:40.337 --> 00:42:43.085 However, hypnotics don't really

NOTE Confidence: 0.81620944

00:42:43.085 --> 00:42:46.520 seem to provide a very.

NOTE Confidence: 0.81620944

00:42:46.520 --> 00:42:47.244 Positive impact,

NOTE Confidence: 0.81620944

00:42:47.244 --> 00:42:50.140 so sleep latency is shortened by about 10

NOTE Confidence: 0.81620944

00:42:50.206 --> 00:42:52.902 minutes and we think that this is probably

NOTE Confidence: 0.81620944

00:42:52.902 --> 00:42:55.080 driving the continued hypnotic use.

NOTE Confidence: 0.81620944

00:42:55.080 --> 00:42:57.632 They fall asleep faster and as a result

NOTE Confidence: 0.81620944

00:42:57.632 --> 00:42:59.910 they keep using sleep medications,

NOTE Confidence: 0.81620944

00:42:59.910 --> 00:43:01.770 but we don't see differences

NOTE Confidence: 0.81620944

00:43:01.770 --> 00:43:03.280 in sleep duration, alertness,

NOTE Confidence: 0.81620944

00:43:03.280 --> 00:43:04.060 sleep efficiency,

NOTE Confidence: 0.81620944

00:43:04.060 --> 00:43:04.450 quality,

NOTE Confidence: 0.81620944

00:43:04.450 --> 00:43:07.174 or any of the other outcome measures

NOTE Confidence: 0.81620944

00:43:07.174 --> 00:43:08.470 that we looked at.

NOTE Confidence: 0.8404867

00:43:11.150 --> 00:43:12.730 Now switching gears to

NOTE Confidence: 0.8404867

00:43:12.730 --> 00:43:13.520 circadian misalignment.

NOTE Confidence: 0.8404867

00:43:13.520 --> 00:43:16.544 So we took all of our long duration

NOTE Confidence: 0.8404867

00:43:16.544 --> 00:43:19.660 data from the 21 crew members who were

NOTE Confidence: 0.8404867

00:43:19.660 --> 00:43:22.610 in space for 155 days on average,

NOTE Confidence: 0.8404867

00:43:22.610 --> 00:43:25.074 and we applied that by a mathematical

NOTE Confidence: 0.8404867

00:43:25.074 --> 00:43:27.110 model to assess circadian phase

NOTE Confidence: 0.8404867

00:43:27.110 --> 00:43:28.926 from the actigraphy data,

NOTE Confidence: 0.8404867

00:43:28.930 --> 00:43:32.476 and what you can see here is these are.

NOTE Confidence: 0.8404867

00:43:32.480 --> 00:43:34.850 So each row represents a day.

NOTE Confidence: 0.8404867

00:43:34.850 --> 00:43:36.940 Again, here in this roster

NOTE Confidence: 0.8404867

00:43:36.940 --> 00:43:39.460 plot and Gray is sleep and.

NOTE Confidence: 0.8404867

00:43:39.460 --> 00:43:42.124 What you can see is firstly there is a

NOTE Confidence: 0.8404867

00:43:42.124 --> 00:43:44.815 lot of change in their sleep pattern.

NOTE Confidence: 0.8404867

00:43:44.820 --> 00:43:47.500 This is 1 crew member another and another,

NOTE Confidence: 0.8404867

00:43:47.500 --> 00:43:50.180 and so you can see this crew member.

NOTE Confidence: 0.8404867

00:43:50.180 --> 00:43:52.860 These are not the same time in space,

NOTE Confidence: 0.8404867

00:43:52.860 --> 00:43:55.065 so they all the crew sleep actually

NOTE Confidence: 0.8404867

00:43:55.065 --> 00:43:57.220 at the same time every night.

NOTE Confidence: 0.8404867

00:43:57.220 --> 00:43:59.524 But we can see here is that there

NOTE Confidence: 0.8404867

00:43:59.524 --> 00:44:01.323 are sleep is really changing

NOTE Confidence: 0.8404867

00:44:01.323 --> 00:44:03.248 in terms of scheduled time.

NOTE Confidence: 0.8404867

00:44:03.250 --> 00:44:04.950 So here where sleeps shifts

NOTE Confidence: 0.8404867

00:44:04.950 --> 00:44:07.269 way out and then comes back in.

NOTE Confidence: 0.8404867

00:44:07.270 --> 00:44:09.180 This is probably a situation

NOTE Confidence: 0.8404867

00:44:09.180 --> 00:44:11.310 where a Soyuz vehicle or a.

NOTE Confidence: 0.8404867

00:44:11.310 --> 00:44:13.235 Resupply vessel arrived at the

NOTE Confidence: 0.8404867

00:44:13.235 --> 00:44:15.787 space station and the crew had to

NOTE Confidence: 0.8404867

00:44:15.787 --> 00:44:17.726 shift their sleep to be able to

NOTE Confidence: 0.8404867

00:44:17.726 --> 00:44:19.999 be awake when the vehicle arrived

NOTE Confidence: 0.8404867

00:44:19.999 --> 00:44:22.638 and then they shifted back to GMT

NOTE Confidence: 0.8404867

00:44:22.638 --> 00:44:24.408 stable time after vehicle left.

NOTE Confidence: 0.8404867

00:44:24.410 --> 00:44:26.498 The little white dots are the

NOTE Confidence: 0.8404867

00:44:26.498 --> 00:44:28.304 estimates for core body temperature

NOTE Confidence: 0.8404867

00:44:28.304 --> 00:44:31.040 minimum and what you can see is when

NOTE Confidence: 0.8404867

00:44:31.040 --> 00:44:33.237 the little white dot is outside

NOTE Confidence: 0.8404867

00:44:33.237 --> 00:44:34.669 of the sleep episode.

NOTE Confidence: 0.8404867

00:44:34.670 --> 00:44:37.239 We would consider them to be circadian

NOTE Confidence: 0.8404867

00:44:37.239 --> 00:44:39.324 misaligned and you can see many

NOTE Confidence: 0.8404867

00:44:39.324 --> 00:44:41.460 places where crew circuiting this line.

NOTE Confidence: 0.8404867

00:44:41.460 --> 00:44:43.920 And did someone have a question?

NOTE Confidence: 0.86529213

00:44:47.040 --> 00:44:51.244 Maybe not. So when we look at the

NOTE Confidence: 0.86529213

00:44:51.244 --> 00:44:53.720 consequences of the circadian misalignment.

NOTE Confidence: 0.86529213

00:44:53.720 --> 00:44:55.310 Again, there are misaligned one

NOTE Confidence: 0.86529213

00:44:55.310 --> 00:44:57.500 out of every five days in space.

NOTE Confidence: 0.86529213

00:44:57.500 --> 00:44:59.705 It looks like it's mostly schedule driven,

NOTE Confidence: 0.86529213

00:44:59.710 --> 00:45:01.878 but we find that it has huge consequences

NOTE Confidence: 0.86529213

00:45:01.878 --> 00:45:04.660 and so they lose about an hour sleep when

NOTE Confidence: 0.86529213

00:45:04.660 --> 00:45:06.702 they're sleeping out of circadian phase

NOTE Confidence: 0.86529213

00:45:06.702 --> 00:45:09.152 compared to when they're sleeping in phase.

NOTE Confidence: 0.86529213

00:45:09.160 --> 00:45:11.608 And when we compare this to the effective

NOTE Confidence: 0.86529213

00:45:11.608 --> 00:45:14.046 hypnotics where we didn't really see a big

NOTE Confidence: 0.86529213

00:45:14.046 --> 00:45:16.090 difference or improvement in sleep duration,

NOTE Confidence: 0.86529213

00:45:16.090 --> 00:45:18.120 one of the things that we're taking

NOTE Confidence: 0.86529213

00:45:18.120 --> 00:45:19.732 forward is just by maintaining

NOTE Confidence: 0.86529213

00:45:19.732 --> 00:45:21.437 them on a regular schedule.

NOTE Confidence: 0.86529213

00:45:21.440 --> 00:45:23.015 We can probably increase their

NOTE Confidence: 0.86529213

00:45:23.015 --> 00:45:24.700 sleep duration, too, you know.

NOTE Confidence: 0.86529213

00:45:24.700 --> 00:45:26.450 Little more than six hours.

NOTE Confidence: 0.86529213

00:45:26.450 --> 00:45:27.794 Probably not a lot,

NOTE Confidence: 0.86529213

00:45:27.794 --> 00:45:29.810 but at least a little bit

NOTE Confidence: 0.86529213

00:45:29.886 --> 00:45:31.378 more than six hours,

NOTE Confidence: 0.86529213

00:45:31.380 --> 00:45:33.816 so this was really important in thinking

NOTE Confidence: 0.86529213

00:45:33.816 --> 00:45:36.914 about how we might build schedules going

NOTE Confidence: 0.86529213

00:45:36.914 --> 00:45:39.394 forward from an operational perspective.

NOTE Confidence: 0.86529213

00:45:39.400 --> 00:45:41.927 When we look at a sleep medication

NOTE Confidence: 0.86529213

00:45:41.927 --> 00:45:44.030 use during nights when they

NOTE Confidence: 0.86529213

00:45:44.030 --> 00:45:45.926 were aligned versus misaligned,

NOTE Confidence: 0.86529213

00:45:45.930 --> 00:45:49.350 we find that they not only took more hypnotic

NOTE Confidence: 0.86529213

00:45:49.350 --> 00:45:52.046 medication nights when they were misaligned,

NOTE Confidence: 0.86529213

00:45:52.050 --> 00:45:55.306 but they also took more of any medication.

NOTE Confidence: 0.86529213

00:45:55.310 --> 00:45:58.985 So I think this really illustrates the.

NOTE Confidence: 0.86529213

00:45:58.990 --> 00:46:00.880 Impact of circadian misalignment on just

NOTE Confidence: 0.86529213

00:46:00.880 --> 00:46:03.195 you know your well being and probably

NOTE Confidence: 0.86529213

00:46:03.195 --> 00:46:05.181 translates to shift workers as well

NOTE Confidence: 0.86529213

00:46:05.181 --> 00:46:07.339 because when we are circadian misaligned.

NOTE Confidence: 0.86529213

00:46:07.340 --> 00:46:09.678 When we're working against our body Clock,

NOTE Confidence: 0.86529213

00:46:09.680 --> 00:46:11.678 you know there are caps Gator,

NOTE Confidence: 0.86529213

00:46:11.680 --> 00:46:13.696 but other symptoms from other causes

NOTE Confidence: 0.86529213

00:46:13.696 --> 00:46:16.371 that can you know cause us to reach

NOTE Confidence: 0.86529213

00:46:16.371 --> 00:46:18.675 for medication as a solution that it

NOTE Confidence: 0.86529213

00:46:18.675 --> 00:46:20.691 certainly was happening on the space

NOTE Confidence: 0.86529213

00:46:20.691 --> 00:46:23.536 station and we think that the prevalence

NOTE Confidence: 0.86529213

00:46:23.536 --> 00:46:26.290 of sleep medication is higher here.

NOTE Confidence: 0.86529213

00:46:26.290 --> 00:46:27.120 Misaligned nights,

NOTE Confidence: 0.86529213

00:46:27.120 --> 00:46:29.610 because when they are misaligned we

NOTE Confidence: 0.86529213

00:46:29.610 --> 00:46:31.725 suspected they had more difficulty

NOTE Confidence: 0.86529213

00:46:31.725 --> 00:46:33.755 falling asleep and staying asleep,

NOTE Confidence: 0.86529213

00:46:33.760 --> 00:46:37.024 which led to them reaching for

NOTE Confidence: 0.86529213

00:46:37.024 --> 00:46:38.656 hypnotic to help.

NOTE Confidence: 0.86529213

00:46:38.660 --> 00:46:39.880 So overall,

NOTE Confidence: 0.86529213

00:46:39.880 --> 00:46:44.150 from the this actigraphy study we find

NOTE Confidence: 0.86529213

00:46:44.150 --> 00:46:49.304 that sleep duration is shorter in space that.

NOTE Confidence: 0.86529213

00:46:49.310 --> 00:46:51.098 Hypnotics are particularly effective

NOTE Confidence: 0.86529213

00:46:51.098 --> 00:46:52.886 for increasing sleep duration.

NOTE Confidence: 0.86529213

00:46:52.890 --> 00:46:56.026 They do increase or reduce sleep latency.

NOTE Confidence: 0.86529213

00:46:56.030 --> 00:46:57.374 Circadian misalignment is

NOTE Confidence: 0.86529213

00:46:57.374 --> 00:46:59.827 happening about 20% of the time,

NOTE Confidence: 0.86529213

00:46:59.827 --> 00:47:02.956 and it seems to be more schedule driven

NOTE Confidence: 0.86529213

00:47:02.956 --> 00:47:05.710 than related to light dark patterns

NOTE Confidence: 0.86529213

00:47:05.710 --> 00:47:09.967 right now and use of all medication is

NOTE Confidence: 0.86529213

00:47:09.967 --> 00:47:12.757 increased during circadian misalignment so.

NOTE Confidence: 0.86529213

00:47:12.760 --> 00:47:14.578 So I just I realized we're

NOTE Confidence: 0.86529213

00:47:14.578 --> 00:47:16.499 coming up to the end here,

NOTE Confidence: 0.86529213

00:47:16.500 --> 00:47:18.924 but I wanted to just tell you a

NOTE Confidence: 0.86529213

00:47:18.924 --> 00:47:20.850 little bit more about what the

NOTE Confidence: 0.86529213

00:47:20.850 --> 00:47:23.369 type of work that we do at NASA,

NOTE Confidence: 0.86529213

00:47:23.370 --> 00:47:25.344 and so I'm not going to go

NOTE Confidence: 0.86529213

00:47:25.344 --> 00:47:26.800 deep into these studies,

NOTE Confidence: 0.86529213

00:47:26.800 --> 00:47:28.546 but I just wanted to show

NOTE Confidence: 0.86529213

00:47:28.546 --> 00:47:30.230 you two really cool things.

NOTE Confidence: 0.86529213

00:47:30.230 --> 00:47:30.854 So firstly,

NOTE Confidence: 0.86529213

00:47:30.854 --> 00:47:32.414 we do fix space missions,

NOTE Confidence: 0.86529213

00:47:32.420 --> 00:47:34.850 so we have this analog called

NOTE Confidence: 0.86529213

00:47:34.850 --> 00:47:36.470 the human exploration research

NOTE Confidence: 0.86529213

00:47:36.541 --> 00:47:38.766 analog where we're preparing for.

NOTE Confidence: 0.86529213

00:47:38.770 --> 00:47:41.388 Lunar mission, so our goal right now,

NOTE Confidence: 0.86529213

00:47:41.390 --> 00:47:44.374 or at least as of the last administration,

NOTE Confidence: 0.86529213

00:47:44.380 --> 00:47:47.364 was to go to the Moon by 2024,

NOTE Confidence: 0.86529213

00:47:47.370 --> 00:47:49.240 and so we're doing missions

NOTE Confidence: 0.86529213

00:47:49.240 --> 00:47:50.736 with four crew members,

NOTE Confidence: 0.86529213

00:47:50.740 --> 00:47:52.978 and we keep them in isolation.

NOTE Confidence: 0.86529213

00:47:52.980 --> 00:47:54.102 In this habitat,

NOTE Confidence: 0.86529213

00:47:54.102 --> 00:47:56.346 we have a fake Mission Control,

NOTE Confidence: 0.86529213

00:47:56.350 --> 00:47:58.144 and this allows us to study

NOTE Confidence: 0.86529213

00:47:58.144 --> 00:47:59.340 them and study their

NOTE Confidence: 0.8471225

00:47:59.402 --> 00:48:01.487 team interaction and their response

NOTE Confidence: 0.8471225

00:48:01.487 --> 00:48:03.155 to stressors like isolation

NOTE Confidence: 0.8471225

00:48:03.155 --> 00:48:05.318 and confinement and sleep loss.

NOTE Confidence: 0.8471225

00:48:05.320 --> 00:48:06.840 And for this particular

NOTE Confidence: 0.8471225

00:48:06.840 --> 00:48:08.740 study we were interested in.

NOTE Confidence: 0.8471225

00:48:08.740 --> 00:48:10.140 Also, assessing the influence of

NOTE Confidence: 0.8471225

00:48:10.140 --> 00:48:11.540 bio mathematical models and how

NOTE Confidence: 0.8471225

00:48:11.587 --> 00:48:13.219 well they are able to predict

NOTE Confidence: 0.8471225

00:48:13.219 --> 00:48:14.035 alertness and performance.

NOTE Confidence: 0.8471225

00:48:14.040 --> 00:48:16.542 And so again, I'm not going into depth here,

NOTE Confidence: 0.8471225

00:48:16.550 --> 00:48:18.646 but this is an example of a study

NOTE Confidence: 0.8471225

00:48:18.646 --> 00:48:20.458 that we did in the habitat.

NOTE Confidence: 0.8471225

00:48:20.460 --> 00:48:22.684 It was just published a few months ago.

NOTE Confidence: 0.8471225

00:48:22.690 --> 00:48:23.545 If you're interested,

NOTE Confidence: 0.8471225

00:48:23.545 --> 00:48:25.760 you can certainly have a look at it,

NOTE Confidence: 0.8471225

00:48:25.760 --> 00:48:27.984 but we studied for cruise over 5 missions.

NOTE Confidence: 0.8471225

00:48:27.990 --> 00:48:29.724 They were restricted to five hours

NOTE Confidence: 0.8471225

00:48:29.724 --> 00:48:31.697 of sleep per night during the week

NOTE Confidence: 0.8471225

00:48:31.697 --> 00:48:33.454 and they were given 8 hours of

NOTE Confidence: 0.8471225

00:48:33.515 --> 00:48:35.219 sleep on weekends and they stayed

NOTE Confidence: 0.8471225

00:48:35.219 --> 00:48:36.920 in the habitat for 45 days,

NOTE Confidence: 0.8471225

00:48:36.920 --> 00:48:39.569 so we wanted to make this similar to what

NOTE Confidence: 0.8471225

00:48:39.569 --> 00:48:41.963 a future lunar mission might look like.

NOTE Confidence: 0.8471225

00:48:41.970 --> 00:48:43.760 And each triangle here represents

NOTE Confidence: 0.8471225

00:48:43.760 --> 00:48:46.621 a time when we had them take a

NOTE Confidence: 0.8471225

00:48:46.621 --> 00:48:48.938 reaction time test and a stamp rally

NOTE Confidence: 0.8471225

00:48:49.010 --> 00:48:51.150 fatigue rating through the day.

NOTE Confidence: 0.8471225

00:48:51.150 --> 00:48:53.790 And So what we found just in terms

NOTE Confidence: 0.8471225

00:48:53.790 --> 00:48:55.712 of performance was that average

NOTE Confidence: 0.8471225

00:48:55.712 --> 00:48:57.697 performance didn't change a whole

NOTE Confidence: 0.8471225

00:48:57.697 --> 00:49:00.317 lot over the course of the mission.

NOTE Confidence: 0.8471225

00:49:00.320 --> 00:49:02.721 But we saw pretty broad Inter individual

NOTE Confidence: 0.8471225

00:49:02.721 --> 00:49:04.601 differences with some people being

NOTE Confidence: 0.8471225

00:49:04.601 --> 00:49:06.185 high performers and resilient.

NOTE Confidence: 0.8471225

00:49:06.190 --> 00:49:08.220 Despite this pretty extreme sleep

NOTE Confidence: 0.8471225

00:49:08.220 --> 00:49:10.666 loss and some really being sort

NOTE Confidence: 0.8471225

00:49:10.666 --> 00:49:12.700 of affected very much by this.

NOTE Confidence: 0.8471225

00:49:12.700 --> 00:49:14.560 Habitat and this sleep restriction.

NOTE Confidence: 0.8471225

00:49:14.560 --> 00:49:15.248 So again,

NOTE Confidence: 0.8471225

00:49:15.248 --> 00:49:16.968 we're taking this information for

NOTE Confidence: 0.8471225

00:49:16.968 --> 00:49:19.672 we also I'm not going into the

NOTE Confidence: 0.8471225

00:49:19.672 --> 00:49:20.878 bio mathematical modeling,

NOTE Confidence: 0.8471225

00:49:20.880 --> 00:49:23.877 but we did learn a lot about how about

NOTE Confidence: 0.8471225

00:49:23.877 --> 00:49:26.319 mathematical models can be used to

NOTE Confidence: 0.8471225

00:49:26.319 --> 00:49:27.947 predict alertness and performance,

NOTE Confidence: 0.8471225

00:49:27.950 --> 00:49:30.456 and then the last thing that I

NOTE Confidence: 0.8471225

00:49:30.456 --> 00:49:33.131 wanted to show you is just what

NOTE Confidence: 0.8471225

00:49:33.131 --> 00:49:34.643 we're doing for Mars.

NOTE Confidence: 0.8471225

00:49:34.650 --> 00:49:36.882 So the cool thing about Mars

NOTE Confidence: 0.8471225

00:49:36.882 --> 00:49:38.370 is that it rotates.

NOTE Confidence: 0.847008

00:49:40.500 --> 00:49:42.810 The rotation is 24 hours 39 minutes,

NOTE Confidence: 0.847008

00:49:42.810 --> 00:49:44.790 so it's incredibly close to Earth.

NOTE Confidence: 0.847008

00:49:44.790 --> 00:49:47.093 None of the other planets are anywhere

NOTE Confidence: 0.847008

00:49:47.093 --> 00:49:49.079 near the ballpark of our rotation,

NOTE Confidence: 0.847008

00:49:49.080 --> 00:49:50.400 so it's really close,

NOTE Confidence: 0.847008

00:49:50.400 --> 00:49:52.380 but as you know, probably from

NOTE Confidence: 0.847008

00:49:52.380 --> 00:49:53.700 reading forced desynchrony studies,

NOTE Confidence: 0.847008

00:49:53.700 --> 00:49:56.196 it could be just long enough that it's

NOTE Confidence: 0.847008

00:49:56.196 --> 00:49:58.646 a problem for some people to entrain,

NOTE Confidence: 0.847008

00:49:58.650 --> 00:50:00.390 and when we send row.

NOTE Confidence: 0.847008

00:50:00.390 --> 00:50:02.436 1st to Mars. This is curiosity.

NOTE Confidence: 0.847008

00:50:02.440 --> 00:50:03.940 The scientists and engineers

NOTE Confidence: 0.847008

00:50:03.940 --> 00:50:06.190 who work to control those Rovers

NOTE Confidence: 0.847008

00:50:06.259 --> 00:50:08.226 will live and work on Mars time.

NOTE Confidence: 0.847008

00:50:08.230 --> 00:50:10.276 They'll live on a 24 hour,

NOTE Confidence: 0.847008

00:50:10.280 --> 00:50:11.980 39 minute day everyday and

NOTE Confidence: 0.847008

00:50:11.980 --> 00:50:14.030 shift a bit later every day,

NOTE Confidence: 0.847008

00:50:14.030 --> 00:50:17.130 and so we can study them to see how well

NOTE Confidence: 0.847008

00:50:17.217 --> 00:50:20.169 people are able to shift to Mars time.

NOTE Confidence: 0.847008

00:50:20.170 --> 00:50:22.444 And we can also introduce countermeasures

NOTE Confidence: 0.847008

00:50:22.444 --> 00:50:25.123 to see if we can adapt them to

NOTE Confidence: 0.847008

00:50:25.123 --> 00:50:27.330 live in on a Mars day length.

NOTE Confidence: 0.847008

00:50:27.330 --> 00:50:29.118 And so we took the opportunity

NOTE Confidence: 0.847008

00:50:29.118 --> 00:50:31.221 to do that during actually the

NOTE Confidence: 0.847008

00:50:31.221 --> 00:50:32.917 Phoenix Mars Lander project.

NOTE Confidence: 0.847008

00:50:32.920 --> 00:50:35.928 And this is a one of the engineers,

NOTE Confidence: 0.847008

00:50:35.930 --> 00:50:38.233 and we use blue light boxes at

NOTE Confidence: 0.847008

00:50:38.233 --> 00:50:39.974 their workstations and we assess

NOTE Confidence: 0.847008

00:50:39.974 --> 00:50:42.026 their circadian phase and had the

NOTE Confidence: 0.847008

00:50:42.026 --> 00:50:43.749 more active watches throughout

NOTE Confidence: 0.847008

00:50:43.749 --> 00:50:45.697 the entire mission duration.

NOTE Confidence: 0.847008

00:50:45.700 --> 00:50:48.436 And we found that in fact they did

NOTE Confidence: 0.847008

00:50:48.436 --> 00:50:51.720 out of the 20 people that we studied,

NOTE Confidence: 0.847008

00:50:51.720 --> 00:50:54.304 all but one were able to adjust to

NOTE Confidence: 0.847008

00:50:54.304 --> 00:50:57.653 this March time and so we think that

NOTE Confidence: 0.847008

00:50:57.653 --> 00:50:59.405 with appropriate countermeasures we

NOTE Confidence: 0.847008

00:50:59.479 --> 00:51:01.943 will be able to help the astronauts

NOTE Confidence: 0.847008

00:51:01.943 --> 00:51:05.750 adapt when we do eventually go to Mars.

NOTE Confidence: 0.847008

00:51:05.750 --> 00:51:06.562 So finally,

NOTE Confidence: 0.847008

00:51:06.562 --> 00:51:07.780 just to summarize,

NOTE Confidence: 0.847008

00:51:07.780 --> 00:51:09.810 with this sleeping space part,

NOTE Confidence: 0.847008

00:51:09.810 --> 00:51:11.840 we have more to do.

NOTE Confidence: 0.847008

00:51:11.840 --> 00:51:13.448 We're assessing sleep architecture.

NOTE Confidence: 0.847008

00:51:13.448 --> 00:51:15.860 I've been working hard to resurrect

NOTE Confidence: 0.847008

00:51:15.917 --> 00:51:16.709 archival data.

NOTE Confidence: 0.847008

00:51:16.710 --> 00:51:19.470 We have a paper under review right now

NOTE Confidence: 0.847008

00:51:19.470 --> 00:51:22.490 looking at sleep spindles from the shuttle

NOTE Confidence: 0.847008

00:51:22.490 --> 00:51:25.240 mission I mentioned with Senator Glenn.

NOTE Confidence: 0.847008

00:51:25.240 --> 00:51:27.670 We I've worked with Bob Stickgold,

NOTE Confidence: 0.847008

00:51:27.670 --> 00:51:30.710 who collected data on REM sleep on mirror

NOTE Confidence: 0.847008

00:51:30.710 --> 00:51:33.757 that was never published 25 years ago,

NOTE Confidence: 0.847008

00:51:33.760 --> 00:51:36.298 and so we're working to do

NOTE Confidence: 0.847008

00:51:36.298 --> 00:51:38.550 a final analysis of that.

NOTE Confidence: 0.847008

00:51:38.550 --> 00:51:40.926 We're continuing to look at countermeasures

NOTE Confidence: 0.847008

00:51:40.926 --> 00:51:43.613 so we have special lights on station

NOTE Confidence: 0.847008

00:51:43.613 --> 00:51:46.028 that should help the crew and train.

NOTE Confidence: 0.847008

00:51:46.030 --> 00:51:46.776 Of course,

NOTE Confidence: 0.847008

00:51:46.776 --> 00:51:49.014 we're working to stabilize their schedules.

NOTE Confidence: 0.847008

00:51:49.020 --> 00:51:51.264 We need to look at wake

NOTE Confidence: 0.847008

00:51:51.264 --> 00:51:52.386 for money medications,

NOTE Confidence: 0.847008

00:51:52.390 --> 00:51:54.847 and then we also need to look

NOTE Confidence: 0.847008

00:51:54.847 --> 00:51:56.500 at performance in flight.

NOTE Confidence: 0.847008

00:51:56.500 --> 00:51:57.824 And so we have.

NOTE Confidence: 0.847008

00:51:57.824 --> 00:51:59.810 Of course Nastic gives out grants

NOTE Confidence: 0.847008

00:51:59.880 --> 00:52:02.040 and doctors Brainard and Lockley

NOTE Confidence: 0.847008

00:52:02.040 --> 00:52:04.200 at Thomas Jefferson and Harvard

NOTE Confidence: 0.847008

00:52:04.273 --> 00:52:06.337 and images and Bazner at Penn

NOTE Confidence: 0.847008

00:52:06.337 --> 00:52:08.170 have grants to assess these.

NOTE Confidence: 0.847008

00:52:08.170 --> 00:52:10.420 Counter measures and performance issues.

NOTE Confidence: 0.847008

00:52:10.420 --> 00:52:12.884 So with that this is my team.

NOTE Confidence: 0.847008

00:52:12.890 --> 00:52:16.817 I just like to say thank you.

NOTE Confidence: 0.847008

00:52:16.820 --> 00:52:18.910 Acknowledge all the people who

NOTE Confidence: 0.847008

00:52:18.910 --> 00:52:21.000 worked on these studies and

NOTE Confidence: 0.847008

00:52:21.076 --> 00:52:23.236 happy to answer any questions.

NOTE Confidence: 0.8552032

00:52:25.280 --> 00:52:27.352 Thank you so much, that was a

NOTE Confidence: 0.8552032

00:52:27.352 --> 00:52:28.838 fantastic talk. Doctor Flynn Evans.

NOTE Confidence: 0.890569366666667

00:52:30.390 --> 00:52:32.520 You hear me OK? Sure can.

NOTE Confidence: 0.890569366666667

00:52:32.520 --> 00:52:35.419 Yeah I had to switch devices mid talk

NOTE Confidence: 0.8352611

00:52:35.420 --> 00:52:38.220 so I just want to welcome everybody to

NOTE Confidence: 0.8352611

00:52:38.220 --> 00:52:40.847 please put any questions in the chat.

NOTE Confidence: 0.8352611

00:52:40.850 --> 00:52:43.890 I see that there are a few there

NOTE Confidence: 0.8352611

00:52:43.890 --> 00:52:46.640 already while I take a look at those.

NOTE Confidence: 0.8352611

00:52:46.640 --> 00:52:49.136 I was just wondering if you might be

NOTE Confidence: 0.8352611

00:52:49.136 --> 00:52:51.450 able to comment on something from

NOTE Confidence: 0.8352611

00:52:51.450 --> 00:52:53.874 your one of your later studies.

NOTE Confidence: 0.8352611

00:52:53.880 --> 00:52:55.932 You just alluded to the individual

NOTE Confidence: 0.8352611

00:52:55.932 --> 00:52:57.746 differences in resistance to sleep

NOTE Confidence: 0.8352611

00:52:57.746 --> 00:52:59.310 loss and circadian disruption.

NOTE Confidence: 0.8352611

00:52:59.310 --> 00:53:01.907 An I was wondering if there's any.

NOTE Confidence: 0.8352611

00:53:01.910 --> 00:53:04.640 Part of the screening to become either

NOTE Confidence: 0.8352611

00:53:04.640 --> 00:53:07.135 an astronaut or a pilot that attempts

NOTE Confidence: 0.8352611

00:53:07.135 --> 00:53:10.089 to get it that in any way currently.

NOTE Confidence: 0.8352611

00:53:10.090 --> 00:53:10.610 Great

NOTE Confidence: 0.88190687

00:53:10.610 --> 00:53:12.530 question. Yeah, unfortunately there's

NOTE Confidence: 0.88190687

00:53:12.530 --> 00:53:16.543 not right now and so we have talked

NOTE Confidence: 0.88190687

00:53:16.543 --> 00:53:19.178 about looking at polymorphisms that

NOTE Confidence: 0.88190687

00:53:19.178 --> 00:53:21.897 might be associated with resilience

NOTE Confidence: 0.88190687

00:53:21.897 --> 00:53:24.537 or vulnerability to sleep loss.

NOTE Confidence: 0.88190687

00:53:24.540 --> 00:53:28.236 You know, we know that per three polymorphism

NOTE Confidence: 0.88190687

00:53:28.236 --> 00:53:30.729 is associated with vulnerability,

NOTE Confidence: 0.88190687

00:53:30.730 --> 00:53:33.310 but the crew there's a.

NOTE Confidence: 0.8444211

00:53:35.370 --> 00:53:37.335 Were prohibited from looking at

NOTE Confidence: 0.8444211

00:53:37.335 --> 00:53:39.300 genetic information among the crew

NOTE Confidence: 0.8444211

00:53:39.362 --> 00:53:41.147 for the purposes of selection.

NOTE Confidence: 0.8444211

00:53:41.150 --> 00:53:43.334 And so, while technically we probably

NOTE Confidence: 0.8444211

00:53:43.334 --> 00:53:45.769 would say it's not for selection,

NOTE Confidence: 0.8444211

00:53:45.770 --> 00:53:47.695 but maybe more for strategic

NOTE Confidence: 0.8444211

00:53:47.695 --> 00:53:48.850 application of countermeasures,

NOTE Confidence: 0.8444211

00:53:48.850 --> 00:53:51.112 the law prevents us from being

NOTE Confidence: 0.8444211

00:53:51.112 --> 00:53:53.848 able to do that at this point.

NOTE Confidence: 0.8444211

00:53:53.850 --> 00:53:57.700 And So what we do, we do what we can.

NOTE Confidence: 0.8444211

00:53:57.700 --> 00:54:00.260 So we do typically have the crew do

NOTE Confidence: 0.8444211

00:54:00.260 --> 00:54:03.090 tests of different hypnotics on Earth,

NOTE Confidence: 0.8444211

00:54:03.090 --> 00:54:06.994 and then we have them wake themselves up.

NOTE Confidence: 0.8444211

00:54:07.000 --> 00:54:10.176 You set an alarm for like you know,

NOTE Confidence: 0.8444211

00:54:10.180 --> 00:54:13.114 midnight and wake up and do a Pvt just

NOTE Confidence: 0.8444211

00:54:13.114 --> 00:54:16.646 to sort of test do it self test to

NOTE Confidence: 0.8444211

00:54:16.646 --> 00:54:19.384 determine whether or not they'll be

NOTE Confidence: 0.8444211

00:54:19.384 --> 00:54:21.729 vulnerable after taking a hypnotic.

NOTE Confidence: 0.8444211

00:54:21.730 --> 00:54:24.453 We also work with them as they

NOTE Confidence: 0.8444211

00:54:24.453 --> 00:54:26.898 travel across time zones on Earth,

NOTE Confidence: 0.8444211

00:54:26.900 --> 00:54:29.360 and if anybody is appearing particularly

NOTE Confidence: 0.8444211

00:54:29.360 --> 00:54:31.679 vulnerable then we'll work with them.

NOTE Confidence: 0.8444211

00:54:31.680 --> 00:54:34.613 Kind of in a very personalized medicine

NOTE Confidence: 0.8444211

00:54:34.613 --> 00:54:36.739 approach to Taylor or fatigue.

NOTE Confidence: 0.8444211

00:54:36.740 --> 00:54:38.378 I did not plan to that person.

NOTE Confidence: 0.8576894

00:54:39.640 --> 00:54:41.550 Interesting great. Well thank you.

NOTE Confidence: 0.8576894

00:54:41.550 --> 00:54:44.575 I see one of the questions that was

NOTE Confidence: 0.8576894

00:54:44.575 --> 00:54:47.666 posed as can you discuss what, if any,

NOTE Confidence: 0.8576894

00:54:47.666 --> 00:54:49.964 affects microgravity has on the Physiology

NOTE Confidence: 0.8576894

00:54:49.964 --> 00:54:52.250 that might disrupt sleep in space?

NOTE Confidence: 0.8576894

00:54:52.250 --> 00:54:54.922 I don't know if you know anything

NOTE Confidence: 0.8576894

00:54:54.922 --> 00:54:56.830 that specifically. Yeah, it's a

NOTE Confidence: 0.857689400000001

00:54:56.830 --> 00:54:59.886 huge question. So the way that I think

NOTE Confidence: 0.857689400000001

00:54:59.886 --> 00:55:02.732 about our work is we have to get rid

NOTE Confidence: 0.857689400000001

00:55:02.732 --> 00:55:06.440 of all of the problems that we know are

NOTE Confidence: 0.857689400000001

00:55:06.440 --> 00:55:09.030 problems for people sleeping on Earth.

NOTE Confidence: 0.857689400000001

00:55:09.030 --> 00:55:10.510 And then will should.

NOTE Confidence: 0.857689400000001

00:55:10.510 --> 00:55:12.925 We should be able to assess the

NOTE Confidence: 0.857689400000001

00:55:12.925 --> 00:55:14.569 influence of microgravity on sleep.

NOTE Confidence: 0.857689400000001

00:55:14.570 --> 00:55:16.770 So it could be that the crew can't

NOTE Confidence: 0.857689400000001

00:55:16.770 --> 00:55:18.983 sleep more than six hours because

NOTE Confidence: 0.857689400000001

00:55:18.983 --> 00:55:20.983 their sleep environment is terrible.

NOTE Confidence: 0.857689400000001

00:55:20.990 --> 00:55:23.018 In addition to being circadian misaligned,

NOTE Confidence: 0.857689400000001

00:55:23.020 --> 00:55:26.053 it could be that they you know are just,

NOTE Confidence: 0.857689400000001

00:55:26.060 --> 00:55:27.745 you know, it's probably not

NOTE Confidence: 0.857689400000001

00:55:27.745 --> 00:55:29.093 an issue like excitement,

NOTE Confidence: 0.857689400000001

00:55:29.100 --> 00:55:30.948 because we don't see that there's

NOTE Confidence: 0.857689400000001

00:55:30.948 --> 00:55:33.160 improvement in the long duration flights.

NOTE Confidence: 0.857689400000001

00:55:33.160 --> 00:55:35.561 But basically we really have to make

NOTE Confidence: 0.857689400000001

00:55:35.561 --> 00:55:38.004 sure that we have their schedules aligned

NOTE Confidence: 0.857689400000001

00:55:38.004 --> 00:55:41.068 so we can look in a very pure way.

NOTE Confidence: 0.857689400000001

00:55:41.070 --> 00:55:45.557 To see if there's residual problems after.

NOTE Confidence: 0.857689400000001

00:55:45.560 --> 00:55:47.486 All of the more typical shift

NOTE Confidence: 0.857689400000001

00:55:47.486 --> 00:55:49.150 work type problems are gone.

NOTE Confidence: 0.857689400000001

00:55:49.150 --> 00:55:51.100 I suspect there is an influence

NOTE Confidence: 0.857689400000001

00:55:51.100 --> 00:55:51.750 of microgravity,

NOTE Confidence: 0.857689400000001

00:55:51.750 --> 00:55:53.780 and right now most of that evidence

NOTE Confidence: 0.857689400000001

00:55:53.780 --> 00:55:55.669 points towards the glymphatic system,

NOTE Confidence: 0.857689400000001

00:55:55.670 --> 00:55:57.290 and so you know,

NOTE Confidence: 0.857689400000001

00:55:57.290 --> 00:56:00.340 we know that during slow wave sleep.

NOTE Confidence: 0.857689400000001

00:56:00.340 --> 00:56:03.140 There is a whole lot of interesting

NOTE Confidence: 0.857689400000001

00:56:03.140 --> 00:56:05.210 stuff going on, I'm sure.

NOTE Confidence: 0.857689400000001

00:56:05.210 --> 00:56:07.820 Probably most of you attended the

NOTE Confidence: 0.857689400000001

00:56:07.820 --> 00:56:10.833 sleep meeting this year and the you

NOTE Confidence: 0.857689400000001

00:56:10.833 --> 00:56:13.313 know plenary talk was incredible and

NOTE Confidence: 0.857689400000001

00:56:13.313 --> 00:56:16.001 so you know the way that slow wave

NOTE Confidence: 0.857689400000001

00:56:16.001 --> 00:56:18.320 sleep is associated with just improved

NOTE Confidence: 0.857689400000001

00:56:18.320 --> 00:56:20.740 performance and lack of slowly sleep.

NOTE Confidence: 0.857689400000001

00:56:20.740 --> 00:56:22.980 Businesses here was development of

NOTE Confidence: 0.857689400000001

00:56:22.980 --> 00:56:24.772 Alzheimer's disease is something

NOTE Confidence: 0.857689400000001

00:56:24.772 --> 00:56:27.022 that we're looking at related to

NOTE Confidence: 0.857689400000001

00:56:27.022 --> 00:56:29.140 the lymphatic system and you know,

NOTE Confidence: 0.857689400000001

00:56:29.140 --> 00:56:30.784 just the waste product.

NOTE Confidence: 0.857689400000001

00:56:30.784 --> 00:56:32.428 Being flushed during sleep,

NOTE Confidence: 0.857689400000001

00:56:32.430 --> 00:56:35.222 so I'm very eager to use the archival

NOTE Confidence: 0.857689400000001

00:56:35.222 --> 00:56:37.820 data that we're collecting or that

NOTE Confidence: 0.857689400000001

00:56:37.820 --> 00:56:40.090 we're assessing to encourage now

NOTE Confidence: 0.857689400000001

00:56:40.090 --> 00:56:43.032 set to allow us to study sleep

NOTE Confidence: 0.857689400000001

00:56:43.032 --> 00:56:45.047 architecture in space again to

NOTE Confidence: 0.857689400000001

00:56:45.047 --> 00:56:47.489 see if there are changes in,

NOTE Confidence: 0.857689400000001

00:56:47.490 --> 00:56:47.896 say,

NOTE Confidence: 0.857689400000001

00:56:47.896 --> 00:56:49.926 slow wave sleep during spaceflight.

NOTE Confidence: 0.8396347

00:56:51.340 --> 00:56:55.404 Great thank you and maybe one last question,

NOTE Confidence: 0.8396347

00:56:55.410 --> 00:56:58.470 so this is from Ian Weir.

NOTE Confidence: 0.8396347

00:56:58.470 --> 00:57:01.620 Is there any data that shows that

NOTE Confidence: 0.8396347

00:57:01.620 --> 00:57:04.242 performance on the Pvt translates

NOTE Confidence: 0.8396347

00:57:04.242 --> 00:57:06.606 to actual job performance?

NOTE Confidence: 0.8396347

00:57:06.610 --> 00:57:09.740 And relatedly, did your studies

NOTE Confidence: 0.8396347

00:57:09.740 --> 00:57:12.580 any flight simulation data? Yeah,

NOTE Confidence: 0.866744

00:57:12.580 --> 00:57:14.220 that's a really good question,

NOTE Confidence: 0.866744

00:57:14.220 --> 00:57:16.532 so we actually do have all of so

NOTE Confidence: 0.866744

00:57:16.532 --> 00:57:19.360 for the flight data we have all of

NOTE Confidence: 0.866744

00:57:19.360 --> 00:57:21.459 the aircraft event data as well,

NOTE Confidence: 0.866744

00:57:21.460 --> 00:57:23.469 so we know if the pilots were

NOTE Confidence: 0.866744

00:57:23.469 --> 00:57:25.410 flying at the wrong altitude.

NOTE Confidence: 0.866744

00:57:25.410 --> 00:57:27.378 We know if they were flying,

NOTE Confidence: 0.866744

00:57:27.380 --> 00:57:29.030 their airspeed was too fast.

NOTE Confidence: 0.866744

00:57:29.030 --> 00:57:31.326 We know if they taxi too quickly,

NOTE Confidence: 0.866744

00:57:31.330 --> 00:57:33.192 if they hit their brakes too hard

NOTE Confidence: 0.866744

00:57:33.192 --> 00:57:35.597 and we do see a relationship between

NOTE Confidence: 0.866744

00:57:35.597 --> 00:57:37.901 the PBT in those aircraft outcomes.

NOTE Confidence: 0.866744

00:57:37.910 --> 00:57:40.220 So I didn't go through that here,

NOTE Confidence: 0.866744

00:57:40.220 --> 00:57:41.584 but that's pretty exciting

NOTE Confidence: 0.866744

00:57:41.584 --> 00:57:43.630 because it does show that direct.

NOTE Confidence: 0.866744

00:57:43.630 --> 00:57:45.073 Operational correlate there

NOTE Confidence: 0.866744

00:57:45.073 --> 00:57:46.997 have been published studies,

NOTE Confidence: 0.866744

00:57:47.000 --> 00:57:50.822 so Matthias Bazner showed a very

NOTE Confidence: 0.866744

00:57:50.822 --> 00:57:54.319 nice correlation between the PBT and.

NOTE Confidence: 0.866744

00:57:54.320 --> 00:57:57.176 Detection of weapons in TSA paradigm.

NOTE Confidence: 0.866744

00:57:57.180 --> 00:58:00.822 So there there are some other

NOTE Confidence: 0.866744

00:58:00.822 --> 00:58:03.950 studies that show some nice.

NOTE Confidence: 0.866744

00:58:03.950 --> 00:58:06.326 Locations that the PBT is is

NOTE Confidence: 0.866744

00:58:06.326 --> 00:58:09.318 relevant and is a sort of assay

NOTE Confidence: 0.866744

00:58:09.318 --> 00:58:11.958 for the influence of sleep loss.

NOTE Confidence: 0.866744

00:58:11.960 --> 00:58:12.303 Great,

NOTE Confidence: 0.866744

00:58:12.303 --> 00:58:14.010 well thank you so much.

NOTE Confidence: 0.81497574

00:58:14.010 --> 00:58:16.432 And just to let everybody know our

NOTE Confidence: 0.81497574

00:58:16.432 --> 00:58:19.103 talk next week is going to be from

NOTE Confidence: 0.81497574

00:58:19.103 --> 00:58:21.791 Jacob Colin who is going to be speaking

NOTE Confidence: 0.81497574

00:58:21.791 --> 00:58:24.262 about sound sleep and PTSD and some

NOTE Confidence: 0.81497574

00:58:24.270 --> 00:58:25.674 veterans specific sleep issues.

NOTE Confidence: 0.81497574

00:58:25.674 --> 00:58:27.780 So please join us for that

NOTE Confidence: 0.81497574

00:58:27.847 --> 00:58:29.059 and thank you again.

NOTE Confidence: 0.81497574

00:58:29.060 --> 00:58:31.112 Doctor Flynn Evans for such a

NOTE Confidence: 0.81497574

00:58:31.112 --> 00:58:32.480 fantastic talk this afternoon.

NOTE Confidence: 0.88098943

00:58:34.510 --> 00:58:35.682 Great, thank you so much

NOTE Confidence: 0.88098943

00:58:35.682 --> 00:58:37.050 for having me have a great

NOTE Confidence: 0.88098943

00:58:37.103 --> 00:58:38.910 day everybody there. Thanks you too.