



**SPACESTATION  
LIVE**

1  
00:00:08,549 --> 00:00:06,950  
this month we're continuing to highlight

2  
00:00:10,870 --> 00:00:08,559  
many of the investigations that scott

3  
00:00:12,870 --> 00:00:10,880  
kelly conducted as part of the one-year

4  
00:00:14,789 --> 00:00:12,880  
mission and today we're looking at one

5  
00:00:16,790 --> 00:00:14,799  
called the reaction self-test where

6  
00:00:18,550 --> 00:00:16,800  
astronauts take a five-minute test to

7  
00:00:21,109 --> 00:00:18,560  
see how different factors including

8  
00:00:23,029 --> 00:00:21,119  
fatigue can affect their job performance

9  
00:00:25,349 --> 00:00:23,039  
it's a similar problem for folks here on

10  
00:00:28,310 --> 00:00:25,359  
earth like airline pilots truck drivers

11  
00:00:30,790 --> 00:00:28,320  
and shift workers who may work up to 16

12  
00:00:32,950 --> 00:00:30,800  
hours per day are more than six

13  
00:00:33,830 --> 00:00:32,960

consecutive days without a day off of

14

00:00:35,750 --> 00:00:33,840

rest

15

00:00:37,270 --> 00:00:35,760

my colleague lori meigs caught up with

16

00:00:39,270 --> 00:00:37,280

the principal investigator of this

17

00:00:41,030 --> 00:00:39,280

experiment to learn more

18

00:00:42,950 --> 00:00:41,040

what we've been trying to understand

19

00:00:44,950 --> 00:00:42,960

with a particular focus on are they

20

00:00:47,270 --> 00:00:44,960

sleeping how much are they sleeping

21

00:00:48,950 --> 00:00:47,280

what's the quality of that sleep what is

22

00:00:51,270 --> 00:00:48,960

their workload like from their own

23

00:00:54,310 --> 00:00:51,280

perception uh and what are their moods

24

00:00:56,630 --> 00:00:54,320

like um ranging from how fatigued are

25

00:00:59,270 --> 00:00:56,640

they to um

26

00:01:01,110 --> 00:00:59,280

what's the quality of their sleep to uh

27

00:01:03,670 --> 00:01:01,120

what's their physical exhaustion to

28

00:01:05,270 --> 00:01:03,680

what's their stress like uh and we're

29

00:01:07,429 --> 00:01:05,280

trying to under in their tiredness

30

00:01:09,429 --> 00:01:07,439

sleepiness we're trying to understand

31

00:01:11,429 --> 00:01:09,439

what they're experiencing and

32

00:01:14,390 --> 00:01:11,439

particularly as it relates to sleep wake

33

00:01:15,590 --> 00:01:14,400

patterns in space flight and then

34

00:01:18,149 --> 00:01:15,600

workload

35

00:01:20,149 --> 00:01:18,159

as well which is another kind of fatigue

36

00:01:21,910 --> 00:01:20,159

right if you work too hard or too long

37

00:01:23,910 --> 00:01:21,920

in addition to not getting enough sleep

38

00:01:24,950 --> 00:01:23,920

and then what that looks like as they go

39

00:01:27,270 --> 00:01:24,960

through the mission we're actually

40

00:01:28,789 --> 00:01:27,280

studying them well before the mission

41

00:01:31,030 --> 00:01:28,799

right up to the mission that in the

42

00:01:32,469 --> 00:01:31,040

launch then throughout the mission and

43

00:01:34,069 --> 00:01:32,479

then we study them again for another

44

00:01:36,630 --> 00:01:34,079

month after the mission

45

00:01:38,870 --> 00:01:36,640

so how does that translate to us here on

46

00:01:40,149 --> 00:01:38,880

earth and our sleep habits and

47

00:01:42,389 --> 00:01:40,159

what you're learning is that going to

48

00:01:44,310 --> 00:01:42,399

help us well so this is an area where

49

00:01:45,910 --> 00:01:44,320

i'm particularly fortunate because

50

00:01:46,710 --> 00:01:45,920

everyone can relate

51

00:01:48,950 --> 00:01:46,720

to

52

00:01:51,510 --> 00:01:48,960

excessive work inadequate sleep poor

53

00:01:53,990 --> 00:01:51,520

sleep quality feeling fatigued or stress

54

00:01:55,270 --> 00:01:54,000

so it's got a lot of translation to

55

00:01:57,429 --> 00:01:55,280

earth

56

00:01:59,510 --> 00:01:57,439

we're learning a lot about what happens

57

00:02:01,350 --> 00:01:59,520

dynamically over time because we get to

58

00:02:03,590 --> 00:02:01,360

study them for the full mission before

59

00:02:05,190 --> 00:02:03,600

during and after but it we're using

60

00:02:07,030 --> 00:02:05,200

tools that we know are sensitive on

61

00:02:08,630 --> 00:02:07,040

earth to schedules that are too

62

00:02:10,790 --> 00:02:08,640

difficult or challenging whether they're

63

00:02:13,350 --> 00:02:10,800

the schedules of physicians in training

64

00:02:14,710 --> 00:02:13,360

or truck drivers or airline pilots so

65

00:02:17,430 --> 00:02:14,720

these tools

66

00:02:19,670 --> 00:02:17,440

generalize nicely to data that we have

67

00:02:21,589 --> 00:02:19,680

from populations on earth that are also

68

00:02:24,150 --> 00:02:21,599

generally populations that are engaged

69

00:02:25,510 --> 00:02:24,160

in what we call sensitive safety

70

00:02:27,270 --> 00:02:25,520

sensitive work

71

00:02:29,030 --> 00:02:27,280

that is to say if you if you're not

72

00:02:32,470 --> 00:02:29,040

alert and able to fly an airplane or

73

00:02:34,710 --> 00:02:32,480

drive a truck or treat a patient etc or

74

00:02:36,630 --> 00:02:34,720

whether a nurse or a doctor then there's

75

00:02:38,710 --> 00:02:36,640

a risk and asteroids are in the same

76  
00:02:39,990 --> 00:02:38,720  
situation they're in a risky environment

77  
00:02:43,190 --> 00:02:40,000  
even more so than these other

78  
00:02:45,350 --> 00:02:43,200  
occupations and it's 24 7. so they we

79  
00:02:47,110 --> 00:02:45,360  
need to know how capable are they how

80  
00:02:49,270 --> 00:02:47,120  
tired do they get because when you get

81  
00:02:51,190 --> 00:02:49,280  
tired when the day's too long the

82  
00:02:52,630 --> 00:02:51,200  
sleep's too short the quality of sleep's

83  
00:02:53,990 --> 00:02:52,640  
too poor

84  
00:02:55,110 --> 00:02:54,000  
and there's emergencies going on you're

85  
00:02:57,190 --> 00:02:55,120  
trying to deal with at some point

86  
00:02:59,270 --> 00:02:57,200  
there's a cumulative effect on you an

87  
00:03:00,710 --> 00:02:59,280  
exhaustion effect a stress effect even

88  
00:03:03,589 --> 00:03:00,720

if you motivate yourself to keep

89

00:03:04,790 --> 00:03:03,599

performing it's very hard to ensure that

90

00:03:05,910 --> 00:03:04,800

you're always going to be fit and

91

00:03:07,990 --> 00:03:05,920

capable

92

00:03:09,430 --> 00:03:08,000

so what do we do about it well

93

00:03:11,030 --> 00:03:09,440

first we need to detect it and that was

94

00:03:12,550 --> 00:03:11,040

really the point of the study part of

95

00:03:13,750 --> 00:03:12,560

what nasa is interested in is whether

96

00:03:15,990 --> 00:03:13,760

this

97

00:03:17,670 --> 00:03:16,000

software on these computers can be used

98

00:03:19,750 --> 00:03:17,680

periodically by the flight docs to just

99

00:03:21,270 --> 00:03:19,760

check an astronaut in the study we

100

00:03:23,350 --> 00:03:21,280

actually have to ask the astronauts to

101

00:03:25,830 --> 00:03:23,360

do it every four days so we get the

102

00:03:27,589 --> 00:03:25,840

database of normative data that we need

103

00:03:29,750 --> 00:03:27,599

to be able to judge

104

00:03:31,509 --> 00:03:29,760

what's normal in space and what isn't

105

00:03:33,589 --> 00:03:31,519

and what the relationships are so if the

106

00:03:35,750 --> 00:03:33,599

sleep's getting shorter in space down

107

00:03:38,309 --> 00:03:35,760

six hours or less five hours or four a

108

00:03:40,309 --> 00:03:38,319

night then we ought to see changes on

109

00:03:42,710 --> 00:03:40,319

the psychomotor vigilance attention task

110

00:03:44,710 --> 00:03:42,720

and we do and we see that on earth and

111

00:03:47,030 --> 00:03:44,720

now we've seen it in space so the point

112

00:03:49,270 --> 00:03:47,040

is that we're showing that the same

113

00:03:51,589 --> 00:03:49,280

phenomena are present in space flight

114

00:03:53,190 --> 00:03:51,599

but then there are additional phenomena

115

00:03:54,550 --> 00:03:53,200

uh that are occurring in space flight

116

00:03:55,990 --> 00:03:54,560

and we'd love to know more about how

117

00:03:58,630 --> 00:03:56,000

those are influencing the overall

118

00:04:00,390 --> 00:03:58,640

fatigue alertness performance matrix so

119

00:04:03,030 --> 00:04:00,400

part of your study

120

00:04:05,509 --> 00:04:03,040

you actually get to go beyond six months

121

00:04:07,830 --> 00:04:05,519

one year that's true and uh the

122

00:04:09,990 --> 00:04:07,840

opportunity for uh to be able to study

123

00:04:12,149 --> 00:04:10,000

uh both an american astronaut and a

124

00:04:13,910 --> 00:04:12,159

russian cosmonaut in the one-year study

125

00:04:15,910 --> 00:04:13,920

was extremely important for the measures

126

00:04:17,909 --> 00:04:15,920

we were taking we're very much

127

00:04:20,069 --> 00:04:17,919

interested in understanding the dynamics

128

00:04:21,909 --> 00:04:20,079

of behavior as things get longer and

129

00:04:23,590 --> 00:04:21,919

most people on earth can relate to this

130

00:04:24,710 --> 00:04:23,600

you know it's one thing

131

00:04:26,150 --> 00:04:24,720

when

132

00:04:28,230 --> 00:04:26,160

your job is

133

00:04:30,070 --> 00:04:28,240

very challenging you got a goal in mind

134

00:04:31,430 --> 00:04:30,080

and your everybody at the workplace is

135

00:04:33,189 --> 00:04:31,440

working for the goal and at the end of

136

00:04:35,270 --> 00:04:33,199

the month it's done

137

00:04:37,830 --> 00:04:35,280

it's quite another when

138

00:04:40,070 --> 00:04:37,840

the goal keeps getting pushed back and

139

00:04:42,550 --> 00:04:40,080

it you know the pace of work can vary

140

00:04:44,310 --> 00:04:42,560

greatly and is often very high tempo and

141

00:04:45,189 --> 00:04:44,320

there's unpredictability in what will

142

00:04:48,230 --> 00:04:45,199

happen

143

00:04:49,670 --> 00:04:48,240

and those sorts of things uh occur in

144

00:04:51,110 --> 00:04:49,680

space flight so you know piece of

145

00:04:53,189 --> 00:04:51,120

equipment will break or there has to be

146

00:04:54,950 --> 00:04:53,199

a space walk or suddenly they change the

147

00:04:56,790 --> 00:04:54,960

operations you got to do a slam shift

148

00:04:58,870 --> 00:04:56,800

now and you didn't have to yesterday and

149

00:05:00,629 --> 00:04:58,880

you hadn't prepared for that and so

150

00:05:02,629 --> 00:05:00,639

there are these unexpected things that

151  
00:05:04,230 --> 00:05:02,639  
occur in space flight and it's important

152  
00:05:06,070 --> 00:05:04,240  
to be able to look at what that's like

153  
00:05:09,350 --> 00:05:06,080  
when they get out even longer and then

154  
00:05:10,950 --> 00:05:09,360  
just time itself time spent in space are

155  
00:05:12,950 --> 00:05:10,960  
they having more and more difficulty

156  
00:05:15,029 --> 00:05:12,960  
sleeping are they having more and more

157  
00:05:16,790 --> 00:05:15,039  
difficulty you know regulating mood or

158  
00:05:18,790 --> 00:05:16,800  
their feelings do they feel the

159  
00:05:20,710 --> 00:05:18,800  
workload's escalating are there stress

160  
00:05:23,189 --> 00:05:20,720  
levels as they report them going up or

161  
00:05:25,270 --> 00:05:23,199  
down so it was an important opportunity

162  
00:05:27,270 --> 00:05:25,280  
and then their cognitive functions to

163  
00:05:29,749 --> 00:05:27,280

just confirm even even if it turned out

164

00:05:31,909 --> 00:05:29,759

we found absolutely no change that would

165

00:05:33,909 --> 00:05:31,919

be hugely valuable in this area it's a

166

00:05:36,550 --> 00:05:33,919

sensitive area we study we're talking

167

00:05:38,790 --> 00:05:36,560

about the brain and behavior and moods

168

00:05:40,710 --> 00:05:38,800

and all that private stuff stress that

169

00:05:43,430 --> 00:05:40,720

most of us would prefer to keep quiet or

170

00:05:45,270 --> 00:05:43,440

between us and our friends or our spouse

171

00:05:46,629 --> 00:05:45,280

but it is an essential thing to know it

172

00:05:48,070 --> 00:05:46,639

in the astronauts and god bless them