
MISSION CONTROL CENTER
PAO

1
00:00:01,256 --> 00:00:02,726
>> Good morning, we're here

2
00:00:02,726 --> 00:00:04,256
in the Space Station
Flight Control Room

3
00:00:04,256 --> 00:00:05,916
and all the activities
are going well,

4
00:00:06,356 --> 00:00:09,206
the [inaudible] crew is working
in the afternoon activities

5
00:00:09,206 --> 00:00:12,386
and one of the big activities,
especially for Karen Nyberg,

6
00:00:12,386 --> 00:00:13,946
Luca Parmitano and
to some degree,

7
00:00:13,946 --> 00:00:17,146
Chris Cassidy has been some
of the first runs as part

8
00:00:17,146 --> 00:00:18,256
of the ocular health study.

9
00:00:18,256 --> 00:00:21,276
So joining us to talk about
that is Dr. Christian Otto,

10
00:00:21,276 --> 00:00:22,586
thank you so much
for joining us.

11
00:00:22,696 --> 00:00:23,256

>> Thank you, Nicole.

12
00:00:23,256 --> 00:00:27,236
>> He's with the United
States Research Association

13
00:00:27,236 --> 00:00:30,126
and he's the principal
investigator for this study

14
00:00:30,426 --> 00:00:32,856
and also the NASA lead
scientist for the VIIP

15
00:00:33,206 --> 00:00:36,236
which I've already forgotten
what that acronym stands

16
00:00:36,236 --> 00:00:37,476
for if you can explain for us.

17
00:00:37,476 --> 00:00:39,646
>> That's the visual impairment
intracranial pressure risk.

18
00:00:40,096 --> 00:00:41,896
>> So a lot going
on in that area.

19
00:00:42,426 --> 00:00:44,716
A lot of our viewers and people

20
00:00:44,716 --> 00:00:47,156
who follow the human spaceflight
program are aware that bone

21
00:00:47,156 --> 00:00:50,836
and muscle loss is a common
issue and we are working on lots

22
00:00:50,836 --> 00:00:51,846
of countermeasures for that.

23
00:00:51,846 --> 00:00:54,596
So some degree, radiation is
something we're always watching

24
00:00:54,596 --> 00:00:58,056
but there's a vision issue
that's kind of a newer topic

25
00:00:58,056 --> 00:00:59,876
that we've been following, can
you tell us just a little bit

26
00:00:59,876 --> 00:01:01,516
about that issue and
how that's come up.

27
00:01:01,806 --> 00:01:03,156
>> Yeah, you're absolutely
right, Nicole,

28
00:01:03,246 --> 00:01:05,426
the visual impairment
intracranial pressure risk is

29
00:01:05,426 --> 00:01:07,546
one of NASA's newest
spaceflight risks

30
00:01:07,546 --> 00:01:11,766
and was actually only
discovered in 2005 when a number

31
00:01:11,766 --> 00:01:17,786
of crewmembers -- one crewmember
developed an eye problem,

32

00:01:17,786 --> 00:01:20,216
it was a minor problem
and it was felt

33
00:01:20,216 --> 00:01:22,296
that it was perhaps a
one off but subsequently,

34
00:01:22,296 --> 00:01:24,926
another U.S. crewmember
developed the same sort

35
00:01:24,926 --> 00:01:28,046
of problem and so with
the two individuals,

36
00:01:28,156 --> 00:01:30,456
there was some question in
terms of why this was happening

37
00:01:30,456 --> 00:01:33,376
and so subsequent
investigation found

38
00:01:33,516 --> 00:01:36,266
that this was an abnormality
that hadn't been seen before

39
00:01:36,266 --> 00:01:38,076
and since then, several
crewmembers --

40
00:01:38,076 --> 00:01:41,636
in fact, we're actually up to
19 crewmembers now who fall

41
00:01:41,636 --> 00:01:43,196
within the visual
impairment intracranial

42

00:01:43,196 --> 00:01:45,216
pressure classification.

43
00:01:45,636 --> 00:01:52,016
So we now have a fairly robust
program in terms of monitoring

44
00:01:52,016 --> 00:01:54,836
and trying to characterize
this newest risk.

45
00:01:55,926 --> 00:01:58,276
>> So tell us a little bit about
this study that's been developed

46
00:01:58,276 --> 00:01:59,776
to look at that and
understand it more.

47
00:02:00,736 --> 00:02:02,706
>> Yeah, so the visual
impairment intracranial pressure

48
00:02:02,706 --> 00:02:04,826
risk really involves the
cardiovascular system,

49
00:02:04,826 --> 00:02:07,006
the central nervous system
or the brain and the eye

50
00:02:07,146 --> 00:02:09,676
and the eye is how it first
manifested the symptoms

51
00:02:09,676 --> 00:02:10,226
that we've seen.

52
00:02:10,226 --> 00:02:14,346
So the prospect of observational

study of ocular health

53
00:02:14,346 --> 00:02:21,116
in ISS crews is our first
formal take at doing a study

54
00:02:21,116 --> 00:02:23,706
over the next few years
on ISS crewmembers

55
00:02:23,996 --> 00:02:28,016
to document systematically
their eye health.

56
00:02:28,126 --> 00:02:29,996
We are getting some
indirect measures

57
00:02:29,996 --> 00:02:32,086
of the intracranial pressure

58
00:02:32,086 --> 00:02:34,556
which we feel is
also an issue here.

59
00:02:35,046 --> 00:02:37,506
Our hypothesis is that the
intracranial pressure's actually

60
00:02:37,506 --> 00:02:42,026
elevated in flight due to the
fluid shift in zero gravity.

61
00:02:42,776 --> 00:02:45,966
And so we have a number
of tests that we're doing,

62
00:02:45,966 --> 00:02:48,576
many of these tests are similar
to what people might get either

63
00:02:48,576 --> 00:02:51,536
at their family physician's
office or at the ophthalmologist

64
00:02:51,536 --> 00:02:55,226
and for example, Karen
Nyberg and Luca Parmitano,

65
00:02:55,226 --> 00:02:57,146
two crewmembers who
are on orbit right now,

66
00:02:57,146 --> 00:02:59,426
a number of tests have
been done this week,

67
00:02:59,556 --> 00:03:04,146
in particular fundoscopy
which is like ophthalmoscopy

68
00:03:04,146 --> 00:03:05,866
so when you go to the doctor's
office, they look in the back

69
00:03:05,866 --> 00:03:08,326
of your eye, that's exactly what
we're doing with the crewmembers

70
00:03:08,726 --> 00:03:10,516
to get a really good view
at the back of the eye.

71
00:03:10,516 --> 00:03:13,086
And there's particular
area that we're interested

72
00:03:13,086 --> 00:03:15,956
in which is the retina where
all the nerves are, the rods

73
00:03:15,956 --> 00:03:17,676
and cones, et cetera,
that receive the light.

74
00:03:17,676 --> 00:03:19,486
And we've seen some
abnormalities there.

75
00:03:20,256 --> 00:03:22,556
In addition to that,
we're doing tonometry

76
00:03:22,676 --> 00:03:24,426
which is measuring the
pressure in the eye

77
00:03:24,786 --> 00:03:27,536
so it's a small device
that you tap the eye,

78
00:03:27,676 --> 00:03:29,636
the crewmember receives
anesthetic

79
00:03:29,636 --> 00:03:31,966
so it numbs the eye just
temporarily and we're able

80
00:03:31,966 --> 00:03:33,936
to get a pressure
on the eye as well

81
00:03:33,936 --> 00:03:36,546
and there's certain diseases
on earth, such as glaucoma

82
00:03:36,936 --> 00:03:38,466
that involve high pressures.

83
00:03:38,996 --> 00:03:42,686
And the sum of the data that med
ops has received so far shows

84
00:03:42,686 --> 00:03:44,416
that there isn't abnormally high

85
00:03:44,416 --> 00:03:48,446
or abnormally low intraocular
pressure but we are seeing --

86
00:03:48,836 --> 00:03:51,206
we'd like to know, does
it drift down or drift up.

87
00:03:51,206 --> 00:03:53,966
So that's another thing that the
ocular health study is trying

88
00:03:53,966 --> 00:03:56,426
to do is to characterize
what's happening to the eye

89
00:03:56,426 --> 00:03:57,956
over a six month increment.

90
00:04:01,486 --> 00:04:05,026
Yes we do, so there's
a video that looks

91
00:04:05,026 --> 00:04:07,366
at the VIIP working hypothesis
and I think we can run

92
00:04:07,366 --> 00:04:11,686
that for you now and so what the
viewers hopefully are seeing is

93
00:04:11,996 --> 00:04:15,736

you've got a schematic of
the vascular system in 1G

94
00:04:15,736 --> 00:04:17,506
and this is normal
fluid movement.

95
00:04:17,996 --> 00:04:21,336
Now when you go to the zero G
environment, as we mentioned,

96
00:04:21,336 --> 00:04:23,026
there's that cephalide
fluid shifter,

97
00:04:23,306 --> 00:04:24,816
the fluids move towards the head

98
00:04:24,816 --> 00:04:26,486
because gravity's
no longer pulling

99
00:04:26,486 --> 00:04:28,806
that down towards the legs.

100
00:04:29,906 --> 00:04:34,496
And what you see is this shift
of fluid towards the head,

101
00:04:34,496 --> 00:04:39,446
it causes essentially blood to
pool to a degree in the head

102
00:04:39,446 --> 00:04:42,356
and in the brain and this raises
the intracranial pressure.

103
00:04:42,786 --> 00:04:44,766
And what's interesting,
that pressure communicates

104
00:04:44,766 --> 00:04:47,096
with the back of the
eye and as you can see

105
00:04:47,096 --> 00:04:50,376
in the schematic here, that
actually presses on the back

106
00:04:50,376 --> 00:04:52,996
of the eye, it changes the
characteristics of the eye,

107
00:04:53,316 --> 00:04:55,436
it changes the vision
of the crewmember.

108
00:04:55,436 --> 00:04:57,886
We've seen changes
in vision in a large,

109
00:04:57,886 --> 00:05:00,466
very large number
of crewmembers.

110
00:05:00,846 --> 00:05:03,276
And in fact, the
ophthalmologists refer to this

111
00:05:03,276 --> 00:05:06,036
as a diopter change or a
change in the optical power

112
00:05:06,036 --> 00:05:09,296
such that they don't
see things as well near

113
00:05:09,386 --> 00:05:10,996
but they retain their
far vision.

114
00:05:11,216 --> 00:05:17,346
And in fact, one crewmembers has
developed scotoma which is a --

115
00:05:17,346 --> 00:05:18,746
it was a temporary blind spot.

116
00:05:18,746 --> 00:05:21,086
And you can imagine
the challenge of that

117
00:05:21,086 --> 00:05:23,176
when you're trying to read
check lists and so on.

118
00:05:23,936 --> 00:05:26,466
>> Absolutely, so it's
definitely a serious issue

119
00:05:26,466 --> 00:05:27,736
and one that's being looked at

120
00:05:27,736 --> 00:05:28,846
and these are the
first crewmembers

121
00:05:28,846 --> 00:05:30,256
to be participating
in this study.

122
00:05:30,566 --> 00:05:32,216
How long do you foresee
this going on?

123
00:05:32,216 --> 00:05:34,556
Is it going to be several
crews, several years?

124

00:05:34,896 --> 00:05:37,746
>> Yeah, we're very
excited; in fact,

125
00:05:37,746 --> 00:05:40,116
Karen and Luca are the first
crewmembers participating

126
00:05:40,116 --> 00:05:40,626
in the study.

127
00:05:40,706 --> 00:05:43,746
We've spent the past two years
putting this study together.

128
00:05:44,096 --> 00:05:49,126
We are aiming for 12 crewmembers
and we've had 4 crewmembers sign

129
00:05:49,126 --> 00:05:51,216
up so there's a lot of
interest amongst the astronaut,

130
00:05:51,216 --> 00:05:52,116
as you can imagine.

131
00:05:52,446 --> 00:05:55,206
We've got international
partner participation

132
00:05:55,206 --> 00:05:58,866
so we expect the study to be
running for the next four years,

133
00:05:58,866 --> 00:05:59,786
as we collect the data.

134
00:05:59,786 --> 00:06:02,016
So we're very excited to
see this data as it comes

135
00:06:02,016 --> 00:06:06,106
down in the various parameters
and get a better understanding

136
00:06:06,106 --> 00:06:07,926
of what's happening
in spaceflight

137
00:06:08,086 --> 00:06:09,836
to the cardiovascular,
the central nervous system

138
00:06:09,836 --> 00:06:11,876
and the eye so that we can
develop countermeasures

139
00:06:12,236 --> 00:06:14,386
because there's probably a
dose response so the longer

140
00:06:14,386 --> 00:06:15,316
that you're in flight,

141
00:06:15,536 --> 00:06:17,346
it's likely the worse
this problem gets.

142
00:06:17,346 --> 00:06:19,066
And as you know, moving
towards a one year mission,

143
00:06:19,066 --> 00:06:19,926
that's of great concern.

144
00:06:20,656 --> 00:06:22,206
>> Absolutely it's
something that they want

145

00:06:22,366 --> 00:06:24,076
to have a good understanding
for,

146
00:06:24,076 --> 00:06:25,876
especially before we
do any longer missions.

147
00:06:26,386 --> 00:06:30,166
And my understanding is the
runs today are just the first

148
00:06:30,166 --> 00:06:32,896
in I think a series of six
for each of these tests?

149
00:06:33,366 --> 00:06:37,096
>> Yeah that's right, so we
-- with many of the tests,

150
00:06:37,096 --> 00:06:39,676
medical operations, they
already do these tests,

151
00:06:39,676 --> 00:06:41,416
in fact they do it
three times in flight

152
00:06:42,076 --> 00:06:45,646
so the ocular health study
aims to increase the number

153
00:06:45,646 --> 00:06:48,126
of data takes, so
approximately once per month

154
00:06:48,256 --> 00:06:49,826
or six times during a mission

155
00:06:49,826 --> 00:06:52,106

so that will give us a
much more accurate picture

156
00:06:52,106 --> 00:06:53,006
of what's happening.

157
00:06:53,286 --> 00:06:56,276
We're also doing it preflight
and we're doing it post flight.

158
00:06:56,276 --> 00:07:00,206
We've added three additional
measures post flight for four

159
00:07:00,206 --> 00:07:02,696
in total, which will allow
us to follow the crewmember

160
00:07:02,696 --> 00:07:05,386
for one year post flight
because we're finding

161
00:07:05,386 --> 00:07:08,126
that they're not returning to
normal as quickly as we would

162
00:07:08,126 --> 00:07:10,086
like and in some cases,
there are abnormalities

163
00:07:10,086 --> 00:07:11,326
that are persisting for years.

164
00:07:12,386 --> 00:07:14,826
>> And also the tonometry
and the fundoscopy

165
00:07:14,826 --> 00:07:17,956
that they're doing today, that's
only two of the different types

166
00:07:17,956 --> 00:07:19,716
of things that it seem
like as part of the study,

167
00:07:19,716 --> 00:07:23,096
there's actually a whole myriad
of different types of exams

168
00:07:23,096 --> 00:07:24,596
that you're doing to
collect the [inaudible].

169
00:07:24,596 --> 00:07:26,086
>> Yeah, you're absolutely
right,

170
00:07:26,086 --> 00:07:27,926
so those are the tests
scheduled for today.

171
00:07:28,436 --> 00:07:31,776
Tomorrow, I believe, we'll
be doing ocular ultrasound

172
00:07:31,896 --> 00:07:33,806
and this is a very
important test for us

173
00:07:33,806 --> 00:07:36,546
because it actually
gives some indirect sense

174
00:07:36,596 --> 00:07:39,496
for what's happening to
intracranial pressure

175
00:07:39,496 --> 00:07:42,746
so we don't get a number but we
see changes that are consistent

176
00:07:43,406 --> 00:07:45,616
with elevations to intracranial
pressure so the back

177
00:07:45,616 --> 00:07:48,716
of the eye gets flattened, we
call that globe flattening.

178
00:07:49,096 --> 00:07:51,716
We see widening, there's
something called the optic nerve

179
00:07:51,716 --> 00:07:54,176
sheet that widens as pressure
goes up and these are things

180
00:07:54,176 --> 00:07:55,746
that we measure with
the ultrasounds

181
00:07:55,746 --> 00:07:56,686
and that's very important.

182
00:07:57,036 --> 00:07:59,396
We're also doing
ultrasound of the heart

183
00:08:00,066 --> 00:08:01,636
and taking blood
pressure and what

184
00:08:01,676 --> 00:08:03,726
that gives us is
something called compliance

185
00:08:03,726 --> 00:08:06,906
or the elasticity of the
blood vessels 'cause we think

186
00:08:06,906 --> 00:08:09,656
that crewmembers have
more elastic blood vessels

187
00:08:09,656 --> 00:08:11,006
or actually they have a --

188
00:08:11,106 --> 00:08:13,826
they're more protected
against the visual impairment

189
00:08:13,826 --> 00:08:15,616
intracranial pressure
problem, whereas those

190
00:08:15,616 --> 00:08:18,736
with stiffer vessels,
for example, crew members

191
00:08:18,736 --> 00:08:19,866
who have higher blood pressure,

192
00:08:19,866 --> 00:08:22,076
they have elevated
blood cholesterol,

193
00:08:22,196 --> 00:08:24,306
elevated blood sugar and so on,

194
00:08:24,726 --> 00:08:26,806
their vessels would
be a little more stiff

195
00:08:26,806 --> 00:08:29,006
and we're finding those
individuals are more severely

196
00:08:29,006 --> 00:08:31,436
affected by VIIP so

that's another measure

197
00:08:31,436 --> 00:08:32,186
that we're doing.

198
00:08:32,846 --> 00:08:37,246
We talked about tonometry, we
have a new device that will be

199
00:08:37,246 --> 00:08:40,366
on station that we hope to add
to the ocular health study,

200
00:08:40,366 --> 00:08:42,656
it's called ocular
coherence tomography

201
00:08:42,916 --> 00:08:47,076
which is a very high
resolution ultrasound that looks

202
00:08:47,076 --> 00:08:51,376
at the retina so really focuses
in on that part of the back

203
00:08:51,736 --> 00:08:54,186
of the eye that we're
very interested in.

204
00:08:54,846 --> 00:08:57,956
>> Also, I wanted to ask, it
sounds like for the runs today,

205
00:08:58,516 --> 00:09:01,176
the crewmembers are being
supported by medical experts

206
00:09:01,176 --> 00:09:02,726
that are helping
with any questions

207
00:09:02,726 --> 00:09:03,786
and monitoring all this,

208
00:09:04,256 --> 00:09:05,906
what kind of team do you
have that's supporting the

209
00:09:05,906 --> 00:09:06,566
activities today?

210
00:09:07,096 --> 00:09:11,276
>> Yeah as you know, it's
always a significant number

211
00:09:11,276 --> 00:09:13,236
of individuals supporting
efforts like this

212
00:09:13,236 --> 00:09:16,406
so we have a very large team;

213
00:09:16,626 --> 00:09:19,836
ISSMP has helped
organize this experiment.

214
00:09:19,836 --> 00:09:21,446
For in flight, as you
know, there are a number

215
00:09:21,446 --> 00:09:23,416
of biomedical engineers
supporting this

216
00:09:23,416 --> 00:09:28,316
and we also have subject matter
experts so optometrists who are

217
00:09:28,316 --> 00:09:30,726

in observing while the tonometry

218
00:09:30,726 --> 00:09:35,206
and the other studies
are being done.

219
00:09:35,206 --> 00:09:39,096
So they will sit in while
these experiments are performed

220
00:09:39,096 --> 00:09:41,896
and ensure that the clinical
exam is performed properly.

221
00:09:42,246 --> 00:09:44,556
The fundoscopy, for example,
that's getting a picture

222
00:09:44,556 --> 00:09:47,266
of the back of the eye and the
retina, we need to make sure

223
00:09:47,266 --> 00:09:50,946
that we've got the right portion
of the eye, that it's in focus,

224
00:09:50,946 --> 00:09:53,406
that we've got the
image of interest

225
00:09:53,406 --> 00:09:55,416
and so that's why the subject
matter experts are there

226
00:09:55,416 --> 00:09:56,806
and of course the
biomedical engineers,

227
00:09:56,806 --> 00:09:58,376
they've got to know how

to work these tests.

228
00:09:58,646 --> 00:10:02,626
And you know, for your viewers,
there's a real science in terms

229
00:10:02,626 --> 00:10:04,986
of being able to direct
individuals to, you know,

230
00:10:04,986 --> 00:10:07,806
capture these very clinical
tests that, you know,

231
00:10:07,806 --> 00:10:10,606
usually expert MDs
are normally acquiring

232
00:10:10,606 --> 00:10:13,266
so NASA does an amazing
at that sort of thing.

233
00:10:13,266 --> 00:10:14,506
>> I was going to mention

234
00:10:14,506 --> 00:10:17,016
that they probably had
extensive preflight training

235
00:10:17,016 --> 00:10:17,946
on all of this as well.

236
00:10:18,766 --> 00:10:24,706
>> Oh yes, yes; many hundreds of
hours go into training the BMEs

237
00:10:24,766 --> 00:10:27,286
and they do a wonderful
job in acquiring this data

238
00:10:27,286 --> 00:10:30,066
and it's really thanks to
the whole team's efforts

239
00:10:30,066 --> 00:10:31,616
that we can accomplish
studies like this.

240
00:10:32,356 --> 00:10:34,296
>> This is all really
fascinating,

241
00:10:34,296 --> 00:10:35,996
you touched on a lot
of different factors

242
00:10:35,996 --> 00:10:38,116
that you're looking at to
help understand this issue

243
00:10:38,486 --> 00:10:41,356
but I'm understanding there's
some possible, you know,

244
00:10:42,136 --> 00:10:44,816
benefits for people on earth
as well, the primary focus

245
00:10:44,816 --> 00:10:47,216
of course is to resolve
this for spaceflight

246
00:10:47,216 --> 00:10:50,236
but there could be potential
benefits for human beings

247
00:10:50,236 --> 00:10:51,596
with various vision
issues as well.

248
00:10:51,926 --> 00:10:53,526
>> Yeah, that's one
of the great things

249
00:10:53,526 --> 00:10:57,156
about doing medical
operations in a spaceflight is

250
00:10:57,156 --> 00:11:01,076
that we're really pushing
the envelope in terms of the,

251
00:11:01,696 --> 00:11:04,366
you know, our techniques,
how we're using technology

252
00:11:04,366 --> 00:11:06,896
because we're sort of limited,
we don't have an MRI scanner

253
00:11:06,896 --> 00:11:09,116
on space station, et
cetera, so we really have

254
00:11:09,116 --> 00:11:12,336
to utilize the tools
that we have in a way

255
00:11:12,336 --> 00:11:18,436
that is not always done on earth
but also with this new problem,

256
00:11:18,506 --> 00:11:20,116
we're gaining information

257
00:11:20,116 --> 00:11:22,916
that can be applied
to diseases on earth.

258

00:11:22,916 --> 00:11:26,056
I mentioned one earlier,
glaucoma so for example,

259
00:11:26,256 --> 00:11:28,966
by measuring the pressure
in the eye and we are hoping

260
00:11:28,966 --> 00:11:32,656
to have a means of measuring
pressure in the brain on station

261
00:11:32,656 --> 00:11:34,976
at some point, it's
that pressure difference

262
00:11:34,976 --> 00:11:38,766
across the retina that causes
the problems that we're seeing

263
00:11:38,956 --> 00:11:41,296
and that has tremendous
benefits if we have a way

264
00:11:41,296 --> 00:11:45,216
of measuring those pressure to
clinical problems here on earth,

265
00:11:45,216 --> 00:11:46,816
for example, glaucoma.

266
00:11:47,136 --> 00:11:48,196
There's another problem

267
00:11:48,196 --> 00:11:51,456
of raised intracranial pressure
called idiopathic intracranial

268
00:11:51,456 --> 00:11:55,186
hypertension so -- and

that's very similar

269
00:11:55,186 --> 00:11:56,886
to what we're seeing in space

270
00:11:56,886 --> 00:11:59,026
and developing techniques
to image that.

271
00:11:59,296 --> 00:12:04,456
In fact, one of our experts
is publishing guidelines

272
00:12:04,456 --> 00:12:08,016
that will be used terrestrially
so they're already --

273
00:12:08,016 --> 00:12:11,506
we're already seeing spinoffs
in terms of the VIIP problem

274
00:12:11,506 --> 00:12:13,876
and how that relates to benefits

275
00:12:13,876 --> 00:12:15,456
of the clinical problems
on earth.

276
00:12:16,566 --> 00:12:18,106
>> Well again, this is
all really fascinating.

277
00:12:18,106 --> 00:12:20,496
Thank you so much for
sharing with us, you know,

278
00:12:20,596 --> 00:12:23,546
everything that's gone into this
and we'll be following along

279
00:12:23,546 --> 00:12:24,406
with this study of course

280
00:12:24,406 --> 00:12:26,176
and this is just
another good example

281
00:12:26,176 --> 00:12:28,616
of the space station serving
as a platform for learning more

282
00:12:28,616 --> 00:12:31,136
about spaceflight and
helping us go further

283
00:12:31,136 --> 00:12:32,496
and maybe helping
people on earth

284
00:12:32,496 --> 00:12:33,086
as well; thanks [inaudible].

285
00:12:33,086 --> 00:12:34,126
>> My pleasure, thank Nicole.

286
00:12:34,126 --> 00:12:36,246
>> Really appreciate it; again,
that's Dr. Christian Otto,

287
00:12:36,246 --> 00:12:38,636
the principal investigator
for the ocular health study

288
00:12:39,016 --> 00:12:41,506
which is a primary activity for
some of the crewmembers today