1
00:00:18,070 --> 00:00:15,749
it's all about matters of the heart hi

2
00:00:20,550 --> 00:00:18,080
i'm nasa astronaut tracy dyson welcome

3
00:00:22,950 --> 00:00:20,560
to station life the focus of today's

4
00:00:25,830 --> 00:00:22,960
show is on matters of the heart as they

5
00:00:27,750 --> 00:00:25,840
relate to good cardiovascular health

6
00:00:30,310 --> 00:00:27,760
we'll take a look at how nasa keeps

7
00:00:31,669 --> 00:00:30,320
astronauts hearts healthy off the earth

8
00:00:33,110 --> 00:00:31,679
and we'll take a look at some of the

9
00:00:35,030 --> 00:00:33,120
research being done aboard the

10
00:00:51,189 --> 00:00:35,040
international space station that can

11
00:00:55,750 --> 00:00:53,430
cardiovascular disease including heart

12
00:00:57,590 --> 00:00:55,760
disease stroke and high blood pressure

13
00:00:59,430 --> 00:00:57,600

is the number one killer of men and

14
00:01:01,750 --> 00:00:59,440
women across america

15
00:01:03,830 --> 00:01:01,760
fortunately many studies have shown that

16
00:01:05,750 --> 00:01:03,840
healthy habits including good nutrition

17
00:01:07,910 --> 00:01:05,760
and exercise are important for

18
00:01:08,789 --> 00:01:07,920
maintaining a healthy heart here on

19
00:01:10,710 --> 00:01:08,799
earth

20
00:01:12,550 --> 00:01:10,720
those habits are even more important for

21
00:01:14,149 --> 00:01:12,560
astronauts on the international space

22
00:01:16,550 --> 00:01:14,159
station

23
00:01:19,109 --> 00:01:16,560
living in microgravity for six months

24
00:01:21,510 --> 00:01:19,119
changes our bodies in a number of ways

25
00:01:23,990 --> 00:01:21,520
without gravity we lose bone mineral

26
00:01:27,030 --> 00:01:24,000
density our muscles atrophy and our

27
00:01:29,109 --> 00:01:27,040
cardiovascular system gets weaker

28
00:01:31,670 --> 00:01:29,119
some of our studies have shown that in

29
00:01:33,429 --> 00:01:31,680
space the size and shape of our hearts

30
00:01:35,109 --> 00:01:33,439
may actually change

31
00:01:37,270 --> 00:01:35,119
which could make it difficult to do our

32
00:01:39,350 --> 00:01:37,280
jobs when we get back to earth or even

33
00:01:42,069 --> 00:01:39,360
land on mars

34
00:01:43,670 --> 00:01:42,079
on earth our heart and blood vessels are

35
00:01:45,830 --> 00:01:43,680
well adapted to work against the

36
00:01:48,230 --> 00:01:45,840
downward pull of gravity

37
00:01:49,910 --> 00:01:48,240
in space however there's a tendency for

38
00:01:52,069 --> 00:01:49,920

blood and other bodily fluids to

39
00:01:53,270 --> 00:01:52,079
accumulate in the upper body

40
00:01:55,830 --> 00:01:53,280
let's take a look at one of the

41
00:01:57,590 --> 00:01:55,840
consequences of this fluid shift

42
00:01:59,670 --> 00:01:57,600
we have recently identified that some

43
00:02:01,190 --> 00:01:59,680
astronauts experience changes in their

44
00:02:03,109 --> 00:02:01,200
vision which might be related to the

45
00:02:05,030 --> 00:02:03,119
cardiovascular system

46
00:02:06,789 --> 00:02:05,040
our hearts pump blood around our body

47
00:02:08,630 --> 00:02:06,799
through blood vessels special

48
00:02:10,710 --> 00:02:08,640
adaptations in our bodies ensure that

49
00:02:13,589 --> 00:02:10,720
fluid is evenly distributed despite the

50
00:02:17,670 --> 00:02:15,830
in space astronauts no longer experience

51
00:02:19,190 --> 00:02:17,680
the downward pull of gravity and the

52
00:02:22,070 --> 00:02:19,200
fluid in their bodies tends to move

53
00:02:24,309 --> 00:02:22,080
towards the upper body and the head

54
00:02:25,990 --> 00:02:24,319
our cranium is a rigid container as the

55
00:02:28,070 --> 00:02:26,000
fluid moves towards the head it causes

56
00:02:30,150 --> 00:02:28,080
the pressure inside the skull to rise

57
00:02:31,350 --> 00:02:30,160
this is known as increased intracranial

58
00:02:33,270 --> 00:02:31,360
pressure

59
00:02:35,430 --> 00:02:33,280
the optic nerve travels from the brain

60
00:02:37,190 --> 00:02:35,440
to the eye the increased pressure from

61
00:02:39,430 --> 00:02:37,200
the cranium travels down the nerve and

62
00:02:41,589 --> 00:02:39,440
affects the eye it causes the optic

63
00:02:43,430 --> 00:02:41,599

nerve to be squeezed in the optic disc

64
00:02:45,750 --> 00:02:43,440
where the optic nerve meets the eye to

65
00:02:47,509 --> 00:02:45,760
swell the back of the eyeball flattens

66
00:02:49,110 --> 00:02:47,519
as pressure builds behind it and the

67
00:02:50,869 --> 00:02:49,120
blood vessels in the back of the eyeball

68
00:02:52,710 --> 00:02:50,879
also swell

69
00:02:55,030 --> 00:02:52,720
these changes can affect the astronaut's

70
00:02:57,190 --> 00:02:55,040
vision one change is that the astronauts

71
00:02:59,350 --> 00:02:57,200
become farsighted a second change is

72
00:03:01,190 --> 00:02:59,360
that they can develop cotton wool spots

73
00:03:03,350 --> 00:03:01,200
which represent damage of the nerve

74
00:03:07,350 --> 00:03:03,360
fibers in the back of the eye these can

75
00:03:08,790 --> 00:03:07,360
cause discrete areas of vision loss

76
00:03:10,390 --> 00:03:08,800
nasa is working to understand and

77
00:03:12,070 --> 00:03:10,400
prevent these changes in astronauts

78
00:03:14,229 --> 00:03:12,080
which may also help us understand and

79
00:03:40,390 --> 00:03:14,239
prevent related vision changes here on

80
00:03:44,550 --> 00:03:42,390
one of the tools we have to study heart

81
00:03:46,869 --> 00:03:44,560
health aboard the space station is an

82
00:03:49,030 --> 00:03:46,879
ultrasound device which uses harmless

83
00:03:50,309 --> 00:03:49,040
sound waves to take images of the inside

84
00:03:52,470 --> 00:03:50,319
of our bodies

85
00:03:54,869 --> 00:03:52,480
those images can be viewed at the same

86
00:03:56,309 --> 00:03:54,879
time by researchers and doctors in

87
00:03:58,470 --> 00:03:56,319
mission control

88
00:04:00,630 --> 00:03:58,480

with minimal training on the ultrasound

89
00:04:03,350 --> 00:04:00,640
remote guidance techniques developed by

90
00:04:05,589 --> 00:04:03,360
nasa enabled astronauts to take detailed

91
00:04:07,670 --> 00:04:05,599
images of their own heart

92
00:04:09,830 --> 00:04:07,680
in our next segment we'll travel to a

93
00:04:11,589 --> 00:04:09,840
small community in brazil that has

94
00:04:13,670 --> 00:04:11,599
benefited from remote medicine

95
00:04:15,750 --> 00:04:13,680
techniques that were advanced by the

96
00:04:28,310 --> 00:04:15,760
research aboard the international space

97
00:04:32,230 --> 00:04:30,469
is a large state

98
00:04:35,510 --> 00:04:32,240
our territory is about the size of

99
00:04:38,070 --> 00:04:35,520
france and we consist of 853 units and

100
00:04:39,909 --> 00:04:38,080
municipalities

101
00:04:42,550 --> 00:04:39,919
there are large distances between our

102
00:04:48,390 --> 00:04:42,560
communities and many very isolated rural

103
00:04:52,469 --> 00:04:50,629
we are using new technology that impacts

104
00:04:54,870 --> 00:04:52,479
the quality of prenatal care and the

105
00:04:56,710 --> 00:04:54,880
diagnostic capacity of the primary care

106
00:05:05,590 --> 00:04:56,720
doctor in these situations involving

107
00:05:10,310 --> 00:05:07,830
providing medical care for people in

108
00:05:12,230 --> 00:05:10,320
remote locations like distant rural

109
00:05:14,070 --> 00:05:12,240
communities or the international space

110
00:05:16,310 --> 00:05:14,080
station can be difficult

111
00:05:19,110 --> 00:05:16,320
because trained medical personnel are

112
00:05:21,830 --> 00:05:19,120
not always available

113
00:05:24,150 --> 00:05:21,840

nasa research teams develop techniques

114
00:05:26,870 --> 00:05:24,160
that enable astronauts aboard the space

115
00:05:29,270 --> 00:05:26,880
station with minimal training to operate

116
00:05:32,230 --> 00:05:29,280
an ultrasound device using simple

117
00:05:37,749 --> 00:05:35,110
the ultrasound images are transmitted in

118
00:05:39,670 --> 00:05:37,759
real time to a doctor back on earth who

119
00:05:43,029 --> 00:05:39,680
can make medical decisions without

120
00:05:44,870 --> 00:05:43,039
actually being aboard the station

121
00:05:47,830 --> 00:05:44,880
these same techniques have been adapted

122
00:05:50,070 --> 00:05:47,840
for use with portable ultrasound devices

123
00:05:56,790 --> 00:05:50,080
in communities where expert medical care

124
00:06:00,790 --> 00:05:58,710
we are also incorporating the first aid

125
00:06:02,870 --> 00:06:00,800
and emergency care components improving

126
00:06:04,710 --> 00:06:02,880
first aid at the scene of the accident

127
00:06:06,469 --> 00:06:04,720
and enabling the use of ultrasound to

128
00:06:12,550 --> 00:06:06,479
communicate to the medical communication

129
00:06:16,230 --> 00:06:14,550
in the ambulance we can use ultrasound

130
00:06:17,990 --> 00:06:16,240
in various situations

131
00:06:20,150 --> 00:06:18,000
in those situations where time really

132
00:06:25,350 --> 00:06:20,160
matters in which you have little time to

133
00:06:29,110 --> 00:06:27,189
the idea of using ultrasound for

134
00:06:31,430 --> 00:06:29,120
healthcare is like an extension of the

135
00:06:33,430 --> 00:06:31,440
physical examination

136
00:06:35,749 --> 00:06:33,440
you are able to conduct the exam with

137
00:06:37,510 --> 00:06:35,759
much more detail

138
00:06:39,830 --> 00:06:37,520

and you can use it at the time to make a

139
00:06:41,909 --> 00:06:39,840
decision or you can use telemedicine

140
00:07:00,790 --> 00:06:41,919
platforms to obtain a second opinion

141
00:07:00,800 --> 00:07:06,950
and that is isolation

142
00:07:10,950 --> 00:07:09,029
we have a geographical barrier that is

143
00:07:13,029 --> 00:07:10,960
the san francisco river

144
00:07:19,189 --> 00:07:13,039
which is both a blessing for the region

145
00:07:22,390 --> 00:07:20,629
we live in a region where financial

146
00:07:24,309 --> 00:07:22,400
resources are few

147
00:07:26,469 --> 00:07:24,319
people do not have a lot of work but

148
00:07:28,790 --> 00:07:26,479
they are honest good people who do not

149
00:07:30,790 --> 00:07:28,800
have much opportunity

150
00:07:33,029 --> 00:07:30,800
so there are many needy people who need

151
00:07:37,670 --> 00:07:33,039
these resources and rely only on this

152
00:07:51,430 --> 00:07:39,830
this is a technology that helps us solve

153
00:07:55,350 --> 00:07:53,110
that was the case of a patient who came

154
00:07:57,350 --> 00:07:55,360
to the hospital with severe respiratory

155
00:08:01,110 --> 00:07:57,360
failure and the people realized she

156
00:08:03,510 --> 00:08:01,120
would die in just 20 to 30 minutes

157
00:08:06,230 --> 00:08:03,520
we ran we talked with dr parzelli who

158
00:08:08,070 --> 00:08:06,240
was training us to use the ultrasound he

159
00:08:10,390 --> 00:08:08,080
came and applied the ultrasound and

160
00:08:13,029 --> 00:08:10,400
discovered large amounts of fluid around

161
00:08:16,150 --> 00:08:13,039
her lungs and heart we performed the

162
00:08:18,629 --> 00:08:16,160
procedure and drained a lot of fluids

163
00:08:20,710 --> 00:08:18,639

in 20 minutes 10 minutes the woman

164
00:08:23,670 --> 00:08:20,720
immediately experienced an improvement

165
00:08:27,749 --> 00:08:23,680
and in half an hour was already walking

166
00:08:29,670 --> 00:08:27,759
it was like a miracle a rise and walk

167
00:08:34,070 --> 00:08:29,680
she was dying in front of us without

168
00:09:01,509 --> 00:08:36,790
this ultrasound was instrumental in

169
00:09:05,269 --> 00:09:03,430
all right ladies and gentlemen boys and

170
00:09:08,310 --> 00:09:05,279
girls space geeks from all over the

171
00:09:11,990 --> 00:09:08,320
world we have with us today a real treat

172
00:09:15,190 --> 00:09:12,000
dr koichi wakata from the japanese space

173
00:09:16,470 --> 00:09:15,200
agency and absolutely one of my favorite

174
00:09:18,310 --> 00:09:16,480
astronauts

175
00:09:20,389 --> 00:09:18,320
actually in fact wait a minute

176
00:09:21,910 --> 00:09:20,399
i have a list right here and i want to

177
00:09:24,389 --> 00:09:21,920
prove it

178
00:09:26,150 --> 00:09:24,399
oh great note tc's top 10 heroes of

179
00:09:28,630 --> 00:09:26,160
space travel look

180
00:09:30,949 --> 00:09:28,640
wow he's on there welcome quiche good to

181
00:09:33,269 --> 00:09:30,959
see you tracy here nice to see you too

182
00:09:35,350 --> 00:09:33,279
thank you for joining us on station life

183
00:09:37,990 --> 00:09:35,360
my pleasure you're always watching your

184
00:09:40,230 --> 00:09:38,000
program really glad to be here oh wow

185
00:09:41,990 --> 00:09:40,240
did you hear that i'm so excited that

186
00:09:43,509 --> 00:09:42,000
you i'm actually honored that you that

187
00:09:45,030 --> 00:09:43,519
you watch our show

188
00:09:46,150 --> 00:09:45,040

it's all about the space station you

189
00:09:47,829 --> 00:09:46,160
know yes

190
00:09:49,829 --> 00:09:47,839
yes this is wonderful to be able to

191
00:09:51,670 --> 00:09:49,839
explain how wonderful it is to to work

192
00:09:54,070 --> 00:09:51,680
and live on with the space station yes

193
00:09:56,230 --> 00:09:54,080
and then today what are we talking about

194
00:09:58,790 --> 00:09:56,240
today we're talking about cardiovascular

195
00:10:00,710 --> 00:09:58,800
health awesome yes and uh you know a

196
00:10:03,590 --> 00:10:00,720
thing or two about that

197
00:10:05,269 --> 00:10:03,600
yes we do exercise pretty much every day

198
00:10:07,750 --> 00:10:05,279
i was going to ask you on board did you

199
00:10:10,550 --> 00:10:07,760
work out every single day

200
00:10:13,590 --> 00:10:10,560
i did because it's uh

201
00:10:17,110 --> 00:10:13,600
not only you know to to keep you know my

202
00:10:19,670 --> 00:10:17,120
body healthy but also it's a very

203
00:10:22,630 --> 00:10:19,680
important psychological i think

204
00:10:27,110 --> 00:10:22,640
relaxation for me and then the best

205
00:10:30,790 --> 00:10:28,389
what is that

206
00:10:31,509 --> 00:10:30,800
the area device that we have on board

207
00:10:32,949 --> 00:10:31,519
yeah

208
00:10:35,350 --> 00:10:32,959
it's just sitting

209
00:10:38,230 --> 00:10:35,360
right next to the cupola windows it's

210
00:10:40,790 --> 00:10:38,240
probably the best view gym in the entire

211
00:10:42,550 --> 00:10:40,800
world absolutely yeah you can do the uh

212
00:10:44,310 --> 00:10:42,560
you know muscle strengthening exercise

213
00:10:47,110 --> 00:10:44,320

and at the same time you can see this

214
00:10:48,710 --> 00:10:47,120
beautiful you know home planet and what

215
00:10:50,310 --> 00:10:48,720
a wonderful place that's right because

216
00:10:53,030 --> 00:10:50,320
we have the cupola and we have that that

217
00:10:54,870 --> 00:10:53,040
big center window we call it windows 7

218
00:10:56,710 --> 00:10:54,880
and and then

219
00:10:58,949 --> 00:10:56,720
most days because the space station is

220
00:11:00,949 --> 00:10:58,959
oriented with the belly of the space

221
00:11:02,949 --> 00:11:00,959
station facing the earth which means

222
00:11:05,030 --> 00:11:02,959
that the cupola windows are facing the

223
00:11:06,630 --> 00:11:05,040
earth and there we are on the a red

224
00:11:08,150 --> 00:11:06,640
above it below however you want whatever

225
00:11:10,630 --> 00:11:08,160
your perspective is but anyways we're

226
00:11:12,630 --> 00:11:10,640
right in line looking out that window

227
00:11:14,150 --> 00:11:12,640
which seems to us like we're on a bench

228
00:11:16,230 --> 00:11:14,160
we're doing our bench press and we're

229
00:11:18,949 --> 00:11:16,240
looking out that window and i remember

230
00:11:20,710 --> 00:11:18,959
doing my exercise one day and i saw

231
00:11:22,949 --> 00:11:20,720
red soil go by and i'm like that's

232
00:11:24,150 --> 00:11:22,959
australia

233
00:11:25,590 --> 00:11:24,160
exactly

234
00:11:26,870 --> 00:11:25,600
you can practice geography at the same

235
00:11:28,150 --> 00:11:26,880
time

236
00:11:30,150 --> 00:11:28,160
can you tell us a little bit about

237
00:11:33,030 --> 00:11:30,160
sprint and what that was all about right

238
00:11:34,790 --> 00:11:33,040

spring exercise a new protocol and

239
00:11:36,069 --> 00:11:34,800
already several astronauts have tried

240
00:11:37,829 --> 00:11:36,079
that

241
00:11:40,150 --> 00:11:37,839
method and

242
00:11:42,870 --> 00:11:40,160
basically

243
00:11:45,990 --> 00:11:42,880
it uses the uh the prescription of uh

244
00:11:48,470 --> 00:11:46,000
like a higher intensity of exercise but

245
00:11:51,430 --> 00:11:48,480
the less volume or less number of

246
00:11:53,990 --> 00:11:51,440
exercise days for example like uh

247
00:11:56,870 --> 00:11:54,000
if i um onboard the space station seven

248
00:11:59,590 --> 00:11:56,880
years ago i pretty much exercised like

249
00:12:01,750 --> 00:11:59,600
running for 40 minutes in the same pace

250
00:12:04,150 --> 00:12:01,760
but here as far as cardiovascular is

251
00:12:07,110 --> 00:12:04,160
concerned we have like a sprint running

252
00:12:09,750 --> 00:12:07,120
like for 30 seconds sprint sprint and 15

253
00:12:11,990 --> 00:12:09,760
seconds rest another 30 seconds of run

254
00:12:14,710 --> 00:12:12,000
but it's only like six or seven minutes

255
00:12:17,110 --> 00:12:14,720
very short interval but high intensity

256
00:12:19,350 --> 00:12:17,120
training and you do that like three

257
00:12:22,150 --> 00:12:19,360
times a week instead of seven days a

258
00:12:24,629 --> 00:12:22,160
week wow and so it's like a smaller

259
00:12:27,030 --> 00:12:24,639
number of days of exercise but the

260
00:12:29,750 --> 00:12:27,040
higher intensity and that's part of the

261
00:12:31,990 --> 00:12:29,760
screen protocol so uh seven years ago

262
00:12:34,230 --> 00:12:32,000
when i was onboard a space station i

263
00:12:36,790 --> 00:12:34,240

used the previous protocol which i

264
00:12:39,190 --> 00:12:36,800
exercise every day but this time it's a

265
00:12:41,509 --> 00:12:39,200
most smaller amount of time actually but

266
00:12:44,870 --> 00:12:41,519
the results were pretty good i was able

267
00:12:46,710 --> 00:12:44,880
to walk right after landing and

268
00:12:48,710 --> 00:12:46,720
so i think this new protocol is working

269
00:12:50,870 --> 00:12:48,720
very well wow so if you compared when

270
00:12:52,870 --> 00:12:50,880
you were on board and landed seven years

271
00:12:54,310 --> 00:12:52,880
ago to to now when you did this new

272
00:12:56,870 --> 00:12:54,320
protocol and you exercise more and you

273
00:12:58,790 --> 00:12:56,880
had um probably more emphasis on the

274
00:13:00,949 --> 00:12:58,800
exercise because you have more

275
00:13:03,350 --> 00:13:00,959
equipment to work with

276
00:13:05,509 --> 00:13:03,360
a big difference did you notice

277
00:13:07,110 --> 00:13:05,519
as far as after landing i don't see very

278
00:13:09,190 --> 00:13:07,120
much difference so

279
00:13:11,190 --> 00:13:09,200
that means that's such a very efficient

280
00:13:13,509 --> 00:13:11,200
way to do exercise because if the

281
00:13:16,069 --> 00:13:13,519
results are the same and if you spend

282
00:13:18,150 --> 00:13:16,079
less time and exercise yeah that's uh

283
00:13:21,269 --> 00:13:18,160
that means it's a very efficient way of

284
00:13:23,590 --> 00:13:21,279
exercising so maybe we can utilize that

285
00:13:25,269 --> 00:13:23,600
in in the future when we go to you know

286
00:13:26,870 --> 00:13:25,279
beyond low earth orbit when we go to

287
00:13:29,269 --> 00:13:26,880
mars and then

288
00:13:31,990 --> 00:13:29,279

so a lot of new protocols are being

289
00:13:34,230 --> 00:13:32,000
tested onboard the station yeah and i

290
00:13:36,710 --> 00:13:34,240
can see where folks back here at home

291
00:13:38,470 --> 00:13:36,720
who don't have time to exercise

292
00:13:40,310 --> 00:13:38,480
pay attention to this because you can

293
00:13:42,150 --> 00:13:40,320
you can spend less time working out and

294
00:13:43,750 --> 00:13:42,160
get the same benefits as if you were

295
00:13:45,990 --> 00:13:43,760
working out for what two hours or

296
00:13:48,389 --> 00:13:46,000
something right right and you you have

297
00:13:50,949 --> 00:13:48,399
done just a tremendous amount of work

298
00:13:53,750 --> 00:13:50,959
cuichi not just in your most recent

299
00:13:55,670 --> 00:13:53,760
increment but throughout your career in

300
00:13:58,629 --> 00:13:55,680
the space program and you've been an

301
00:14:00,629 --> 00:13:58,639
asset to japan and to nasa and to the

302
00:14:03,189 --> 00:14:00,639
international space station and to

303
00:14:05,030 --> 00:14:03,199
station life so thank you so much for

304
00:14:06,550 --> 00:14:05,040
being here with us spending so much time

305
00:14:08,629 --> 00:14:06,560
sharing your stories we've just had a

306
00:14:11,269 --> 00:14:08,639
lot of fun with you so uh wish you all

307
00:14:12,550 --> 00:14:11,279
the best um as we go forward i'll see

308
00:14:14,069 --> 00:14:12,560
you you know probably in five minutes

309
00:14:15,750 --> 00:14:14,079
but

310
00:14:18,150 --> 00:14:15,760
thank you tracy so much for being here

311
00:14:37,910 --> 00:14:18,160
with us i enjoyed it thank you tracy

312
00:14:37,920 --> 00:14:52,870
but you're saying tracy

313
00:15:04,310 --> 00:14:54,949

okay

314
00:15:08,069 --> 00:15:06,710
so with all this exercise going on is it

315
00:15:10,550 --> 00:15:08,079
really working

316
00:15:12,629 --> 00:15:10,560
researchers and acers who are astronaut

317
00:15:15,430 --> 00:15:12,639
strength conditioning and rehabilitation

318
00:15:17,350 --> 00:15:15,440
specialists have made great progress

319
00:15:19,350 --> 00:15:17,360
before we had a full gym on the space

320
00:15:21,670 --> 00:15:19,360
station our astronauts needed quite a

321
00:15:23,990 --> 00:15:21,680
bit of recovery time back here on earth

322
00:15:26,710 --> 00:15:24,000
today our astronauts are coming home in

323
00:15:28,710 --> 00:15:26,720
excellent health my name is mark

324
00:15:30,949 --> 00:15:28,720
williams i'm the lead astronaut strength

325
00:15:32,870 --> 00:15:30,959
and conditioning coach

326
00:15:34,550 --> 00:15:32,880
on board the international space station

327
00:15:37,030 --> 00:15:34,560
we have three pieces of hardware we have

328
00:15:39,350 --> 00:15:37,040
a cycle which we call sevis

329
00:15:41,350 --> 00:15:39,360
we have a treadmill which is called t2

330
00:15:44,069 --> 00:15:41,360
and we have a resistive exercise device

331
00:15:46,550 --> 00:15:44,079
which is called a red and each

332
00:15:49,030 --> 00:15:46,560
device is specifically designed to do

333
00:15:51,829 --> 00:15:49,040
certain things for the astronaut we try

334
00:15:53,509 --> 00:15:51,839
to do one of those particular vices

335
00:15:54,870 --> 00:15:53,519
every other day

336
00:15:56,870 --> 00:15:54,880
one of them we're going to get a little

337
00:15:58,310 --> 00:15:56,880
bit better cardiovascular fitness out of

338
00:16:00,069 --> 00:15:58,320

it the other one we get a little bit

339
00:16:02,470 --> 00:16:00,079
more impact loading like running on the

340
00:16:04,389 --> 00:16:02,480
ground you get so that affects muscle

341
00:16:06,230 --> 00:16:04,399
it'll affect a little bit of bone

342
00:16:08,550 --> 00:16:06,240
does things

343
00:16:10,150 --> 00:16:08,560
those are the physiological aspects of

344
00:16:12,069 --> 00:16:10,160
it but then also

345
00:16:13,829 --> 00:16:12,079
making sure when they come home from a

346
00:16:15,990 --> 00:16:13,839
six-month flight that they don't come

347
00:16:17,829 --> 00:16:16,000
home like a bowl of jell-o you know

348
00:16:19,749 --> 00:16:17,839
they're they're going to lose muscle

349
00:16:21,590 --> 00:16:19,759
they're going to lose strength they're

350
00:16:23,350 --> 00:16:21,600
going to lose bone they're going to lose

351
00:16:25,670 --> 00:16:23,360
cardiovascular fitness

352
00:16:27,590 --> 00:16:25,680
but at the same time then we have to

353
00:16:29,590 --> 00:16:27,600
take them get them back to where they

354
00:16:31,110 --> 00:16:29,600
were before they left which is what we

355
00:16:33,910 --> 00:16:31,120
do in our post-flight period once they

356
00:16:35,350 --> 00:16:33,920
come home for about six to eight weeks

357
00:16:37,590 --> 00:16:35,360
and just get them prepared back to

358
00:16:39,430 --> 00:16:37,600
normal life you know doing their job

359
00:16:57,430 --> 00:16:39,440
work doing their family doing yard work

360
00:17:01,430 --> 00:16:59,350
have you ever been sedentary for a long

361
00:17:03,749 --> 00:17:01,440
period of time like lying in bed for a

362
00:17:05,829 --> 00:17:03,759
week because of an illness or surgery

363
00:17:07,669 --> 00:17:05,839

and then stood up quickly

364
00:17:09,829 --> 00:17:07,679
did you feel like you might fall or that

365
00:17:11,990 --> 00:17:09,839
not all your senses were functioning

366
00:17:13,669 --> 00:17:12,000
hi i'm dr john charles with nasa's human

367
00:17:15,429 --> 00:17:13,679
research program

368
00:17:17,189 --> 00:17:15,439
during the one year international space

369
00:17:19,350 --> 00:17:17,199
station mission nasa will conduct

370
00:17:21,029 --> 00:17:19,360
functional studies to gain insight into

371
00:17:23,510 --> 00:17:21,039
key physiological factors that

372
00:17:25,270 --> 00:17:23,520
contribute to changes in performance

373
00:17:27,189 --> 00:17:25,280
just like it would take minutes hours or

374
00:17:29,190 --> 00:17:27,199
even days for your body to acclimate to

375
00:17:30,870 --> 00:17:29,200
standing after lying in bed for weeks it

376
00:17:32,630 --> 00:17:30,880
takes time for an astronaut's body to

377
00:17:35,350 --> 00:17:32,640
acclimate to an environment with gravity

378
00:17:37,270 --> 00:17:35,360
after working without it for many months

379
00:17:39,110 --> 00:17:37,280
two tests will focus on post-flight

380
00:17:40,710 --> 00:17:39,120
tasks and procedures that will be vital

381
00:17:43,029 --> 00:17:40,720
for an exploration crew that has just

382
00:17:44,630 --> 00:17:43,039
landed on a planet after a prolonged

383
00:17:46,150 --> 00:17:44,640
period of weightlessness

384
00:17:48,230 --> 00:17:46,160
the functional studies will assess how

385
00:17:50,070 --> 00:17:48,240
the neurosensory networks eye hand

386
00:17:51,750 --> 00:17:50,080
coordination fluid distribution

387
00:17:53,029 --> 00:17:51,760
cardiovascular and skeletal muscle

388
00:17:54,710 --> 00:17:53,039

performance

389
00:17:57,190 --> 00:17:54,720
all work together to accomplish an

390
00:17:58,710 --> 00:17:57,200
integrated task or function

391
00:18:00,549 --> 00:17:58,720
researchers hope to compile a

392
00:18:02,789 --> 00:18:00,559
post-flight recovery timeline and

393
00:18:04,470 --> 00:18:02,799
develop and validate tests to define

394
00:18:06,070 --> 00:18:04,480
acceptable performance

395
00:18:07,990 --> 00:18:06,080
and define the linkage between

396
00:18:09,510 --> 00:18:08,000
physiological changes and functional

397
00:18:11,190 --> 00:18:09,520
capacity

398
00:18:12,549 --> 00:18:11,200
this information will be helpful for

399
00:18:14,470 --> 00:18:12,559
astronauts and researchers as they

400
00:18:17,830 --> 00:18:14,480
prepare for future long duration

401
00:18:19,590 --> 00:18:17,840
missions to asteroids mars and beyond to

402
00:18:26,710 --> 00:18:19,600
learn more about nasa's human research

403
00:18:29,510 --> 00:18:28,230
so now let's hear from one of our

404
00:18:32,150 --> 00:18:29,520
researchers who is studying the

405
00:18:38,230 --> 00:18:32,160
cardiovascular system off the earth for

406
00:18:41,350 --> 00:18:39,590
my name is stuart lee i'm the lead

407
00:18:42,950 --> 00:18:41,360
research scientist in the cardiovascular

408
00:18:43,830 --> 00:18:42,960
and vision laboratory at johnson space

409
00:18:44,710 --> 00:18:43,840
center

410
00:18:46,870 --> 00:18:44,720
so

411
00:18:49,669 --> 00:18:46,880
the astronauts in space flight is

412
00:18:51,669 --> 00:18:49,679
somewhat analogous to if you took one of

413
00:18:54,150 --> 00:18:51,679

us on the ground and told us not to

414
00:18:56,390 --> 00:18:54,160
exercise for a long period of time

415
00:18:58,549 --> 00:18:56,400
so space flight has allowed us to see

416
00:18:59,909 --> 00:18:58,559
the deconditioning effects and we can

417
00:19:01,590 --> 00:18:59,919
see all the negative things that could

418
00:19:03,909 --> 00:19:01,600
happen when you don't exercise when you

419
00:19:05,430 --> 00:19:03,919
don't do physical work every day that

420
00:19:06,549 --> 00:19:05,440
we're actually genetically designed to

421
00:19:08,230 --> 00:19:06,559
do

422
00:19:10,710 --> 00:19:08,240
so i would say that cardiovascular

423
00:19:13,110 --> 00:19:10,720
health is important from the aspect of

424
00:19:15,110 --> 00:19:13,120
the heart and the blood vessels are

425
00:19:17,510 --> 00:19:15,120
are the communication system in your

426
00:19:19,430 --> 00:19:17,520
body so the experiment that they're

427
00:19:20,630 --> 00:19:19,440
demonstrating in the background

428
00:19:22,710 --> 00:19:20,640
is the

429
00:19:24,630 --> 00:19:22,720
the primary measurements in our

430
00:19:26,870 --> 00:19:24,640
cardiovascular experiment called cardio

431
00:19:30,070 --> 00:19:26,880
ox and it's primarily looking at the

432
00:19:32,230 --> 00:19:30,080
health and function of the arteries in

433
00:19:34,549 --> 00:19:32,240
your body in this particular case

434
00:19:36,230 --> 00:19:34,559
they're scanning the brachial artery

435
00:19:37,669 --> 00:19:36,240
and we use that as a surrogate for the

436
00:19:40,150 --> 00:19:37,679
arteries in your heart the coronary

437
00:19:42,470 --> 00:19:40,160
arteries so we're able to see

438
00:19:44,549 --> 00:19:42,480

how they would respond to stress and

439
00:19:46,390 --> 00:19:44,559
obviously if they respond well then

440
00:19:48,230 --> 00:19:46,400
they're we've got good cardiovascular

441
00:19:51,029 --> 00:19:48,240
health and it has a good prognosis long

442
00:19:54,070 --> 00:19:51,039
term for the health of the heart

443
00:19:55,990 --> 00:19:54,080
so they're looking specifically at how

444
00:19:58,150 --> 00:19:56,000
the the vessel

445
00:20:01,510 --> 00:19:58,160
uh expands and contracts with each

446
00:20:03,990 --> 00:20:01,520
heartbeat and then we also we stress the

447
00:20:05,909 --> 00:20:04,000
vessel and we see how well it expands

448
00:20:07,990 --> 00:20:05,919
those are key functions and in your

449
00:20:11,029 --> 00:20:08,000
ability to adapt to stress uh when

450
00:20:12,630 --> 00:20:11,039
they're exercising or um when you're

451
00:20:14,789 --> 00:20:12,640
experiencing arthrostatic or

452
00:20:16,630 --> 00:20:14,799
gravitational stress and so it gives us

453
00:20:18,149 --> 00:20:16,640
a way that we can look at

454
00:20:20,230 --> 00:20:18,159
throughout the mission and after the

455
00:20:21,510 --> 00:20:20,240
mission held how the crew members are

456
00:20:22,870 --> 00:20:21,520
responding to the space flight

457
00:20:25,510 --> 00:20:22,880
experience

458
00:20:26,950 --> 00:20:25,520
so cardiacs is looking good primarily at

459
00:20:29,110 --> 00:20:26,960
the health and

460
00:20:30,549 --> 00:20:29,120
and fitness as you as you might say

461
00:20:32,149 --> 00:20:30,559
other arteries

462
00:20:33,830 --> 00:20:32,159
the unique part of cardio ox is we're

463
00:20:34,789 --> 00:20:33,840

actually looking at five years after the

464
00:20:37,510 --> 00:20:34,799
mission

465
00:20:39,430 --> 00:20:37,520
so most experiments just look pre

466
00:20:40,789 --> 00:20:39,440
some in in post-flight we're actually

467
00:20:43,350 --> 00:20:40,799
interested in long-term health of the

468
00:20:44,710 --> 00:20:43,360
crew members five years later

469
00:20:46,070 --> 00:20:44,720
where their stress is involved with

470
00:20:48,870 --> 00:20:46,080
space flight which might have caused

471
00:20:50,950 --> 00:20:48,880
some issues for them spring is another

472
00:20:53,990 --> 00:20:50,960
experiment that looks at cardiovascular

473
00:20:56,950 --> 00:20:54,000
but it looks primarily at the

474
00:20:59,350 --> 00:20:56,960
cardiovascular fitness end of things how

475
00:21:01,430 --> 00:20:59,360
how hard you can work we call it bht max

476
00:21:03,909 --> 00:21:01,440
or maximum oxygen consumption how hard

477
00:21:06,470 --> 00:21:03,919
you can get your body to work

478
00:21:08,070 --> 00:21:06,480
during space and the vo2 max test is

479
00:21:09,830 --> 00:21:08,080
very good because it's an integrative

480
00:21:11,750 --> 00:21:09,840
test of the cardiovascular system it

481
00:21:13,430 --> 00:21:11,760
brings together all the function the

482
00:21:15,669 --> 00:21:13,440
cardiovascular system so you can work as

483
00:21:18,070 --> 00:21:15,679
hard as possible so these

484
00:21:19,510 --> 00:21:18,080
these experiments together give us an

485
00:21:21,350 --> 00:21:19,520
idea of what's happening on the

486
00:21:23,669 --> 00:21:21,360
functional side of things the sprint

487
00:21:25,669 --> 00:21:23,679
study and then on the the i don't want

488
00:21:28,070 --> 00:21:25,679

to say pathological but on the health

489
00:21:30,310 --> 00:21:28,080
side of things with cardio ox and then

490
00:21:31,990 --> 00:21:30,320
with the cardiox twins experiment we're

491
00:21:34,230 --> 00:21:32,000
also then looking at how genetics

492
00:21:35,830 --> 00:21:34,240
affects those things

493
00:21:37,590 --> 00:21:35,840
my name is stuart lee i'm a lead

494
00:21:39,669 --> 00:21:37,600
research scientist in my cardiovascular

495
00:21:41,990 --> 00:21:39,679
and vision laboratory at johnson space

496
00:22:17,990 --> 00:21:42,000
center we're working off the earth for

497
00:22:22,549 --> 00:22:20,149
our international space station provides

498
00:22:25,110 --> 00:22:22,559
an unprecedented research platform in

499
00:22:27,110 --> 00:22:25,120
space allowing doctors and scientists to

500
00:22:28,950 --> 00:22:27,120
conduct science experiments that can't

501
00:22:31,350 --> 00:22:28,960
be done anywhere else

502
00:22:33,270 --> 00:22:31,360
for nasa keeping our astronauts heart

503
00:22:35,110 --> 00:22:33,280
healthy is vital for continuing the

504
00:22:37,350 --> 00:22:35,120
journey off the earth

505
00:22:39,510 --> 00:22:37,360
here on the earth the keys to good heart

506
00:22:40,710 --> 00:22:39,520
health are good nutrition and vigorous

507
00:22:42,950 --> 00:22:40,720
exercise

508
00:22:44,230 --> 00:22:42,960
thanks for joining us on station life at

509
00:22:46,149 --> 00:22:44,240
our behind the scenes look at

510
00:22:48,390 --> 00:22:46,159
cardiovascular research being done

511
00:22:50,549 --> 00:22:48,400
aboard the international space station

512
00:22:52,070 --> 00:22:50,559
and as always be sure to follow us on

513
00:22:54,789 --> 00:22:52,080

facebook and twitter for the latest

514
00:22:57,510 --> 00:22:54,799
research news and download our app which

515
00:22:59,909 --> 00:22:57,520
is legit on your mobile device until