

A close-up portrait of Richard Haier, an older man with grey hair, a goatee, and glasses, smiling. He is wearing a light blue collared shirt. The background behind him is a dark, abstract, colorful pattern resembling a nebula or a torn paper effect with red, yellow, and blue hues.

**RICHARD
HAIER**

**IQ AND
PSYCHOMETRICS**

1
00:00:03,429 --> 00:00:02,470
i'm here with professor richard heyer

2
00:00:06,470 --> 00:00:03,439
who has studied

3
00:00:10,070 --> 00:00:06,480
the neuroscience of intelligence for

4
00:00:12,789 --> 00:00:10,080
40 years or so is that correct 40 years

5
00:00:14,070 --> 00:00:12,799
or more it's not quite clear to me but a

6
00:00:15,430 --> 00:00:14,080
long time

7
00:00:17,430 --> 00:00:15,440
right so what are you working on these

8
00:00:21,910 --> 00:00:17,440
days well

9
00:00:24,950 --> 00:00:21,920
um i just a couple of months ago

10
00:00:28,830 --> 00:00:24,960
finished the manuscript for a

11
00:00:30,710 --> 00:00:28,840
new textbook called the science of human

12
00:00:34,389 --> 00:00:30,720
intelligence and so

13
00:00:38,310 --> 00:00:34,399

it was the my latest review

14

00:00:41,990 --> 00:00:38,320

of the research literature um

15

00:00:45,510 --> 00:00:42,000

so actually this is the third book um

16

00:00:47,029 --> 00:00:45,520

i've only i wrote the first book after i

17

00:00:50,350 --> 00:00:47,039

retired

18

00:00:51,910 --> 00:00:50,360

uh that was the uh the neuroscience of

19

00:00:54,709 --> 00:00:51,920

intelligence book

20

00:00:56,830 --> 00:00:54,719

right and that came out uh at the very

21

00:00:59,990 --> 00:00:56,840

end of 2016

22

00:01:02,229 --> 00:01:00,000

2017 and then

23

00:01:03,110 --> 00:01:02,239

i have edited a book with some

24

00:01:06,510 --> 00:01:03,120

colleagues

25

00:01:10,149 --> 00:01:06,520

called intelligence and cognitive

26

00:01:13,270 --> 00:01:10,159

neuroscience it's a cambridge handbook

27

00:01:17,670 --> 00:01:13,280

okay that is due to come out sometime uh

28

00:01:18,950 --> 00:01:17,680

early in 2021 and the textbook the

29

00:01:21,670 --> 00:01:18,960

science of human

30

00:01:22,870 --> 00:01:21,680

intelligence with my colleague and

31

00:01:26,870 --> 00:01:22,880

friend roberto

32

00:01:27,910 --> 00:01:26,880

collum that is due out sometime in 2021

33

00:01:31,109 --> 00:01:27,920

also

34

00:01:33,190 --> 00:01:31,119

so those are textbooks isn't those those

35

00:01:36,710 --> 00:01:33,200

are for university students

36

00:01:39,030 --> 00:01:36,720

um yes they're the um

37

00:01:40,950 --> 00:01:39,040

the handbook of intelligence and

38

00:01:44,469 --> 00:01:40,960

cognitive neuroscience

39

00:01:47,350 --> 00:01:44,479

is for more advanced students and the

40

00:01:50,749 --> 00:01:47,360

science of human intelligence will be

41

00:01:53,510 --> 00:01:50,759

an introductory textbook and the

42

00:01:56,149 --> 00:01:53,520

neuroscience of intelligence which is

43

00:01:58,630 --> 00:01:56,159

out now for a couple of years that was

44

00:02:00,469 --> 00:01:58,640

intended as an introductory text for

45

00:02:03,510 --> 00:02:00,479

students but also i wrote it

46

00:02:04,469 --> 00:02:03,520

for the public as well and it's had a

47

00:02:07,190 --> 00:02:04,479

very nice

48

00:02:08,309 --> 00:02:07,200

public uh response actually right now

49

00:02:10,229 --> 00:02:08,319

this book which

50

00:02:12,229 --> 00:02:10,239

i'm gonna put a link in the description

51
00:02:13,990 --> 00:02:12,239
i recommend for the people who watch

52
00:02:16,390 --> 00:02:14,000
if you're interested in intelligence at

53
00:02:18,470 --> 00:02:16,400
all especially if you have no idea

54
00:02:20,309 --> 00:02:18,480
this is a superlative book i read cover

55
00:02:23,030 --> 00:02:20,319
to cover and i don't say that often

56
00:02:23,750 --> 00:02:23,040
i just a bit of a background on me i'm

57
00:02:25,030 --> 00:02:23,760
uh

58
00:02:27,430 --> 00:02:25,040
matt my background's in math

59
00:02:29,110 --> 00:02:27,440
mathematical physics in university

60
00:02:30,949 --> 00:02:29,120
and i pretty much stayed narrowly in

61
00:02:32,790 --> 00:02:30,959
that field even narrow in that field to

62
00:02:35,830 --> 00:02:32,800
the theoretical side

63
00:02:37,190 --> 00:02:35,840

so i know virtually nothing outside that

64

00:02:39,270 --> 00:02:37,200

and

65

00:02:41,030 --> 00:02:39,280

this takes someone like me who knows a

66

00:02:43,350 --> 00:02:41,040

smidgen or modicum about

67

00:02:44,790 --> 00:02:43,360

neuroscience and intelligence to getting

68

00:02:46,869 --> 00:02:44,800

a surveillance of the entire field it's

69

00:02:50,470 --> 00:02:46,879

almost like the bell curve of the

70

00:02:52,150 --> 00:02:50,480

of 2015 except minus the controversy

71

00:02:53,990 --> 00:02:52,160

well it's interesting you should say

72

00:02:55,830 --> 00:02:54,000

that um

73

00:02:58,309 --> 00:02:55,840

charles murray one of the authors of the

74

00:03:01,430 --> 00:02:58,319

bell curve is a friend of mine

75

00:03:03,990 --> 00:03:01,440

and he endorsed the book

76
00:03:05,910 --> 00:03:04,000
and the controversy about the bell curve

77
00:03:09,750 --> 00:03:05,920
is largely

78
00:03:10,949 --> 00:03:09,760
misplaced shall we say a lot of people

79
00:03:13,110 --> 00:03:10,959
who never read the book

80
00:03:14,710 --> 00:03:13,120
think they know what's in it and react

81
00:03:15,350 --> 00:03:14,720
to what they think they know what's in

82
00:03:17,589 --> 00:03:15,360
it

83
00:03:19,589 --> 00:03:17,599
but in fact when you actually read the

84
00:03:21,270 --> 00:03:19,599
book and see what's in it it's nothing

85
00:03:23,270 --> 00:03:21,280
like it's been portrayed

86
00:03:25,430 --> 00:03:23,280
right this is another whole side issue

87
00:03:28,550 --> 00:03:25,440
we can spend an hour talking about that

88
00:03:29,430 --> 00:03:28,560

yeah okay forget about that the the book

89

00:03:31,430 --> 00:03:29,440

also has

90

00:03:32,550 --> 00:03:31,440

humor injected in it and i haven't heard

91

00:03:34,070 --> 00:03:32,560

that

92

00:03:35,750 --> 00:03:34,080

mentioned in any of the reviews and i

93

00:03:39,910 --> 00:03:35,760

found myself chuckling aloud which is

94

00:03:41,589 --> 00:03:39,920

again rare for me i i this is fantastic

95

00:03:43,750 --> 00:03:41,599

that you appreciate that

96

00:03:45,030 --> 00:03:43,760

because either some people didn't notice

97

00:03:47,830 --> 00:03:45,040

the humor

98

00:03:49,990 --> 00:03:47,840

or i just couldn't quite figure out if i

99

00:03:52,229 --> 00:03:50,000

was really trying to be funny

100

00:03:53,830 --> 00:03:52,239

and there's even you can you can see

101
00:03:55,110 --> 00:03:53,840
yourself thinking aloud in the book so

102
00:03:57,670 --> 00:03:55,120
for example there's one

103
00:03:58,949 --> 00:03:57,680
section where you say i'm paraphrasing

104
00:04:00,470 --> 00:03:58,959
something like there is no hope and then

105
00:04:01,990 --> 00:04:00,480
the next section next sentence is

106
00:04:04,710 --> 00:04:02,000
actually wait there is a study just came

107
00:04:07,670 --> 00:04:04,720
out so on and so on

108
00:04:08,390 --> 00:04:07,680
okay just so you know one of my favorite

109
00:04:11,030 --> 00:04:08,400
parts was

110
00:04:12,470 --> 00:04:11,040
at the end where you admit your own bias

111
00:04:14,630 --> 00:04:12,480
and you may admit it in the front too

112
00:04:16,469 --> 00:04:14,640
your bias towards the genetic

113
00:04:18,629 --> 00:04:16,479

influence towards intelligence but it's

114

00:04:20,310 --> 00:04:18,639

not just based on

115

00:04:21,909 --> 00:04:20,320

your own proclivities or your own

116

00:04:23,030 --> 00:04:21,919

pensions it's based on 40 years of

117

00:04:25,909 --> 00:04:23,040

research

118

00:04:26,469 --> 00:04:25,919

and you say this which i'm going to read

119

00:04:29,350 --> 00:04:26,479

so

120

00:04:30,790 --> 00:04:29,360

it's one of the last lines it says i

121

00:04:31,990 --> 00:04:30,800

challenge you to think critically about

122

00:04:33,430 --> 00:04:32,000

the studies i've presented throughout

123

00:04:35,110 --> 00:04:33,440

this book as representative of

124

00:04:36,150 --> 00:04:35,120

neuroscience progress and about what i

125

00:04:38,550 --> 00:04:36,160

think they mean

126

00:04:40,230 --> 00:04:38,560

my challenge to you is to find the weak

127

00:04:40,870 --> 00:04:40,240

links and loopholes in my presentation

128

00:04:42,790 --> 00:04:40,880

and when i do

129

00:04:45,990 --> 00:04:42,800

then you design a new research study and

130

00:04:47,670 --> 00:04:46,000

fix them or falsify them now that to me

131

00:04:50,710 --> 00:04:47,680

says that you're a true scientist you're

132

00:04:52,390 --> 00:04:50,720

saying hey here are my theories

133

00:04:54,230 --> 00:04:52,400

they i think they're largely correct but

134

00:04:56,469 --> 00:04:54,240

maybe they're not please

135

00:04:58,469 --> 00:04:56,479

go show me where they're false and do

136

00:05:02,150 --> 00:04:58,479

the studies

137

00:05:05,350 --> 00:05:02,160

well you know to be honest it's not even

138

00:05:05,749 --> 00:05:05,360

that i think they're mostly correct i

139

00:05:09,590 --> 00:05:05,759

don't

140

00:05:12,710 --> 00:05:09,600

know if they're correct the theories

141

00:05:15,590 --> 00:05:12,720

came from the empirical observations

142

00:05:17,350 --> 00:05:15,600

and it represents our best guess of what

143

00:05:19,909 --> 00:05:17,360

might be true

144

00:05:23,990 --> 00:05:19,919

but they're formulated in a way that

145

00:05:27,670 --> 00:05:24,000

that creates testable hypotheses

146

00:05:28,070 --> 00:05:27,680

and so over the years a lot of other

147

00:05:29,909 --> 00:05:28,080

people

148

00:05:31,670 --> 00:05:29,919

interested in intelligence have found

149

00:05:33,110 --> 00:05:31,680

those theories of interest

150

00:05:35,110 --> 00:05:33,120

and they've tested many of the

151

00:05:37,110 --> 00:05:35,120

hypotheses

152

00:05:40,070 --> 00:05:37,120

one of the things i note up front in the

153

00:05:42,870 --> 00:05:40,080

book is what i call my three laws

154

00:05:44,310 --> 00:05:42,880

number one no story about the brain is

155

00:05:47,670 --> 00:05:44,320

simple

156

00:05:50,230 --> 00:05:47,680

number two no one study is definitive

157

00:05:52,070 --> 00:05:50,240

and number three almost most importantly

158

00:05:54,230 --> 00:05:52,080

it takes many years to sort out

159

00:05:55,430 --> 00:05:54,240

inconsistent and conflicting data from

160

00:05:58,710 --> 00:05:55,440

different studies

161

00:05:59,830 --> 00:05:58,720

to establish a weight of evidence on any

162

00:06:03,189 --> 00:05:59,840

particular

163

00:06:06,550 --> 00:06:03,199

question and we are now at this stage

164

00:06:09,990 --> 00:06:06,560

where some of the things i proposed

165

00:06:10,629 --> 00:06:10,000

as much more than 20 years ago have been

166

00:06:13,590 --> 00:06:10,639

tested

167

00:06:16,150 --> 00:06:13,600

there are inconsistent results there are

168

00:06:16,629 --> 00:06:16,160

contradictory results but an emerging

169

00:06:20,150 --> 00:06:16,639

weight

170

00:06:21,189 --> 00:06:20,160

of evidence is apparent to people in the

171

00:06:23,990 --> 00:06:21,199

field

172

00:06:26,710 --> 00:06:24,000

and sometimes it supports the original

173

00:06:29,670 --> 00:06:26,720

formulation sometimes it doesn't

174

00:06:30,150 --> 00:06:29,680

i was at a meeting a couple years ago

175

00:06:33,510 --> 00:06:30,160

where

176

00:06:36,629 --> 00:06:33,520

a terrific researcher

177

00:06:39,670 --> 00:06:36,639

professor bastin from germany

178

00:06:41,029 --> 00:06:39,680

gave a talk on the brain efficiency

179

00:06:43,990 --> 00:06:41,039

hypothesis

180

00:06:44,550 --> 00:06:44,000

right and she reviewed all the evidence

181

00:06:48,710 --> 00:06:44,560

as

182

00:06:51,430 --> 00:06:48,720

uh

183

00:06:54,390 --> 00:06:51,440

geez about three years ago i think it

184

00:06:59,110 --> 00:06:54,400

was a meeting in edinburgh

185

00:07:02,469 --> 00:06:59,120

and she concluded that the evidence

186

00:07:05,189 --> 00:07:02,479

for the brain efficiency hypothesis

187

00:07:06,950 --> 00:07:05,199

at best wasn't so strong she was very

188

00:07:09,670 --> 00:07:06,960

diplomatic

189

00:07:11,830 --> 00:07:09,680

and uh so i you know i was in the

190

00:07:13,830 --> 00:07:11,840

audience i raised my hand and i said you

191

00:07:16,309 --> 00:07:13,840

might be wondering what it feels like to

192

00:07:19,589 --> 00:07:16,319

be sitting in the audience hearing your

193

00:07:22,629 --> 00:07:19,599

one of your key you know

194

00:07:26,469 --> 00:07:22,639

theories being discussed

195

00:07:28,469 --> 00:07:26,479

and with not too much enthusiasm

196

00:07:30,469 --> 00:07:28,479

and so she you know started to laugh and

197

00:07:33,790 --> 00:07:30,479

i said i'll tell you what it feels like

198

00:07:36,390 --> 00:07:33,800

it feels fantastic it's a it was a

199

00:07:38,790 --> 00:07:36,400

hypothesis

200

00:07:41,189 --> 00:07:38,800

it doesn't matter you know what i

201
00:07:44,309 --> 00:07:41,199
thought whether i thought it was correct

202
00:07:47,189 --> 00:07:44,319
or not it's an empirical question

203
00:07:48,150 --> 00:07:47,199
and all the research that has come out

204
00:07:49,749 --> 00:07:48,160
since

205
00:07:51,589 --> 00:07:49,759
we've discovered all kinds of

206
00:07:54,790 --> 00:07:51,599
interesting things that we didn't know

207
00:07:57,189 --> 00:07:54,800
before from that research so it's not

208
00:07:59,990 --> 00:07:57,199
whether it's right or wrong

209
00:08:00,869 --> 00:08:00,000
all hypotheses are meant to be tested

210
00:08:03,350 --> 00:08:00,879
and then you

211
00:08:04,150 --> 00:08:03,360
formulate new hypotheses and new

212
00:08:06,629 --> 00:08:04,160
theories

213
00:08:08,230 --> 00:08:06,639

based on the new kinds of data and

214

00:08:11,510 --> 00:08:08,240

what's interesting to me

215

00:08:13,189 --> 00:08:11,520

about this field is when i started doing

216

00:08:16,950 --> 00:08:13,199

brain imaging studies of

217

00:08:19,430 --> 00:08:16,960

intelligence in the late 1980s

218

00:08:20,869 --> 00:08:19,440

i was one of the few psychologists who

219

00:08:23,909 --> 00:08:20,879

had any

220

00:08:26,070 --> 00:08:23,919

access to brain imaging technology

221

00:08:27,270 --> 00:08:26,080

at that time it was positron emission

222

00:08:30,790 --> 00:08:27,280

tomography

223

00:08:34,070 --> 00:08:30,800

this was 12 years before fmri

224

00:08:36,469 --> 00:08:34,080

became available to most places

225

00:08:37,589 --> 00:08:36,479

and we were making everything up there

226

00:08:40,949 --> 00:08:37,599

was no canned

227

00:08:42,310 --> 00:08:40,959

software to analyze the images there was

228

00:08:45,190 --> 00:08:42,320

no database of

229

00:08:48,150 --> 00:08:45,200

images we could access not only did we

230

00:08:49,829 --> 00:08:48,160

have to pay for every scan we got

231

00:08:51,829 --> 00:08:49,839

with pet it was twenty five hundred

232

00:08:56,150 --> 00:08:51,839

dollars per scan

233

00:08:59,829 --> 00:08:58,630

more than how much was that more than a

234

00:09:03,269 --> 00:08:59,839

million

235

00:09:05,430 --> 00:09:03,279

and because pet used short-lived radio

236

00:09:08,230 --> 00:09:05,440

isotopes

237

00:09:10,389 --> 00:09:08,240

we had a biocyclotron we had to buy our

238

00:09:13,750 --> 00:09:10,399

own cyclotron

239

00:09:16,870 --> 00:09:13,760

so i spent many many years fundraising

240

00:09:19,990 --> 00:09:16,880

for the capital equipment we needed

241

00:09:22,310 --> 00:09:20,000

to get a few scans and at that time if

242

00:09:25,030 --> 00:09:22,320

we could do a sample size of eight

243

00:09:27,190 --> 00:09:25,040

people these were the first eight people

244

00:09:29,790 --> 00:09:27,200

ever scanned in an intelligence

245

00:09:31,910 --> 00:09:29,800

test and everything we saw was

246

00:09:32,310 --> 00:09:31,920

fantastically interesting no one had

247

00:09:35,990 --> 00:09:32,320

ever

248

00:09:38,870 --> 00:09:36,000

seen brain function in this way before

249

00:09:39,430 --> 00:09:38,880

and so when in our very first study when

250

00:09:42,550 --> 00:09:39,440

we found

251
00:09:44,710 --> 00:09:42,560
inverse correlations between glucose

252
00:09:45,030 --> 00:09:44,720
metabolic rate in the brain which is

253
00:09:48,470 --> 00:09:45,040
what

254
00:09:49,990 --> 00:09:48,480
pet assessed and scores on a non-verbal

255
00:09:53,990 --> 00:09:50,000
abstract reasoning

256
00:09:56,150 --> 00:09:54,000
test of intelligence that was amazing it

257
00:09:57,750 --> 00:09:56,160
was very surprising it's not what we

258
00:09:59,910 --> 00:09:57,760
expected

259
00:10:01,509 --> 00:09:59,920
and it was thrilling actually even

260
00:10:04,870 --> 00:10:01,519
though the sample size was

261
00:10:07,910 --> 00:10:04,880
eight now you can access

262
00:10:10,870 --> 00:10:07,920
public databases of brain images and get

263
00:10:13,829 --> 00:10:10,880

a thousand people

264

00:10:15,190 --> 00:10:13,839

and it doesn't cost you anything for the

265

00:10:16,790 --> 00:10:15,200

for the public for the audience for the

266

00:10:18,550 --> 00:10:16,800

people listening do you mind

267

00:10:20,310 --> 00:10:18,560

outlining what is the brain efficiency

268

00:10:22,150 --> 00:10:20,320

hypothesis also

269

00:10:23,990 --> 00:10:22,160

also please let people know the

270

00:10:25,829 --> 00:10:24,000

advantages and disadvantages to pet

271

00:10:28,150 --> 00:10:25,839

versus mri i'm not sure

272

00:10:30,550 --> 00:10:28,160

i remember i'm going off of this book so

273

00:10:32,150 --> 00:10:30,560

i know what it was in the 1980s and the

274

00:10:33,430 --> 00:10:32,160

1990s but i don't know if those have

275

00:10:34,949 --> 00:10:33,440

been fixed if there's any new

276

00:10:37,350 --> 00:10:34,959

technologies any new

277

00:10:39,190 --> 00:10:37,360

connections innovations yes i i lost the

278

00:10:40,870 --> 00:10:39,200

threat of the point i wanted to make

279

00:10:42,389 --> 00:10:40,880

i'll answer your question but the point

280

00:10:46,389 --> 00:10:42,399

i wanted to make

281

00:10:49,750 --> 00:10:46,399

is that you know the 1980s

282

00:10:51,829 --> 00:10:49,760

35 years ago this is a whole generation

283

00:10:53,829 --> 00:10:51,839

some of the people i listen to when i go

284

00:10:57,350 --> 00:10:53,839

to talks now literally were not

285

00:11:00,630 --> 00:10:57,360

born when i was doing this and

286

00:11:01,590 --> 00:11:00,640

i could not imagine then the kinds of

287

00:11:03,269 --> 00:11:01,600

technology

288

00:11:06,230 --> 00:11:03,279

that's being brought to bear on the

289

00:11:10,949 --> 00:11:06,240

brain efficiency hypothesis

290

00:11:13,030 --> 00:11:10,959

and i think people in the field

291

00:11:14,550 --> 00:11:13,040

the young people in the field need to

292

00:11:15,350 --> 00:11:14,560

think about what the field is going to

293

00:11:19,670 --> 00:11:15,360

be like

294

00:11:20,710 --> 00:11:19,680

35 years from now i won't be here but

295

00:11:23,430 --> 00:11:20,720

it's going to be

296

00:11:24,150 --> 00:11:23,440

fantastic even though what they're doing

297

00:11:26,870 --> 00:11:24,160

today

298

00:11:27,509 --> 00:11:26,880

is fantastic and they need to start

299

00:11:30,870 --> 00:11:27,519

thinking

300

00:11:33,110 --> 00:11:30,880

about what's what's coming with the

301
00:11:35,269 --> 00:11:33,120
technology that's coming in the kinds of

302
00:11:39,269 --> 00:11:35,279
questions they're going to ask

303
00:11:40,470 --> 00:11:39,279
so in 1988 positron emission tomography

304
00:11:42,790 --> 00:11:40,480
was brand new

305
00:11:45,110 --> 00:11:42,800
it was available in only a handful of

306
00:11:46,790 --> 00:11:45,120
universities

307
00:11:48,790 --> 00:11:46,800
and that's why i came to the university

308
00:11:50,550 --> 00:11:48,800
of california at irvine because i had an

309
00:11:53,110 --> 00:11:50,560
opportunity to work with people who

310
00:11:56,150 --> 00:11:53,120
acquired a pet scan machine

311
00:11:59,670 --> 00:11:56,160
here and pet

312
00:12:00,790 --> 00:11:59,680
works by um injecting a radioactive

313
00:12:03,269 --> 00:12:00,800

tracer

314

00:12:04,870 --> 00:12:03,279

into a person while they're doing a

315

00:12:07,750 --> 00:12:04,880

cognitive task

316

00:12:09,190 --> 00:12:07,760

and the tracer labels those hearts parts

317

00:12:10,389 --> 00:12:09,200

of the brain that we're taking up the

318

00:12:13,430 --> 00:12:10,399

most glucose

319

00:12:14,150 --> 00:12:13,440

that we're using the most energy and

320

00:12:17,670 --> 00:12:14,160

then

321

00:12:20,069 --> 00:12:17,680

you can make a picture of the um

322

00:12:22,470 --> 00:12:20,079

the places in the brain that took up the

323

00:12:24,069 --> 00:12:22,480

most of the radioactive tracer

324

00:12:26,069 --> 00:12:24,079

because the parts of the brain that are

325

00:12:28,710 --> 00:12:26,079

working the hardest

326
00:12:29,509 --> 00:12:28,720
would take up the most glucose and give

327
00:12:33,829 --> 00:12:29,519
off the most

328
00:12:38,389 --> 00:12:33,839
radio activity to make the picture from

329
00:12:40,069 --> 00:12:38,399
and the very first study we did we were

330
00:12:41,670 --> 00:12:40,079
interested in what parts of the brain

331
00:12:43,910 --> 00:12:41,680
were most active

332
00:12:45,750 --> 00:12:43,920
while people were literally solving

333
00:12:48,870 --> 00:12:45,760
intelligence test items

334
00:12:51,990 --> 00:12:48,880
they were non-verbal abstract reasoning

335
00:12:54,230 --> 00:12:52,000
problems and we found

336
00:12:55,670 --> 00:12:54,240
some areas of the brain compared to some

337
00:12:58,710 --> 00:12:55,680
control conditions

338
00:12:59,509 --> 00:12:58,720

were more active while people solved the

339

00:13:02,870 --> 00:12:59,519

problems

340

00:13:05,590 --> 00:13:02,880

but the surprising thing was when you

341

00:13:06,310 --> 00:13:05,600

correlated the amount of glucose

342

00:13:08,230 --> 00:13:06,320

activity

343

00:13:09,430 --> 00:13:08,240

in those parts of the brain that were

344

00:13:11,829 --> 00:13:09,440

more active

345

00:13:13,350 --> 00:13:11,839

to the scores people got on the

346

00:13:17,430 --> 00:13:13,360

intelligence test

347

00:13:20,470 --> 00:13:17,440

the correlations were inverse that is

348

00:13:21,430 --> 00:13:20,480

the people whose brains were working the

349

00:13:25,030 --> 00:13:21,440

hardest

350

00:13:27,269 --> 00:13:25,040

had the lowest scores hence the brain

351

00:13:29,350 --> 00:13:27,279

efficiency hypothesis

352

00:13:31,030 --> 00:13:29,360

that it's not how hard your brain was

353

00:13:33,190 --> 00:13:31,040

working that made you

354

00:13:34,470 --> 00:13:33,200

score high on the test it was how

355

00:13:36,949 --> 00:13:34,480

efficiently

356

00:13:39,389 --> 00:13:36,959

your brain was working that's how we

357

00:13:41,030 --> 00:13:39,399

explained the inverse correlations in

358

00:13:45,590 --> 00:13:41,040

1988

359

00:13:48,069 --> 00:13:45,600

and and that was the origin of a lot of

360

00:13:51,670 --> 00:13:48,079

subsequent research

361

00:13:52,150 --> 00:13:51,680

on the direction of correlations between

362

00:13:55,189 --> 00:13:52,160

brain

363

00:13:58,790 --> 00:13:55,199

activity measured by pet measured by

364

00:14:02,790 --> 00:13:58,800

functional mri and scores on

365

00:14:06,230 --> 00:14:02,800

intelligence tests between 1988

366

00:14:09,910 --> 00:14:06,240

and the year 2000 not much happened in

367

00:14:13,110 --> 00:14:09,920

brain imaging studies of intelligence

368

00:14:14,389 --> 00:14:13,120

pet was a very complicated and expensive

369

00:14:17,509 --> 00:14:14,399

technology

370

00:14:19,670 --> 00:14:17,519

it was not available in many places but

371

00:14:22,870 --> 00:14:19,680

around the year 2000

372

00:14:25,030 --> 00:14:22,880

functional mri became available

373

00:14:26,710 --> 00:14:25,040

although mri machines have been around

374

00:14:29,189 --> 00:14:26,720

for a while

375

00:14:30,230 --> 00:14:29,199

getting functional information in terms

376

00:14:33,189 --> 00:14:30,240
of blood flow

377

00:14:34,710 --> 00:14:33,199
out of an mri scanner start to be

378

00:14:37,590 --> 00:14:34,720
started to become available

379

00:14:38,230 --> 00:14:37,600
around 2000 and then a remarkable thing

380

00:14:41,590 --> 00:14:38,240
happened

381

00:14:43,750 --> 00:14:41,600
a bunch of cognitive psychologists

382

00:14:46,389 --> 00:14:43,760
who were really not so much interested

383

00:14:48,870 --> 00:14:46,399
in brain location

384

00:14:51,189 --> 00:14:48,880
but we're interested in how the brain

385

00:14:54,069 --> 00:14:51,199
processes information irrespective of

386

00:14:57,189 --> 00:14:54,079
the brain areas involved

387

00:14:57,990 --> 00:14:57,199
fmri was readily available in many

388

00:14:59,750 --> 00:14:58,000

institutions

389

00:15:01,990 --> 00:14:59,760
in the medical school so a lot of

390

00:15:05,509 --> 00:15:02,000
cognitive psychologists

391

00:15:08,790 --> 00:15:05,519
started getting access to fmri

392

00:15:09,910 --> 00:15:08,800
and they started doing fmri studies of

393

00:15:11,990 --> 00:15:09,920
cognition

394

00:15:13,750 --> 00:15:12,000
and some of that included tests of

395

00:15:16,870 --> 00:15:13,760
intelligence

396

00:15:18,790 --> 00:15:16,880
so there it's kind of a watershed moment

397

00:15:21,189 --> 00:15:18,800
in cognitive psychology

398

00:15:22,310 --> 00:15:21,199
where people who traditionally were

399

00:15:26,069 --> 00:15:22,320
uninterested in

400

00:15:29,350 --> 00:15:26,079
individual differences became in

401
00:15:31,389 --> 00:15:29,360
individual difference researchers

402
00:15:33,030 --> 00:15:31,399
and now we have a lot of the most

403
00:15:35,430 --> 00:15:33,040
sophisticated

404
00:15:37,590 --> 00:15:35,440
brain imaging studies and intelligence

405
00:15:38,790 --> 00:15:37,600
being done by sophisticated brain

406
00:15:40,710 --> 00:15:38,800
imaging people

407
00:15:43,350 --> 00:15:40,720
who were never really came up through

408
00:15:46,150 --> 00:15:43,360
the ranks of intelligence research

409
00:15:46,949 --> 00:15:46,160
so the whole field is is very exciting a

410
00:15:52,470 --> 00:15:46,959
lot of new

411
00:15:55,189 --> 00:15:52,480
this is not your grandfather's uh

412
00:15:55,590 --> 00:15:55,199
intelligence research you know that was

413
00:15:59,350 --> 00:15:55,600

all

414

00:16:01,749 --> 00:15:59,360

paper and pencil iq test scores are iq

415

00:16:03,189 --> 00:16:01,759

scores meaningful at all aren't they

416

00:16:07,189 --> 00:16:03,199

just biased

417

00:16:09,350 --> 00:16:07,199

and those controversies are long gone

418

00:16:10,790 --> 00:16:09,360

long gone in your field but to the

419

00:16:13,430 --> 00:16:10,800

general public

420

00:16:15,110 --> 00:16:13,440

it's still it's still a touchy issue in

421

00:16:17,670 --> 00:16:15,120

fact you even mentioned that

422

00:16:18,389 --> 00:16:17,680

some researchers say we're measuring

423

00:16:19,749 --> 00:16:18,399

reasoning

424

00:16:21,350 --> 00:16:19,759

and they don't mention intelligence

425

00:16:23,110 --> 00:16:21,360

because maybe the grant providers will

426

00:16:24,710 --> 00:16:23,120

be more likely to give funding to people

427

00:16:26,949 --> 00:16:24,720

who don't study intelligence because of

428

00:16:29,590 --> 00:16:26,959

the the stigma attached to it

429

00:16:30,150 --> 00:16:29,600

the stigma attached to intelligence came

430

00:16:33,590 --> 00:16:30,160

about

431

00:16:37,350 --> 00:16:33,600

almost overnight there was a time when

432

00:16:39,110 --> 00:16:37,360

educational tended to be experts in

433

00:16:42,389 --> 00:16:39,120

psychometrics and things like

434

00:16:44,069 --> 00:16:42,399

intelligence testing as i actually

435

00:16:46,949 --> 00:16:44,079

explained in the book

436

00:16:48,870 --> 00:16:46,959

the watershed moment was the publication

437

00:16:50,069 --> 00:16:48,880

of an article by an educational

438

00:16:52,629 --> 00:16:50,079

psychologist named

439

00:16:53,990 --> 00:16:52,639

arthur jensen published an article in

440

00:16:57,350 --> 00:16:54,000

the harvard educational

441

00:16:59,350 --> 00:16:57,360

review in 1969 he had been asked to

442

00:17:02,710 --> 00:16:59,360

review

443

00:17:05,909 --> 00:17:02,720

programs that were designed

444

00:17:09,110 --> 00:17:05,919

to help disadvantaged children

445

00:17:11,750 --> 00:17:09,120

close the gap on cognitive testing

446

00:17:12,230 --> 00:17:11,760

it had been known for decades that many

447

00:17:15,350 --> 00:17:12,240

uh

448

00:17:18,630 --> 00:17:15,360

disadvantaged children start this was

449

00:17:20,789 --> 00:17:18,640

before head start head start

450

00:17:24,069 --> 00:17:20,799

started just about the time but it was

451
00:17:27,029 --> 00:17:24,079
too new to be included in his evaluation

452
00:17:28,870 --> 00:17:27,039
but there were demonstration projects

453
00:17:31,190 --> 00:17:28,880
that helped lead to that

454
00:17:32,310 --> 00:17:31,200
head start and some of those

455
00:17:35,350 --> 00:17:32,320
demonstration

456
00:17:38,710 --> 00:17:35,360
projects were claiming

457
00:17:42,230 --> 00:17:38,720
gigantic increases in children's

458
00:17:44,590 --> 00:17:42,240
iq after an intervention

459
00:17:45,750 --> 00:17:44,600
right after what they called

460
00:17:48,789 --> 00:17:45,760
compensatory

461
00:17:50,470 --> 00:17:48,799
education and it was like

462
00:17:53,190 --> 00:17:50,480
remarkable one of them was actually

463
00:17:56,150 --> 00:17:53,200

called the miracle in milwaukee

464

00:17:58,630 --> 00:17:56,160

right and jensen was asked by the

465

00:18:01,990 --> 00:17:58,640

editors of the harvard educational

466

00:18:03,350 --> 00:18:02,000

review to get the data look into it and

467

00:18:05,510 --> 00:18:03,360

and just see

468

00:18:07,430 --> 00:18:05,520

what was going on because these these

469

00:18:10,789 --> 00:18:07,440

reports were so

470

00:18:11,430 --> 00:18:10,799

phenomenal and encouraging and supported

471

00:18:14,549 --> 00:18:11,440

what almost

472

00:18:17,430 --> 00:18:14,559

every psychologist at the time believed

473

00:18:20,390 --> 00:18:17,440

that that gaps in cognitive testing were

474

00:18:23,830 --> 00:18:20,400

due entirely to being disadvantaged

475

00:18:29,750 --> 00:18:26,950

compensate for the disadvantage

476

00:18:33,990 --> 00:18:29,760

those gaps would go away and that's why

477

00:18:36,390 --> 00:18:34,000

they called it compensatory education

478

00:18:37,830 --> 00:18:36,400

and what jensen found as he actually got

479

00:18:41,590 --> 00:18:37,840

data and looked into

480

00:18:42,950 --> 00:18:41,600

this that from a statistical

481

00:18:45,990 --> 00:18:42,960

psychometric point of view

482

00:18:48,310 --> 00:18:46,000

none of the claims held up none of them

483

00:18:50,549 --> 00:18:48,320

and it was very disappointing but then

484

00:18:53,270 --> 00:18:50,559

he went further and said look

485

00:18:53,590 --> 00:18:53,280

the fact that intelligence seems to be

486

00:18:56,789 --> 00:18:53,600

so

487

00:18:58,789 --> 00:18:56,799

resistant to efforts to improve it by

488

00:19:02,870 --> 00:18:58,799

making environmental education

489

00:19:05,430 --> 00:19:02,880

changes this suggests that genetics

490

00:19:08,630 --> 00:19:05,440

plays a more powerful role in

491

00:19:12,310 --> 00:19:08,640

intelligence differences among people

492

00:19:15,510 --> 00:19:12,320

than we have considered before

493

00:19:18,549 --> 00:19:15,520

and that was bad enough but then he went

494

00:19:19,830 --> 00:19:18,559

further and applied that reasoning to

495

00:19:22,789 --> 00:19:19,840

the well-known

496

00:19:25,830 --> 00:19:22,799

historical average difference between

497

00:19:28,310 --> 00:19:25,840

black students and white students

498

00:19:30,150 --> 00:19:28,320

so jensen did that jensen did that all

499

00:19:31,590 --> 00:19:30,160

in this one article it's over a hundred

500

00:19:35,029 --> 00:19:31,600

pages long

501
00:19:39,029 --> 00:19:35,039
and it's technical and he basically

502
00:19:40,710 --> 00:19:39,039
said we should consider as a hypothesis

503
00:19:43,110 --> 00:19:40,720
that part of this average group

504
00:19:46,549 --> 00:19:43,120
difference might be due to genetics

505
00:19:49,270 --> 00:19:46,559
he didn't conclude it he didn't state it

506
00:19:49,990 --> 00:19:49,280
he said this is uh some hypothesis we

507
00:19:53,430 --> 00:19:50,000
should

508
00:19:55,110 --> 00:19:53,440
consider he then went on to say in part

509
00:19:58,630 --> 00:19:55,120
of the article that no one ever

510
00:20:01,510 --> 00:19:58,640
cites that what this might mean

511
00:20:03,190 --> 00:20:01,520
is that education has to be tailored to

512
00:20:05,750 --> 00:20:03,200
individual students

513
00:20:07,510 --> 00:20:05,760

strengths and weaknesses so that every

514

00:20:10,630 --> 00:20:07,520

student can benefit

515

00:20:12,470 --> 00:20:10,640

from the to maximize their education by

516

00:20:13,270 --> 00:20:12,480

concentrating on their strengths

517

00:20:16,149 --> 00:20:13,280

essentially

518

00:20:16,789 --> 00:20:16,159

i think i cite that concluding paragraph

519

00:20:19,909 --> 00:20:16,799

in the book

520

00:20:21,590 --> 00:20:19,919

you held up well anyway this created a

521

00:20:25,029 --> 00:20:21,600

firestorm because all people

522

00:20:25,590 --> 00:20:25,039

heard was compensatory education doesn't

523

00:20:28,789 --> 00:20:25,600

work

524

00:20:31,110 --> 00:20:28,799

because uh intelligence is

525

00:20:33,029 --> 00:20:31,120

genetic and so is the black and white

526

00:20:35,350 --> 00:20:33,039

differences due to genetics

527

00:20:37,350 --> 00:20:35,360

and since genetics is deterministic and

528

00:20:40,470 --> 00:20:37,360

we can't do anything about it

529

00:20:43,590 --> 00:20:40,480

it means that at least one group is

530

00:20:47,430 --> 00:20:43,600

genetically inferior and you can imagine

531

00:20:50,470 --> 00:20:47,440

that this went over very poorly

532

00:20:53,270 --> 00:20:50,480

jensen uh was hounded for this

533

00:20:55,590 --> 00:20:53,280

he couldn't speak at a meeting of the

534

00:20:57,029 --> 00:20:55,600

american psychological association he

535

00:20:59,669 --> 00:20:57,039

couldn't give an address

536

00:21:01,510 --> 00:20:59,679

i actually went as a student to hear him

537

00:21:04,070 --> 00:21:01,520

and the room was cleared because of a

538

00:21:07,190 --> 00:21:04,080

bomb threat

539

00:21:09,350 --> 00:21:07,200

and he had to basically uh

540

00:21:11,350 --> 00:21:09,360

have the university police escort him

541

00:21:14,070 --> 00:21:11,360

around the berkeley campus

542

00:21:14,549 --> 00:21:14,080

his mail was checked by the police i

543

00:21:17,029 --> 00:21:14,559

mean

544

00:21:18,470 --> 00:21:17,039

you can't really imagine the backlash

545

00:21:21,350 --> 00:21:18,480

against this article

546

00:21:23,990 --> 00:21:21,360

and against the view that we should

547

00:21:25,029 --> 00:21:24,000

consider the hypothesis that genetics

548

00:21:27,750 --> 00:21:25,039

had something

549

00:21:29,110 --> 00:21:27,760

to do with average group differences

550

00:21:32,870 --> 00:21:29,120

it's still

551
00:21:35,029 --> 00:21:32,880
a hot button issue today we need to

552
00:21:36,149 --> 00:21:35,039
make clear for the people listening that

553
00:21:37,430 --> 00:21:36,159
during the course of this

554
00:21:39,029 --> 00:21:37,440
conversation when we're talking about

555
00:21:39,750 --> 00:21:39,039
intelligence it may seem as if we're

556
00:21:42,149 --> 00:21:39,760
saying that

557
00:21:43,430 --> 00:21:42,159
because having more intelligence seems

558
00:21:46,630 --> 00:21:43,440
to be better overall

559
00:21:50,310 --> 00:21:46,640
it increases your we can talk about the

560
00:21:52,070 --> 00:21:50,320
the benefits later that if you have low

561
00:21:54,630 --> 00:21:52,080
intelligence then you're lesser of a

562
00:21:57,110 --> 00:21:54,640
human or that you're worth less

563
00:21:58,390 --> 00:21:57,120

no intelligence researcher that i know

564

00:22:01,110 --> 00:21:58,400

and i know

565

00:22:03,190 --> 00:22:01,120

a quite a number of them has ever

566

00:22:05,510 --> 00:22:03,200

entertained that thought

567

00:22:07,110 --> 00:22:05,520

i don't there are people who clearly

568

00:22:09,029 --> 00:22:07,120

believe right i'm just saying that

569

00:22:11,029 --> 00:22:09,039

there's the perception that when we talk

570

00:22:13,270 --> 00:22:11,039

about something like this that we're

571

00:22:16,149 --> 00:22:13,280

holding that belief unstable part of

572

00:22:19,510 --> 00:22:16,159

what intelligence researchers have to do

573

00:22:22,710 --> 00:22:19,520

is just say how silly that belief

574

00:22:25,830 --> 00:22:22,720

would be so having uh

575

00:22:26,390 --> 00:22:25,840

low and we haven't really talked about

576

00:22:28,549 --> 00:22:26,400

it

577

00:22:29,909 --> 00:22:28,559

what intelligence is right we have to

578

00:22:30,549 --> 00:22:29,919

define it we have to delineate it

579

00:22:33,190 --> 00:22:30,559

between

580

00:22:34,950 --> 00:22:33,200

iq intelligence and g factor yeah for

581

00:22:36,390 --> 00:22:34,960

the purposes of this conversation

582

00:22:40,070 --> 00:22:36,400

intelligence is very

583

00:22:42,149 --> 00:22:40,080

narrowly defined as a general ability

584

00:22:43,190 --> 00:22:42,159

that underlies all other mental

585

00:22:46,310 --> 00:22:43,200

abilities

586

00:22:47,909 --> 00:22:46,320

it's not one particular thing it's a

587

00:22:51,909 --> 00:22:47,919

general ability

588

00:22:54,789 --> 00:22:51,919

is not the only

589

00:22:56,630 --> 00:22:54,799

aspect of intelligence but it turns out

590

00:22:59,990 --> 00:22:56,640

to be the most predictive

591

00:23:02,630 --> 00:23:00,000

of academic success job success

592

00:23:05,190 --> 00:23:02,640

and life success in general that's why

593

00:23:06,310 --> 00:23:05,200

most intelligence researchers focus on

594

00:23:18,149 --> 00:23:06,320

it

595

00:23:18,710 --> 00:23:18,159

measure of intelligence like there is

596

00:23:22,470 --> 00:23:18,720

for

597

00:23:25,590 --> 00:23:22,480

uh temperature or distance

598

00:23:29,270 --> 00:23:25,600

so as i explained in the book

599

00:23:32,149 --> 00:23:29,280

ten feet is exactly twice

600

00:23:32,630 --> 00:23:32,159

as long as five feet right a ratio

601
00:23:36,470 --> 00:23:32,640
measure

602
00:23:37,430 --> 00:23:36,480
of 140 is not twice as smart as an iq

603
00:23:39,350 --> 00:23:37,440
with 70.

604
00:23:42,470 --> 00:23:39,360
it's a different metric there is no

605
00:23:45,590 --> 00:23:42,480
metric in intelligence research

606
00:23:48,230 --> 00:23:45,600
comparable to weight or distance

607
00:23:50,630 --> 00:23:48,240
is there a weight scale is there a way

608
00:23:53,669 --> 00:23:50,640
to develop the ratio scale with

609
00:23:55,029 --> 00:23:53,679
chronometry people that is assessing

610
00:23:56,950 --> 00:23:55,039
reaction time

611
00:23:58,470 --> 00:23:56,960
people we're getting ahead of the story

612
00:24:01,510 --> 00:23:58,480
but people have

613
00:24:04,470 --> 00:24:01,520

have dreamed about that so far it

614

00:24:05,830 --> 00:24:04,480

hasn't come to fruition reaction time is

615

00:24:09,029 --> 00:24:05,840

a possibility

616

00:24:12,870 --> 00:24:09,039

because 500 milliseconds is

617

00:24:15,990 --> 00:24:12,880

twice as slow as 250 milliseconds

618

00:24:17,269 --> 00:24:16,000

and reaction time to brain events has

619

00:24:20,230 --> 00:24:17,279

been used

620

00:24:20,549 --> 00:24:20,240

but so far it's and it is correlated

621

00:24:23,269 --> 00:24:20,559

with

622

00:24:24,390 --> 00:24:23,279

iq scores and other measures of

623

00:24:26,950 --> 00:24:24,400

intelligence

624

00:24:27,990 --> 00:24:26,960

but so far it hasn't really broken

625

00:24:31,190 --> 00:24:28,000

through as an

626
00:24:34,549 --> 00:24:31,200
independent or alternative measure

627
00:24:36,310 --> 00:24:34,559
of general intelligence but even with

628
00:24:39,029 --> 00:24:36,320
the limitations we have

629
00:24:41,029 --> 00:24:39,039
of estimating general intelligence

630
00:24:43,110 --> 00:24:41,039
researchers have still learned a lot

631
00:24:44,230 --> 00:24:43,120
about what intelligence is and where it

632
00:24:47,269 --> 00:24:44,240
comes from

633
00:24:49,830 --> 00:24:47,279
if you score low on an iq test

634
00:24:51,669 --> 00:24:49,840
uh and because you don't have this

635
00:24:53,750 --> 00:24:51,679
generalized ability

636
00:24:55,269 --> 00:24:53,760
it means absolutely nothing about your

637
00:24:59,190 --> 00:24:55,279
quality of

638
00:25:02,710 --> 00:24:59,200

what kind of person you are

639

00:25:06,230 --> 00:25:02,720

you can be a kind person you can be

640

00:25:10,549 --> 00:25:06,240

a loyal person you can be a likable

641

00:25:12,870 --> 00:25:10,559

person you can be a friendly person

642

00:25:17,430 --> 00:25:12,880

and on the opposite end you can have a

643

00:25:23,990 --> 00:25:20,470

so i think part of the problem

644

00:25:24,789 --> 00:25:24,000

is that many people who are interested

645

00:25:28,070 --> 00:25:24,799

in iq

646

00:25:31,350 --> 00:25:28,080

or discuss it don't

647

00:25:34,710 --> 00:25:31,360

have personal experience

648

00:25:37,909 --> 00:25:34,720

with people at the lower end

649

00:25:39,430 --> 00:25:37,919

unless you have a relative or you grew

650

00:25:43,830 --> 00:25:39,440

up with somebody

651
00:25:46,149 --> 00:25:43,840
with a with an iq of around 80 or less

652
00:25:47,669 --> 00:25:46,159
you have no idea what life is like for

653
00:25:52,230 --> 00:25:47,679
them

654
00:25:55,669 --> 00:25:52,240
and and how difficult it is somebody

655
00:25:59,510 --> 00:25:55,679
wants a defined uh

656
00:26:01,269 --> 00:25:59,520
life uh everyday life is a is an iq test

657
00:26:03,909 --> 00:26:01,279
just navigating the trials and

658
00:26:06,950 --> 00:26:03,919
tribulations of everyday life

659
00:26:10,470 --> 00:26:06,960
uh probably most of the people you know

660
00:26:12,710 --> 00:26:10,480
are at the higher end of the spectrum

661
00:26:13,510 --> 00:26:12,720
and if your average iq most of the

662
00:26:16,950 --> 00:26:13,520
people you know

663
00:26:19,110 --> 00:26:16,960

are you know plus or minus uh

664

00:26:20,149 --> 00:26:19,120

and you don't really know what it's like

665

00:26:23,750 --> 00:26:20,159

to have an iq

666

00:26:26,470 --> 00:26:23,760

of of 80 or even 85 and i

667

00:26:28,149 --> 00:26:26,480

people with iqs of 85 and less are the

668

00:26:34,230 --> 00:26:28,159

lower 16

669

00:26:37,430 --> 00:26:34,240

so if you think about iq as a percentile

670

00:26:40,710 --> 00:26:37,440

you know if you have an iq of 130

671

00:26:44,630 --> 00:26:40,720

you're in about the top two percent

672

00:26:48,310 --> 00:26:44,640

people if if you have an iq

673

00:26:51,430 --> 00:26:48,320

of of 85 or less you're in the bottom

674

00:26:55,350 --> 00:26:51,440

16th percentile and people

675

00:26:58,470 --> 00:26:55,360

in that range with some exceptions

676
00:27:02,230 --> 00:26:58,480
find it very difficult to have

677
00:27:04,149 --> 00:27:02,240
the kind of employment that pays enough

678
00:27:06,549 --> 00:27:04,159
to be self-sufficient they're

679
00:27:09,750 --> 00:27:06,559
chronically underemployed

680
00:27:12,950 --> 00:27:09,760
okay is this a problem

681
00:27:16,950 --> 00:27:12,960
well the 16th percentile in the united

682
00:27:19,830 --> 00:27:16,960
states with 320 million some odd people

683
00:27:24,710 --> 00:27:19,840
this means over 50 million people in the

684
00:27:29,110 --> 00:27:27,430
this is a problem it's not a problem

685
00:27:31,110 --> 00:27:29,120
because they're bad people it's not a

686
00:27:33,590 --> 00:27:31,120
problem because they're lazy people

687
00:27:35,590 --> 00:27:33,600
it's not a problem for any negative

688
00:27:36,710 --> 00:27:35,600

reason about them through no fault of

689

00:27:39,750 --> 00:27:36,720

their own

690

00:27:42,470 --> 00:27:39,760

they have mental abilities that

691

00:27:43,909 --> 00:27:42,480

limit their participation in modern

692

00:27:46,310 --> 00:27:43,919

society

693

00:27:48,070 --> 00:27:46,320

so what do you what how can you help

694

00:27:48,630 --> 00:27:48,080

this well there are two ways you can

695

00:27:51,510 --> 00:27:48,640

provide

696

00:27:53,669 --> 00:27:51,520

safety nets i mean this is partly the

697

00:27:55,510 --> 00:27:53,679

reason i've come around to the universal

698

00:27:58,149 --> 00:27:55,520

basic income idea

699

00:27:58,630 --> 00:27:58,159

that there are some people who really

700

00:28:00,549 --> 00:27:58,640

really

701
00:28:01,990 --> 00:28:00,559
need this and through no fault of their

702
00:28:05,029 --> 00:28:02,000
own just can't earn

703
00:28:06,789 --> 00:28:05,039
enough to be self-efficient but the

704
00:28:09,669 --> 00:28:06,799
other way to approach it

705
00:28:10,950 --> 00:28:09,679
is to say well what can we do to raise

706
00:28:13,029 --> 00:28:10,960
iq

707
00:28:14,630 --> 00:28:13,039
what can we do to increase people's

708
00:28:18,149 --> 00:28:14,640
general ability

709
00:28:21,269 --> 00:28:18,159
is there anything compensatory education

710
00:28:23,269 --> 00:28:21,279
doesn't work it's been tried you know

711
00:28:25,430 --> 00:28:23,279
jensen said it didn't work based on what

712
00:28:28,549 --> 00:28:25,440
he did in 1969

713
00:28:31,029 --> 00:28:28,559

here we are 50 years later there have

714

00:28:33,350 --> 00:28:31,039

been all kinds of compensatory education

715

00:28:37,029 --> 00:28:33,360

programs including head start

716

00:28:39,350 --> 00:28:37,039

and others and they do

717

00:28:40,149 --> 00:28:39,360

some positive things you get positive

718

00:28:43,269 --> 00:28:40,159

outcomes

719

00:28:46,310 --> 00:28:43,279

from them they're worth doing

720

00:28:50,389 --> 00:28:46,320

but one of the positive outcomes is not

721

00:28:53,590 --> 00:28:50,399

increasing their iq right q of students

722

00:28:55,190 --> 00:28:53,600

so and we don't call it compensatory

723

00:28:58,870 --> 00:28:55,200

education anymore

724

00:29:02,389 --> 00:28:58,880

we call it early childhood education

725

00:29:03,590 --> 00:29:02,399

completely change in in name partly as a

726

00:29:06,630 --> 00:29:03,600

recognition that it

727

00:29:07,909 --> 00:29:06,640

failed to increase iq is there anything

728

00:29:10,870 --> 00:29:07,919

we can do to increase

729

00:29:11,990 --> 00:29:10,880

iq in my view when i go through this

730

00:29:15,350 --> 00:29:12,000

chapter and verse in

731

00:29:18,310 --> 00:29:15,360

the book so far nothing has worked

732

00:29:19,990 --> 00:29:18,320

many claims about memory training

733

00:29:23,510 --> 00:29:20,000

computer games

734

00:29:27,149 --> 00:29:23,520

in my view the way to increase iq

735

00:29:29,350 --> 00:29:27,159

will come from an understanding of the

736

00:29:31,029 --> 00:29:29,360

neuroscience and genetics of

737

00:29:34,070 --> 00:29:31,039

intelligence

738

00:29:34,950 --> 00:29:34,080

and ironically the more differences

739

00:29:38,230 --> 00:29:34,960

among people

740

00:29:40,269 --> 00:29:38,240

in intelligence are genetic

741

00:29:42,310 --> 00:29:40,279

that means there's an underlying

742

00:29:46,389 --> 00:29:42,320

biochemistry

743

00:29:47,029 --> 00:29:46,399

which is ironic because in the 21st

744

00:29:49,350 --> 00:29:47,039

century

745

00:29:50,310 --> 00:29:49,360

we are learning how to manipulate that

746

00:29:53,510 --> 00:29:50,320

kind of bio

747

00:29:56,630 --> 00:29:53,520

that kind of neurochemistry

748

00:29:57,350 --> 00:29:56,640

and that tells me that it's going to be

749

00:29:59,510 --> 00:29:57,360

possible

750

00:30:02,950 --> 00:29:59,520

once we have a better understanding of

751
00:30:06,830 --> 00:30:02,960
the of the neuroscience of intelligence

752
00:30:09,750 --> 00:30:06,840
to use neuroscience methods to develop

753
00:30:10,630 --> 00:30:09,760
interventions possibly medications or

754
00:30:14,789 --> 00:30:10,640
drugs

755
00:30:15,510 --> 00:30:14,799
that would increase iq that's the ironic

756
00:30:17,830 --> 00:30:15,520
part

757
00:30:19,430 --> 00:30:17,840
people think that if intelligence is

758
00:30:21,590 --> 00:30:19,440
genetic it's immutable

759
00:30:23,590 --> 00:30:21,600
can change that's the wrong way to look

760
00:30:26,110 --> 00:30:23,600
at genetics

761
00:30:28,630 --> 00:30:26,120
genetics is probabilistic not

762
00:30:30,310 --> 00:30:28,640
necessarily deterministic

763
00:30:32,389 --> 00:30:30,320

and if you can manipulate those

764

00:30:34,950 --> 00:30:32,399

probabilities by

765

00:30:37,590 --> 00:30:34,960

manipulating somewhere in the cascade of

766

00:30:39,430 --> 00:30:37,600

events between a gene turning on

767

00:30:41,430 --> 00:30:39,440

and something happening in the brain

768

00:30:43,430 --> 00:30:41,440

there's a thousand steps

769

00:30:45,029 --> 00:30:43,440

a thousand neurochemical steps in

770

00:30:48,830 --> 00:30:45,039

between and many

771

00:30:51,830 --> 00:30:48,840

interactions of other genes and other uh

772

00:30:54,710 --> 00:30:51,840

uh you know events in the brain

773

00:30:55,590 --> 00:30:54,720

um if you we get some understanding of

774

00:30:59,029 --> 00:30:55,600

that

775

00:31:01,110 --> 00:30:59,039

we can possibly intervene to increase

776

00:31:03,269 --> 00:31:01,120

intelligence dramatically

777

00:31:04,230 --> 00:31:03,279

that's why i say in the beginning of the

778

00:31:07,669 --> 00:31:04,240

book

779

00:31:09,990 --> 00:31:07,679

in my view the ultimate purpose of

780

00:31:12,950 --> 00:31:10,000

intelligence research

781

00:31:15,190 --> 00:31:12,960

is to be able to increase intelligence

782

00:31:16,950 --> 00:31:15,200

that's why we do this kind of research

783

00:31:21,029 --> 00:31:16,960

it's somewhat controversial point of

784

00:31:25,029 --> 00:31:24,149

does brain training like lumosity and so

785

00:31:27,669 --> 00:31:25,039

on those

786

00:31:29,110 --> 00:31:27,679

games do they help with it with an

787

00:31:32,630 --> 00:31:29,120

increase in iq

788

00:31:35,750 --> 00:31:32,640

no okay

789

00:31:37,990 --> 00:31:35,760

how about paracetam that's a nootropic

790

00:31:39,909 --> 00:31:38,000

some people say it increases their iq

791

00:31:43,110 --> 00:31:39,919

have you heard any research on that

792

00:31:46,950 --> 00:31:43,120

i've seen no research on

793

00:31:51,190 --> 00:31:46,960

neurotropic drugs brain training

794

00:31:54,310 --> 00:31:51,200

computer games that suggests an increase

795

00:31:55,190 --> 00:31:54,320

of the general intellectual ability

796

00:31:58,549 --> 00:31:55,200

factor the g

797

00:32:00,070 --> 00:31:58,559

factor what about dual n-back training i

798

00:32:01,509 --> 00:32:00,080

heard that that was associated with an

799

00:32:03,350 --> 00:32:01,519

increase in working memory i think you

800

00:32:06,950 --> 00:32:03,360

do outline that in the book itself

801
00:32:09,669 --> 00:32:06,960
the original study was extremely flawed

802
00:32:10,310 --> 00:32:09,679
i go through it in the book subsequent

803
00:32:13,830 --> 00:32:10,320
studies

804
00:32:14,389 --> 00:32:13,840
are less flawed but the only people that

805
00:32:17,269 --> 00:32:14,399
seem to

806
00:32:19,430 --> 00:32:17,279
replicate the finding at all are the

807
00:32:21,509 --> 00:32:19,440
original researchers

808
00:32:23,430 --> 00:32:21,519
that independent researchers have

809
00:32:25,269 --> 00:32:23,440
essentially been unable to replicate

810
00:32:26,470 --> 00:32:25,279
this finding and even the original

811
00:32:28,710 --> 00:32:26,480
researchers

812
00:32:30,230 --> 00:32:28,720
have kind of backed off the claim that

813
00:32:33,990 --> 00:32:30,240

they're changing

814

00:32:36,710 --> 00:32:34,000

intelligence

815

00:32:38,710 --> 00:32:36,720

it might be that such training increases

816

00:32:42,870 --> 00:32:38,720

attention

817

00:32:46,389 --> 00:32:42,880

maybe makes visual spatial

818

00:32:49,110 --> 00:32:46,399

ability go up a little bit not so clear

819

00:32:49,750 --> 00:32:49,120

but in terms of really affecting what we

820

00:32:52,070 --> 00:32:49,760

call

821

00:32:52,789 --> 00:32:52,080

the general intelligence factor which is

822

00:32:56,470 --> 00:32:52,799

the core

823

00:32:57,029 --> 00:32:56,480

key factor i don't know any evidence of

824

00:32:58,950 --> 00:32:57,039

it

825

00:33:01,269 --> 00:32:58,960

uh i've gone on record saying the

826

00:33:02,310 --> 00:33:01,279

original report was like the original

827

00:33:05,350 --> 00:33:02,320

report of cold

828

00:33:08,389 --> 00:33:05,360

fusion it was done by people

829

00:33:11,669 --> 00:33:08,399

who were really not experts in the field

830

00:33:14,630 --> 00:33:11,679

and uh kind of over hyped their own uh

831

00:33:16,870 --> 00:33:14,640

data and and the original report was

832

00:33:18,710 --> 00:33:16,880

seriously flawed

833

00:33:20,950 --> 00:33:18,720

how about electromagnetic stimulation

834

00:33:23,990 --> 00:33:20,960

like transcranial direct current

835

00:33:27,350 --> 00:33:24,000

and there's a lot of pemf like like this

836

00:33:30,870 --> 00:33:27,360

little device oh you have one this isn't

837

00:33:34,310 --> 00:33:30,880

uh a tdcs one this is a p

838

00:33:35,430 --> 00:33:34,320

e m f it's neo rhythm i don't find that

839

00:33:37,269 --> 00:33:35,440

it makes me any

840

00:33:39,190 --> 00:33:37,279

any brighter in the least but i wear it

841

00:33:42,070 --> 00:33:39,200

when i'm trying to concentrate

842

00:33:44,870 --> 00:33:42,080

has there been any research i don't know

843

00:33:48,070 --> 00:33:44,880

research on that particular device

844

00:33:51,350 --> 00:33:48,080

the last time i reviewed the

845

00:33:53,669 --> 00:33:51,360

brain stimulation research uh

846

00:33:55,669 --> 00:33:53,679

the evidence there was some positive

847

00:33:57,909 --> 00:33:55,679

evidence but the weight of evidence

848

00:34:01,190 --> 00:33:57,919

seemed to be negative

849

00:34:03,750 --> 00:34:01,200

negative thing oh okay okay

850

00:34:04,389 --> 00:34:03,760

it decreased your iq uh there was one

851
00:34:06,070 --> 00:34:04,399
study that

852
00:34:08,629 --> 00:34:06,080
that claimed a decrease but that was

853
00:34:10,710 --> 00:34:08,639
only one study

854
00:34:12,069 --> 00:34:10,720
i don't know that there has been an

855
00:34:15,349 --> 00:34:12,079
evolving weight of

856
00:34:18,069 --> 00:34:15,359
of evidence um you know this

857
00:34:19,349 --> 00:34:18,079
transcranial magnetic stimulation and

858
00:34:21,589 --> 00:34:19,359
other

859
00:34:22,869 --> 00:34:21,599
ways to stimulate the brain they're very

860
00:34:25,510 --> 00:34:22,879
interesting

861
00:34:26,550 --> 00:34:25,520
uh they should do something but whether

862
00:34:30,230 --> 00:34:26,560
they can be used to

863
00:34:33,510 --> 00:34:30,240

increase intelligence

864

00:34:35,990 --> 00:34:33,520

as i have defined it right right i'm not

865

00:34:37,190 --> 00:34:36,000

certain of i i don't know of any

866

00:34:39,190 --> 00:34:37,200

evidence that i would

867

00:34:40,950 --> 00:34:39,200

say would would be compelling but

868

00:34:43,430 --> 00:34:40,960

remember my third law it takes

869

00:34:44,470 --> 00:34:43,440

many years to write this out and figure

870

00:34:47,829 --> 00:34:44,480

it out

871

00:34:49,589 --> 00:34:47,839

um i i don't recommend meanwhile that

872

00:34:51,510 --> 00:34:49,599

people make their own devices to

873

00:34:54,470 --> 00:34:51,520

stimulate their own brains

874

00:34:55,510 --> 00:34:54,480

like some gamers were doing a few years

875

00:34:58,310 --> 00:34:55,520

ago

876

00:34:59,270 --> 00:34:58,320

i myself would not do that i heard that

877

00:35:01,829 --> 00:34:59,280

darpa uses

878

00:35:03,190 --> 00:35:01,839

tdsc for sniper training that it

879

00:35:05,190 --> 00:35:03,200

increases their rate of learning which

880

00:35:07,270 --> 00:35:05,200

to me seems like it would increase your

881

00:35:08,870 --> 00:35:07,280

crystalline intelligence have you seen

882

00:35:09,589 --> 00:35:08,880

any results that are solid in that

883

00:35:11,589 --> 00:35:09,599

domain

884

00:35:13,510 --> 00:35:11,599

i know the people who did that or at

885

00:35:15,109 --> 00:35:13,520

least did some of that original research

886

00:35:16,870 --> 00:35:15,119

it's very interesting

887

00:35:18,710 --> 00:35:16,880

interesting research i guess darpa

888

00:35:22,230 --> 00:35:18,720

decided not to pursue it

889

00:35:25,109 --> 00:35:22,240

i don't think the effects were very big

890

00:35:26,710 --> 00:35:25,119

and they were effects on really

891

00:35:29,430 --> 00:35:26,720

increasing the speed

892

00:35:30,390 --> 00:35:29,440

that analysts could learn material or

893

00:35:33,670 --> 00:35:30,400

increase

894

00:35:35,190 --> 00:35:33,680

the speed that image analog

895

00:35:36,790 --> 00:35:35,200

that people that were doing image

896

00:35:39,829 --> 00:35:36,800

analysis that humans

897

00:35:43,510 --> 00:35:39,839

doing image analysis could could do

898

00:35:45,510 --> 00:35:43,520

more of it in a shorter period of time

899

00:35:46,950 --> 00:35:45,520

but again in terms of increasing

900

00:35:49,030 --> 00:35:46,960

intelligence

901
00:35:53,430 --> 00:35:49,040
these are these are interesting research

902
00:35:54,870 --> 00:35:53,440
questions i don't rule it out but so far

903
00:35:56,550 --> 00:35:54,880
let me put it this way if there was

904
00:35:58,790 --> 00:35:56,560
something i knew about that could

905
00:36:01,750 --> 00:35:58,800
increase my intelligence

906
00:36:02,310 --> 00:36:01,760
i'd be using it right something that's

907
00:36:04,550 --> 00:36:02,320
interesting

908
00:36:06,710 --> 00:36:04,560
is that there's a study i think it's in

909
00:36:08,150 --> 00:36:06,720
the book a fairly established phenomenon

910
00:36:09,430 --> 00:36:08,160
is that the nucleus accumbens the

911
00:36:11,430 --> 00:36:09,440
caudate the putamen

912
00:36:13,829 --> 00:36:11,440
the morphology of it is associated with

913
00:36:16,069 --> 00:36:13,839

an increase or a high rate of

914

00:36:18,230 --> 00:36:16,079

fluid intelligence but only in the right

915

00:36:21,990 --> 00:36:18,240

hemisphere

916

00:36:25,030 --> 00:36:22,000

all of this research on localization

917

00:36:26,390 --> 00:36:25,040

or identifying parts of the brain that

918

00:36:29,109 --> 00:36:26,400

are related to

919

00:36:30,470 --> 00:36:29,119

intelligence test scores this is

920

00:36:35,109 --> 00:36:30,480

something we started

921

00:36:38,470 --> 00:36:35,119

in 1988 it's been done a lot

922

00:36:40,710 --> 00:36:38,480

but as i pointed out even in 1988

923

00:36:41,589 --> 00:36:40,720

finding these little spots in the brain

924

00:36:44,390 --> 00:36:41,599

where there's some

925

00:36:46,069 --> 00:36:44,400

connection to intelligence that's just

926
00:36:48,069 --> 00:36:46,079
the starting point

927
00:36:49,589 --> 00:36:48,079
you have to find out what it is about

928
00:36:53,349 --> 00:36:49,599
those spots

929
00:36:56,550 --> 00:36:53,359
is it more neurons more dendrites

930
00:36:58,950 --> 00:36:56,560
different kinds of neurons more glial

931
00:36:59,670 --> 00:36:58,960
cells you know what's going on in those

932
00:37:02,870 --> 00:36:59,680
areas

933
00:37:05,270 --> 00:37:02,880
and moreover it's probably

934
00:37:07,190 --> 00:37:05,280
as important to know how those areas

935
00:37:09,990 --> 00:37:07,200
communicate with each other

936
00:37:11,030 --> 00:37:10,000
right that's your p-fit model the p-4

937
00:37:14,470 --> 00:37:11,040
the pariah

938
00:37:17,589 --> 00:37:14,480

parietal frontal integration theory

939

00:37:20,390 --> 00:37:17,599

where based on uh all the imaging

940

00:37:23,829 --> 00:37:20,400

studies we could find in 2007.

941

00:37:26,310 --> 00:37:23,839

actually 2006 it was published in 2007

942

00:37:27,430 --> 00:37:26,320

all the imaging studies of reasoning or

943

00:37:29,270 --> 00:37:27,440

intelligence

944

00:37:31,990 --> 00:37:29,280

we looked at all the brain areas that

945

00:37:35,109 --> 00:37:32,000

were implicated we looked at pet studies

946

00:37:38,230 --> 00:37:35,119

we looked at fmri studies

947

00:37:40,390 --> 00:37:38,240

and uh the way we looked at this

948

00:37:42,470 --> 00:37:40,400

these findings you know in all the

949

00:37:43,750 --> 00:37:42,480

studies we had different nomenclature

950

00:37:49,990 --> 00:37:43,760

and different

951
00:37:50,870 --> 00:37:50,000
but the commonalities we could find seem

952
00:37:54,550 --> 00:37:50,880
to implicate

953
00:37:55,349 --> 00:37:54,560
areas mostly in the frontal and parietal

954
00:37:59,030 --> 00:37:55,359
lobes

955
00:38:01,349 --> 00:37:59,040
not exclusively but mostly and so we

956
00:38:03,670 --> 00:38:01,359
develop what we call the parietal

957
00:38:06,790 --> 00:38:03,680
frontal integration theory

958
00:38:08,069 --> 00:38:06,800
of how information flowed around those

959
00:38:10,390 --> 00:38:08,079
areas

960
00:38:11,510 --> 00:38:10,400
that would be related to individual

961
00:38:14,950 --> 00:38:11,520
differences

962
00:38:18,390 --> 00:38:14,960
in intelligence that some people might

963
00:38:22,150 --> 00:38:18,400

have white matter or dendrites

964

00:38:25,190 --> 00:38:22,160

or even mitochondria something different

965

00:38:28,230 --> 00:38:25,200

that would allow information to flow

966

00:38:31,270 --> 00:38:28,240

more efficiently while people were

967

00:38:33,430 --> 00:38:31,280

processing problem solving

968

00:38:34,310 --> 00:38:33,440

and that they would could pro they could

969

00:38:37,510 --> 00:38:34,320

problem solve

970

00:38:40,230 --> 00:38:37,520

better and faster than other people

971

00:38:40,630 --> 00:38:40,240

and this at the time there was no way to

972

00:38:44,069 --> 00:38:40,640

go

973

00:38:46,150 --> 00:38:44,079

to really measure information flow

974

00:38:47,109 --> 00:38:46,160

you could do it indirectly with reaction

975

00:38:49,910 --> 00:38:47,119

time

976
00:38:51,550 --> 00:38:49,920
subsequently with fmri and something

977
00:38:53,670 --> 00:38:51,560
called

978
00:38:57,190 --> 00:38:53,680
magnetoencephalograph

979
00:39:00,710 --> 00:38:57,200
you could get such measurements now fmri

980
00:39:01,829 --> 00:39:00,720
connectivity analysis is looking at this

981
00:39:03,349 --> 00:39:01,839
kind of thing

982
00:39:05,670 --> 00:39:03,359
these are techniques that were not

983
00:39:07,190 --> 00:39:05,680
available in 2007

984
00:39:09,270 --> 00:39:07,200
this is partly why i said at the

985
00:39:12,390 --> 00:39:09,280
beginning that the technology

986
00:39:13,990 --> 00:39:12,400
is is moving ahead so quickly and

987
00:39:15,990 --> 00:39:14,000
allowing you to ask questions

988
00:39:18,150 --> 00:39:16,000

you couldn't really you could ask them

989

00:39:20,310 --> 00:39:18,160

you couldn't really answer before

990

00:39:21,829 --> 00:39:20,320

so now they're the people doing the most

991

00:39:24,069 --> 00:39:21,839

interesting intelligence

992

00:39:25,430 --> 00:39:24,079

research with brain imaging are the

993

00:39:27,910 --> 00:39:25,440

people looking at

994

00:39:29,030 --> 00:39:27,920

how brain areas are connected to each

995

00:39:32,310 --> 00:39:29,040

other

996

00:39:36,150 --> 00:39:32,320

with white matter and how information

997

00:39:39,349 --> 00:39:36,160

flows around those areas using

998

00:39:41,910 --> 00:39:39,359

functional mri

999

00:39:42,870 --> 00:39:41,920

and a lot of it is while the person is

1000

00:39:45,349 --> 00:39:42,880

just resting

1001
00:39:46,550 --> 00:39:45,359
with their eyes closed but it's going to

1002
00:39:48,950 --> 00:39:46,560
be more interesting

1003
00:39:52,470 --> 00:39:48,960
as this research is done while the

1004
00:39:55,270 --> 00:39:52,480
person is solving cognitive tasks

1005
00:39:55,990 --> 00:39:55,280
so there's a lot of interesting things

1006
00:39:57,990 --> 00:39:56,000
um

1007
00:40:00,630 --> 00:39:58,000
i don't like like to focus too much on

1008
00:40:03,990 --> 00:40:00,640
the old p fit because that was

1009
00:40:05,990 --> 00:40:04,000
you know that's 13 years ago and since

1010
00:40:08,470 --> 00:40:06,000
then we have a lot more information

1011
00:40:09,990 --> 00:40:08,480
the general pfit model seems to be

1012
00:40:12,870 --> 00:40:10,000
holding up well

1013
00:40:13,750 --> 00:40:12,880

right just minor modifications frontal

1014

00:40:16,230 --> 00:40:13,760

areas are

1015

00:40:17,750 --> 00:40:16,240

implicated and how they communicate

1016

00:40:20,710 --> 00:40:17,760

seems to be important

1017

00:40:21,109 --> 00:40:20,720

to help explain individual differences

1018

00:40:25,829 --> 00:40:21,119

in

1019

00:40:26,950 --> 00:40:25,839

hemispheric differences so for example

1020

00:40:28,870 --> 00:40:26,960

let's say the left

1021

00:40:30,230 --> 00:40:28,880

dorsal lateral prefrontal cortex is more

1022

00:40:32,390 --> 00:40:30,240

important than

1023

00:40:35,190 --> 00:40:32,400

the right there seem to be some

1024

00:40:37,190 --> 00:40:35,200

hemispheric differences i don't

1025

00:40:39,670 --> 00:40:37,200

know that they've replicated all that

1026
00:40:41,990 --> 00:40:39,680
much one of the most surprising things

1027
00:40:42,950 --> 00:40:42,000
to me when we first started doing brain

1028
00:40:46,150 --> 00:40:42,960
imaging

1029
00:40:47,670 --> 00:40:46,160
was the lack of hemispheric differences

1030
00:40:49,349 --> 00:40:47,680
that you know everyone talks about the

1031
00:40:50,390 --> 00:40:49,359
left hemisphere does this the right

1032
00:40:53,670 --> 00:40:50,400
hemisphere

1033
00:40:55,990 --> 00:40:53,680
does that the truth mostly

1034
00:40:58,309 --> 00:40:56,000
i believe is in the communication

1035
00:41:01,510 --> 00:40:58,319
between the hemispheres

1036
00:41:03,510 --> 00:41:01,520
that almost nothing is exclusively left

1037
00:41:05,510 --> 00:41:03,520
or right

1038
00:41:08,630 --> 00:41:05,520

you know there are some language areas

1039

00:41:10,710 --> 00:41:08,640

that are predominantly on the left

1040

00:41:11,829 --> 00:41:10,720

we know this when people have strokes in

1041

00:41:15,030 --> 00:41:11,839

certain areas

1042

00:41:18,309 --> 00:41:15,040

lose some

1043

00:41:21,430 --> 00:41:18,319

some verbal abilities

1044

00:41:23,589 --> 00:41:21,440

but by and large i'm i'm

1045

00:41:25,510 --> 00:41:23,599

i'm underwhelmed at the hemispheric

1046

00:41:27,510 --> 00:41:25,520

findings so far

1047

00:41:29,510 --> 00:41:27,520

yeah what i found unintuitive was that

1048

00:41:30,309 --> 00:41:29,520

the weaker inter-hemispheric homotopic

1049

00:41:32,950 --> 00:41:30,319

connections

1050

00:41:34,390 --> 00:41:32,960

were correlated with iq that was one

1051

00:41:37,670 --> 00:41:34,400

study a

1052

00:41:38,950 --> 00:41:37,680

study out of harvard um needs some

1053

00:41:42,230 --> 00:41:38,960

replication

1054

00:41:43,510 --> 00:41:42,240

and now um one of the interesting things

1055

00:41:47,109 --> 00:41:43,520

that's happening

1056

00:41:50,309 --> 00:41:47,119

is there are so many different a net

1057

00:41:51,750 --> 00:41:50,319

brain image analysis techniques being

1058

00:41:54,630 --> 00:41:51,760

developed

1059

00:41:56,230 --> 00:41:54,640

that one of the problems is that if you

1060

00:41:58,950 --> 00:41:56,240

use a certain analysis

1061

00:41:59,750 --> 00:41:58,960

technique you find one thing and if you

1062

00:42:02,470 --> 00:41:59,760

use a

1063

00:42:04,710 --> 00:42:02,480

different technique on the same data set

1064

00:42:08,230 --> 00:42:04,720

you come up with some differences

1065

00:42:09,109 --> 00:42:08,240

this has to be sorted out by by people

1066

00:42:12,150 --> 00:42:09,119

who develop

1067

00:42:13,670 --> 00:42:12,160

these analysis techniques this is not

1068

00:42:15,670 --> 00:42:13,680

unique to brain imaging

1069

00:42:16,950 --> 00:42:15,680

this is what happened with eeg

1070

00:42:18,870 --> 00:42:16,960

technology

1071

00:42:20,069 --> 00:42:18,880

you know this group did it this way that

1072

00:42:22,390 --> 00:42:20,079

group connected

1073

00:42:24,550 --> 00:42:22,400

uh corrected for artifacts in a

1074

00:42:27,430 --> 00:42:24,560

different way they had different results

1075

00:42:28,150 --> 00:42:27,440

this will be sorted out over time i

1076

00:42:30,870 --> 00:42:28,160

think uh

1077

00:42:31,349 --> 00:42:30,880

you just have to be patient and what's

1078

00:42:34,550 --> 00:42:31,359

really

1079

00:42:36,230 --> 00:42:34,560

nice now we've reached a stage where

1080

00:42:37,829 --> 00:42:36,240

brain imaging studies with the

1081

00:42:41,109 --> 00:42:37,839

connectome had

1082

00:42:43,670 --> 00:42:41,119

they tend to have very large samples

1083

00:42:45,270 --> 00:42:43,680

and the publications often will have a

1084

00:42:48,470 --> 00:42:45,280

discovery sample

1085

00:42:50,790 --> 00:42:48,480

and a cross-validation sample

1086

00:42:52,870 --> 00:42:50,800

now we're really getting into some great

1087

00:42:54,870 --> 00:42:52,880

science

1088

00:42:56,390 --> 00:42:54,880

i also heard that the thickness of the

1089

00:43:00,470 --> 00:42:56,400

corpus callosum is

1090

00:43:01,990 --> 00:43:00,480

related to iq not inversely

1091

00:43:04,069 --> 00:43:02,000

but that seems to go against the inter

1092

00:43:07,829 --> 00:43:04,079

hemisphere connection in my estimation

1093

00:43:09,910 --> 00:43:07,839

now the quantity yeah that's those are

1094

00:43:12,309 --> 00:43:09,920

that's the bundle of fibers that connect

1095

00:43:16,309 --> 00:43:12,319

the right and left hemispheres

1096

00:43:18,790 --> 00:43:16,319

in some people it's bigger than others

1097

00:43:20,790 --> 00:43:18,800

it seems to be bigger i think in women

1098

00:43:22,870 --> 00:43:20,800

than in men

1099

00:43:24,710 --> 00:43:22,880

so what all these differences mean are

1100

00:43:27,430 --> 00:43:24,720

not yet clear there's there's

1101

00:43:28,309 --> 00:43:27,440

some conflicting data on the corpus

1102

00:43:31,430 --> 00:43:28,319

callosum

1103

00:43:34,710 --> 00:43:31,440

intelligence relationship

1104

00:43:35,910 --> 00:43:34,720

but if you step back when you know when

1105

00:43:39,589 --> 00:43:35,920

i started studying

1106

00:43:42,309 --> 00:43:39,599

intelligence in the 1970s

1107

00:43:43,109 --> 00:43:42,319

the big question was are genetics

1108

00:43:46,710 --> 00:43:43,119

involved

1109

00:43:50,150 --> 00:43:46,720

or not now we're finding

1110

00:43:53,030 --> 00:43:50,160

genes you know we're

1111

00:43:53,829 --> 00:43:53,040

much more sophisticated a big question

1112

00:43:56,870 --> 00:43:53,839

was are

1113

00:44:00,150 --> 00:43:56,880

our iq scores meaningful or are they

1114

00:44:03,829 --> 00:44:00,160

random numbers basically well we

1115

00:44:07,670 --> 00:44:03,839

know that iq scores correlate to brain

1116

00:44:10,150 --> 00:44:07,680

parameters like thickness of the cortex

1117

00:44:12,309 --> 00:44:10,160

or the activity in this area or the

1118

00:44:15,750 --> 00:44:12,319

activity in that area

1119

00:44:17,030 --> 00:44:15,760

so we we we've learned a tremendous

1120

00:44:20,630 --> 00:44:17,040

amount

1121

00:44:23,750 --> 00:44:20,640

about intelligence um

1122

00:44:24,950 --> 00:44:23,760

and uh the field has really moved way

1123

00:44:28,069 --> 00:44:24,960

beyond

1124

00:44:30,150 --> 00:44:28,079

uh a lot of those early questions have

1125

00:44:33,190 --> 00:44:30,160

been answered definitively

1126
00:44:34,150 --> 00:44:33,200
you know genetic in about genetics for

1127
00:44:36,870 --> 00:44:34,160
example

1128
00:44:37,750 --> 00:44:36,880
and now we're in a very uh exciting

1129
00:44:41,030 --> 00:44:37,760
stage

1130
00:44:41,390 --> 00:44:41,040
of working out details and the details

1131
00:44:44,470 --> 00:44:41,400
are

1132
00:44:51,030 --> 00:44:44,480
phenomenally complex

1133
00:44:53,430 --> 00:44:51,040
there are some people who say you know

1134
00:44:54,870 --> 00:44:53,440
the genetics of intelligence is so

1135
00:44:58,150 --> 00:44:54,880
complex we'll never

1136
00:45:00,230 --> 00:44:58,160
figure it out because there are maybe a

1137
00:45:02,309 --> 00:45:00,240
thousand genes involved and they all

1138
00:45:05,109 --> 00:45:02,319

interact with each other and some of

1139

00:45:07,510 --> 00:45:05,119

them interact with environmental

1140

00:45:08,230 --> 00:45:07,520

factors that we're never going to figure

1141

00:45:11,510 --> 00:45:08,240

this out

1142

00:45:14,630 --> 00:45:11,520

and my answer is if physicists

1143

00:45:15,190 --> 00:45:14,640

like you can figure out what happened in

1144

00:45:18,630 --> 00:45:15,200

the first

1145

00:45:21,349 --> 00:45:18,640

nine nanoseconds of the big bang

1146

00:45:22,790 --> 00:45:21,359

then we can figure out these complex

1147

00:45:25,190 --> 00:45:22,800

relationships

1148

00:45:26,550 --> 00:45:25,200

and the way the field is evolving in

1149

00:45:29,750 --> 00:45:26,560

technology

1150

00:45:31,750 --> 00:45:29,760

and data analysis

1151

00:45:33,270 --> 00:45:31,760

i think we'll get there at some point i

1152

00:45:35,589 --> 00:45:33,280

hope i live to see it

1153

00:45:37,190 --> 00:45:35,599

but i don't think i think it's a finite

1154

00:45:39,589 --> 00:45:37,200

problem i don't think it's an

1155

00:45:41,030 --> 00:45:39,599

infinite problem right and you see that

1156

00:45:43,030 --> 00:45:41,040

progress has been made so you just

1157

00:45:46,150 --> 00:45:43,040

extrapolate that forward

1158

00:45:47,589 --> 00:45:46,160

in my lifetime incredible progress

1159

00:45:49,829 --> 00:45:47,599

has been made and that's why i want

1160

00:45:51,510 --> 00:45:49,839

young people in their 20s and 30s doing

1161

00:45:55,829 --> 00:45:51,520

intelligence research

1162

00:45:58,230 --> 00:45:55,839

to think 40 years ahead

1163

00:45:58,950 --> 00:45:58,240

what is it going to be like in 40 years

1164

00:46:01,910 --> 00:45:58,960

will we

1165

00:46:04,230 --> 00:46:01,920

have enough knowledge about the

1166

00:46:07,109 --> 00:46:04,240

neuroscience of intelligence

1167

00:46:09,670 --> 00:46:07,119

to tweak what goes on in the brain will

1168

00:46:10,150 --> 00:46:09,680

we be able to take someone with an iq of

1169

00:46:13,349 --> 00:46:10,160

80

1170

00:46:17,109 --> 00:46:13,359

and get it up to 85. that would be a

1171

00:46:20,550 --> 00:46:17,119

huge change for that person

1172

00:46:22,950 --> 00:46:20,560

and for a number of social problems

1173

00:46:24,710 --> 00:46:22,960

not just poverty some people are going

1174

00:46:27,670 --> 00:46:24,720

to live in poverty because they

1175

00:46:29,829 --> 00:46:27,680

cannot through no fault of their own

1176

00:46:32,950 --> 00:46:29,839

compete in the modern world for

1177

00:46:34,309 --> 00:46:32,960

jobs that pay enough and that's why i

1178

00:46:38,150 --> 00:46:34,319

mentioned universal

1179

00:46:42,150 --> 00:46:38,160

basic income on the other hand

1180

00:46:45,270 --> 00:46:42,160

imagine if you have an iq of 130

1181

00:46:46,950 --> 00:46:45,280

and you can get up to 135 you're going

1182

00:46:51,109 --> 00:46:46,960

to be more productive in your

1183

00:46:52,870 --> 00:46:51,119

profession the probability will increase

1184

00:46:55,270 --> 00:46:52,880

that you'll be yes yeah yeah

1185

00:46:56,790 --> 00:46:55,280

there's more the audience of course for

1186

00:46:58,390 --> 00:46:56,800

some of the people who are still like iq

1187

00:47:00,230 --> 00:46:58,400

is just a number why don't you

1188

00:47:01,910 --> 00:47:00,240

talk about the correlates between high

1189

00:47:02,870 --> 00:47:01,920

iq and then what are the life outcomes

1190

00:47:05,589 --> 00:47:02,880

and then low iq

1191

00:47:06,870 --> 00:47:05,599

like for example 100 166 times more

1192

00:47:08,829 --> 00:47:06,880

likely to drop out of high school

1193

00:47:10,069 --> 00:47:08,839

some phenomenal number if you have a

1194

00:47:14,470 --> 00:47:10,079

lower

1195

00:47:17,270 --> 00:47:14,480

there's really no question that for most

1196

00:47:19,270 --> 00:47:17,280

metrics of success that people care

1197

00:47:22,870 --> 00:47:19,280

about

1198

00:47:26,390 --> 00:47:22,880

more intelligence is better than less

1199

00:47:29,670 --> 00:47:26,400

it doesn't i'm better i don't mean

1200

00:47:34,150 --> 00:47:29,680

in a um inferior superior

1201
00:47:36,150 --> 00:47:34,160
kind of moral view i mean in terms of

1202
00:47:37,430 --> 00:47:36,160
increasing the probability of your

1203
00:47:39,349 --> 00:47:37,440
success

1204
00:47:40,549 --> 00:47:39,359
there's no i said before there's no

1205
00:47:44,630 --> 00:47:40,559
relationship

1206
00:47:47,109 --> 00:47:44,640
between moral character and iq

1207
00:47:48,230 --> 00:47:47,119
no essential relation you can make

1208
00:47:49,910 --> 00:47:48,240
something is there

1209
00:47:51,990 --> 00:47:49,920
is there a psychometric test for moral

1210
00:47:55,349 --> 00:47:52,000
character like there is for iq

1211
00:47:59,109 --> 00:47:55,359
um there are

1212
00:48:03,430 --> 00:47:59,119
tests that measure moral maturity

1213
00:48:08,870 --> 00:48:06,390

and they can be related empirically to

1214

00:48:11,030 --> 00:48:08,880

iq a little bit

1215

00:48:12,230 --> 00:48:11,040

but i don't see any real practical

1216

00:48:15,829 --> 00:48:12,240

relationship there

1217

00:48:16,549 --> 00:48:15,839

um so i think for the purposes of

1218

00:48:19,670 --> 00:48:16,559

discussing

1219

00:48:22,470 --> 00:48:19,680

does iq have value you have to

1220

00:48:23,190 --> 00:48:22,480

put aside the idea that people with

1221

00:48:26,309 --> 00:48:23,200

higher

1222

00:48:27,430 --> 00:48:26,319

iq are better than people with less high

1223

00:48:30,069 --> 00:48:27,440

iq

1224

00:48:30,470 --> 00:48:30,079

even though more intelligence is better

1225

00:48:33,589 --> 00:48:30,480

than

1226

00:48:36,630 --> 00:48:33,599

less it's like being taller it might

1227

00:48:37,589 --> 00:48:36,640

in many circumstances be is better than

1228

00:48:39,990 --> 00:48:37,599

being

1229

00:48:41,109 --> 00:48:40,000

shorter it doesn't mean that taller

1230

00:48:45,829 --> 00:48:41,119

people have a higher

1231

00:48:49,750 --> 00:48:48,069

i think there's there i understand that

1232

00:48:52,549 --> 00:48:49,760

there's empirical research

1233

00:48:54,790 --> 00:48:52,559

that shows that better looking people

1234

00:48:57,910 --> 00:48:54,800

are more successful

1235

00:49:00,309 --> 00:48:57,920

doesn't mean they're better in any way

1236

00:49:02,790 --> 00:49:00,319

right as far as i know i have not been a

1237

00:49:06,150 --> 00:49:02,800

subject in such a study

1238

00:49:07,430 --> 00:49:06,160

but you know we take the world as we

1239

00:49:09,829 --> 00:49:07,440

find it there are these

1240

00:49:12,790 --> 00:49:09,839

these things that float around but in

1241

00:49:15,829 --> 00:49:12,800

terms of intelligence

1242

00:49:18,309 --> 00:49:15,839

more generally is better than less okay

1243

00:49:21,190 --> 00:49:18,319

on page 168 you say

1244

00:49:22,549 --> 00:49:21,200

that to advance the field the study of

1245

00:49:24,309 --> 00:49:22,559

intelligence it can't be limited to

1246

00:49:25,750 --> 00:49:24,319

psychometric scores of the past

1247

00:49:27,829 --> 00:49:25,760

but what i'm wondering is why not

1248

00:49:28,549 --> 00:49:27,839

because the raven's advanced progressive

1249

00:49:32,470 --> 00:49:28,559

matrices

1250

00:49:36,230 --> 00:49:32,480

seems to be a wonderful test of iq

1251

00:49:39,349 --> 00:49:36,240

um it is it's the ravens

1252

00:49:40,470 --> 00:49:39,359

test is a matrix test where you have to

1253

00:49:43,109 --> 00:49:40,480

reason out what

1254

00:49:43,589 --> 00:49:43,119

elements of the matrix are i'll overlay

1255

00:49:45,990 --> 00:49:43,599

some

1256

00:49:46,790 --> 00:49:46,000

images right now for people um and

1257

00:49:50,069 --> 00:49:46,800

that's a good

1258

00:49:53,589 --> 00:49:50,079

that's a high g test not a perfect

1259

00:49:56,950 --> 00:49:53,599

g test but that it's a high g test

1260

00:49:59,589 --> 00:49:56,960

and it would be better if we could

1261

00:50:01,510 --> 00:49:59,599

could develop a ratio scale it's still a

1262

00:50:04,069 --> 00:50:01,520

cycle

1263

00:50:05,270 --> 00:50:04,079

yeah but it's a good one and people use

1264

00:50:08,630 --> 00:50:05,280

it a lot

1265

00:50:10,630 --> 00:50:08,640

and uh of course critics will say well

1266

00:50:12,710 --> 00:50:10,640

who cares if you can solve this kind of

1267

00:50:13,589 --> 00:50:12,720

problem it has no relationship to the

1268

00:50:16,230 --> 00:50:13,599

real world

1269

00:50:17,990 --> 00:50:16,240

but in fact empirically it does people

1270

00:50:20,309 --> 00:50:18,000

who can solve those problems

1271

00:50:21,829 --> 00:50:20,319

do better at certain kinds of

1272

00:50:25,190 --> 00:50:21,839

professions

1273

00:50:29,190 --> 00:50:25,200

you know not everyone uh

1274

00:50:32,309 --> 00:50:29,200

competes within a profession equally

1275

00:50:35,910 --> 00:50:32,319

so in physics for example

1276

00:50:39,430 --> 00:50:35,920

there are really brilliant physicists

1277

00:50:42,069 --> 00:50:39,440

and just really smart physicists

1278

00:50:43,270 --> 00:50:42,079

and as a physicist you probably without

1279

00:50:46,230 --> 00:50:43,280

hesitation

1280

00:50:47,030 --> 00:50:46,240

could name the really brilliant ones and

1281

00:50:49,990 --> 00:50:47,040

you would get

1282

00:50:51,670 --> 00:50:50,000

nearly a hundred percent agreement right

1283

00:50:53,430 --> 00:50:51,680

from other physicists

1284

00:50:55,589 --> 00:50:53,440

except among the brilliant ones they

1285

00:50:56,309 --> 00:50:55,599

might they might disagree who's most

1286

00:50:59,030 --> 00:50:56,319

brilliant

1287

00:51:00,630 --> 00:50:59,040

right right right right now what's a

1288

00:51:01,990 --> 00:51:00,640

white matter integrity and what's its

1289

00:51:04,630 --> 00:51:02,000

relationship to iq

1290

00:51:05,910 --> 00:51:04,640

is it just defense against damage or

1291

00:51:08,630 --> 00:51:05,920

something different

1292

00:51:09,829 --> 00:51:08,640

the brain has gray matter and white

1293

00:51:12,230 --> 00:51:09,839

matter the white matter

1294

00:51:13,510 --> 00:51:12,240

the gray matter is like the processing

1295

00:51:15,349 --> 00:51:13,520

parts of the brain

1296

00:51:17,109 --> 00:51:15,359

the white matter are the fibers that

1297

00:51:19,990 --> 00:51:17,119

connect uh

1298

00:51:21,990 --> 00:51:20,000

brain areas to each other yeah and

1299

00:51:25,270 --> 00:51:22,000

they're like bundles of fibers

1300

00:51:26,230 --> 00:51:25,280

literally yes so the integrity of those

1301
00:51:28,710 --> 00:51:26,240
fibers

1302
00:51:29,829 --> 00:51:28,720
related to the integrity of processing

1303
00:51:32,630 --> 00:51:29,839
information

1304
00:51:34,390 --> 00:51:32,640
think about if you have a very uh if you

1305
00:51:36,069 --> 00:51:34,400
have a lot of white matter fibers

1306
00:51:38,069 --> 00:51:36,079
connecting two areas

1307
00:51:40,230 --> 00:51:38,079
the communication between those two

1308
00:51:43,750 --> 00:51:40,240
areas might be more efficient

1309
00:51:46,390 --> 00:51:43,760
than if you had fewer connections

1310
00:51:47,270 --> 00:51:46,400
and there are a couple of studies of

1311
00:51:51,030 --> 00:51:47,280
white matter

1312
00:51:53,750 --> 00:51:51,040
integrity

1313
00:51:54,710 --> 00:51:53,760

uh with an imaging technology called

1314

00:51:57,270 --> 00:51:54,720

diffusion

1315

00:51:59,109 --> 00:51:57,280

tensor imaging and there are some new

1316

00:52:01,270 --> 00:51:59,119

versions of that i understand that are

1317

00:52:04,230 --> 00:52:01,280

even better than the person i know about

1318

00:52:04,630 --> 00:52:04,240

that's this right here yeah and it's

1319

00:52:07,910 --> 00:52:04,640

that

1320

00:52:11,270 --> 00:52:07,920

particular technique is excellent

1321

00:52:13,109 --> 00:52:11,280

at imaging these connections

1322

00:52:15,190 --> 00:52:13,119

and you can follow these connections and

1323

00:52:16,870 --> 00:52:15,200

see what areas are connected best to

1324

00:52:20,069 --> 00:52:16,880

other areas

1325

00:52:20,630 --> 00:52:20,079

and it turns out that metrics of white

1326
00:52:23,670 --> 00:52:20,640
matter

1327
00:52:24,230 --> 00:52:23,680
integrity are correlated with things

1328
00:52:26,950 --> 00:52:24,240
like

1329
00:52:28,950 --> 00:52:26,960
iq scores what about gray matter

1330
00:52:33,589 --> 00:52:28,960
integrity is there a measure of that

1331
00:52:36,950 --> 00:52:33,599
there are measures of gray matter volume

1332
00:52:39,109 --> 00:52:36,960
the thickness of the cortex

1333
00:52:40,150 --> 00:52:39,119
and some of these measures also are

1334
00:52:43,430 --> 00:52:40,160
related to

1335
00:52:46,630 --> 00:52:43,440
intelligence brain

1336
00:52:49,030 --> 00:52:46,640
size is related to intelligence

1337
00:52:50,790 --> 00:52:49,040
whether that correlation is due to more

1338
00:52:56,790 --> 00:52:50,800

neurons

1339

00:52:57,270 --> 00:52:56,800

more white matter all of these things

1340

00:52:59,750 --> 00:52:57,280

are

1341

00:53:02,230 --> 00:52:59,760

being investigated with ever more

1342

00:53:04,790 --> 00:53:02,240

sophisticated techniques

1343

00:53:07,030 --> 00:53:04,800

and you know the weight of evidence is

1344

00:53:08,150 --> 00:53:07,040

emerging that these things seem to be

1345

00:53:12,230 --> 00:53:08,160

predictive

1346

00:53:14,390 --> 00:53:12,240

the next round of research

1347

00:53:16,549 --> 00:53:14,400

levels of explanation you know we're

1348

00:53:19,430 --> 00:53:16,559

going deeper and deeper in terms of our

1349

00:53:20,790 --> 00:53:19,440

levels of explanation of these things

1350

00:53:23,750 --> 00:53:20,800

right now we're kind of still in the

1351

00:53:25,589 --> 00:53:23,760

descriptive phase

1352

00:53:27,510 --> 00:53:25,599

you also mentioned that the path length

1353

00:53:29,109 --> 00:53:27,520

of the frontal parietal connections are

1354

00:53:31,829 --> 00:53:29,119

important

1355

00:53:33,430 --> 00:53:31,839

now the way that so what i'm wondering

1356

00:53:34,390 --> 00:53:33,440

is why do path links differ at all

1357

00:53:36,549 --> 00:53:34,400

because there's

1358

00:53:38,230 --> 00:53:36,559

there's like point a to b it seems like

1359

00:53:40,390 --> 00:53:38,240

it's approximately the same

1360

00:53:42,790 --> 00:53:40,400

from here to here as it is on me than

1361

00:53:44,549 --> 00:53:42,800

someone else unless it makes a curve

1362

00:53:46,390 --> 00:53:44,559

or a fractal and you're talking about

1363

00:53:48,069 --> 00:53:46,400

the path length

1364

00:53:49,990 --> 00:53:48,079

connection i think you're referring to

1365

00:53:54,150 --> 00:53:50,000

studies that compared

1366

00:53:56,150 --> 00:53:54,160

the path length between two nearby areas

1367

00:53:57,190 --> 00:53:56,160

you can look at nearby areas and get an

1368

00:54:00,309 --> 00:53:57,200

average path

1369

00:54:01,910 --> 00:54:00,319

linked to nearby areas then you can look

1370

00:54:05,030 --> 00:54:01,920

in the same people

1371

00:54:05,990 --> 00:54:05,040

as to the average pathology of different

1372

00:54:12,309 --> 00:54:06,000

areas

1373

00:54:15,829 --> 00:54:12,319

and it turns out one study showed that

1374

00:54:19,430 --> 00:54:15,839

the path length to the distant

1375

00:54:22,150 --> 00:54:19,440

areas which were a little weaker

1376
00:54:23,030 --> 00:54:22,160
actually were more predictive of iq now

1377
00:54:27,109 --> 00:54:23,040
that was one

1378
00:54:28,710 --> 00:54:27,119
study so my point is that there

1379
00:54:30,230 --> 00:54:28,720
are still a lot of conflicting

1380
00:54:32,710 --> 00:54:30,240
information about this

1381
00:54:34,470 --> 00:54:32,720
a lot of those early studies had smaller

1382
00:54:37,829 --> 00:54:34,480
sample sizes

1383
00:54:41,030 --> 00:54:37,839
there's now more sophisticated uh

1384
00:54:44,230 --> 00:54:41,040
techniques to looking at

1385
00:54:45,910 --> 00:54:44,240
these analyses so you know

1386
00:54:47,670 --> 00:54:45,920
we still don't know exactly what the

1387
00:54:50,230 --> 00:54:47,680
right parameters are

1388
00:54:51,270 --> 00:54:50,240

but we know we can measure brain

1389

00:54:53,750 --> 00:54:51,280

parameters

1390

00:54:54,630 --> 00:54:53,760

that are somehow salient to individual

1391

00:54:57,829 --> 00:54:54,640

differences in

1392

00:55:01,270 --> 00:54:57,839

intelligence and once we figure out

1393

00:55:04,390 --> 00:55:01,280

what those are and how they work

1394

00:55:05,750 --> 00:55:04,400

and where they come from then that will

1395

00:55:08,390 --> 00:55:05,760

open the door

1396

00:55:09,270 --> 00:55:08,400

to the possibilities of increasing

1397

00:55:12,069 --> 00:55:09,280

intelligence

1398

00:55:12,630 --> 00:55:12,079

i think possibly dramatically i guess

1399

00:55:14,549 --> 00:55:12,640

what i'm

1400

00:55:16,549 --> 00:55:14,559

curious about is why do the path links

1401

00:55:18,549 --> 00:55:16,559

between individuals differ at all

1402

00:55:20,309 --> 00:55:18,559

because let's just take eyebrows like

1403

00:55:21,589 --> 00:55:20,319

the distance between here and here on me

1404

00:55:23,750 --> 00:55:21,599

is approximately the same

1405

00:55:25,589 --> 00:55:23,760

distance as it is from here to here on

1406

00:55:27,670 --> 00:55:25,599

you it just depends on how you define

1407

00:55:29,829 --> 00:55:27,680

here to here

1408

00:55:31,349 --> 00:55:29,839

is it just not a b line like are they

1409

00:55:33,430 --> 00:55:31,359

not connected one to the other

1410

00:55:34,390 --> 00:55:33,440

directly straight they make a good

1411

00:55:37,589 --> 00:55:34,400

question

1412

00:55:41,510 --> 00:55:37,599

but let me answer like this

1413

00:55:42,069 --> 00:55:41,520

everyone's eyebrows in relation to their

1414

00:55:45,190 --> 00:55:42,079

eyes

1415

00:55:48,630 --> 00:55:45,200

their mouth

1416

00:55:50,870 --> 00:55:48,640

relation to their

1417

00:55:52,789 --> 00:55:50,880

cheeks pretty much the same for

1418

00:55:54,710 --> 00:55:52,799

everybody but no two people have the

1419

00:55:58,870 --> 00:55:54,720

same face

1420

00:56:02,630 --> 00:55:58,880

right no two people have the same brains

1421

00:56:05,270 --> 00:56:02,640

and right as a millimeter difference

1422

00:56:07,510 --> 00:56:05,280

in the brain make a difference i think a

1423

00:56:11,190 --> 00:56:07,520

millimeter is like a mile

1424

00:56:11,750 --> 00:56:11,200

i see i see so who knows and it's not

1425

00:56:15,829 --> 00:56:11,760

just

1426
00:56:17,589 --> 00:56:15,839
one measurement you got trillions of

1427
00:56:20,710 --> 00:56:17,599
synapses

1428
00:56:23,589 --> 00:56:20,720
and neurons and

1429
00:56:24,230 --> 00:56:23,599
you know who know who's to say what

1430
00:56:28,069 --> 00:56:24,240
small

1431
00:56:31,510 --> 00:56:28,079
differences here and there might mean

1432
00:56:32,390 --> 00:56:31,520
on their impact on neurotransmitter

1433
00:56:36,230 --> 00:56:32,400
levels

1434
00:56:40,309 --> 00:56:36,240
on the the sensitivity of receptors

1435
00:56:42,789 --> 00:56:40,319
pre and postsynaptic receptors we really

1436
00:56:43,829 --> 00:56:42,799
don't know very much on the molecular

1437
00:56:46,870 --> 00:56:43,839
level

1438
00:56:48,150 --> 00:56:46,880

about what these small physiological

1439

00:56:50,470 --> 00:56:48,160

differences might

1440

00:56:53,910 --> 00:56:50,480

mean or what they might reflect they

1441

00:56:56,950 --> 00:56:53,920

might reflect deeper differences

1442

00:56:58,309 --> 00:56:56,960

there is vast uncharted territory in the

1443

00:57:01,829 --> 00:56:58,319

brain

1444

00:57:04,309 --> 00:57:01,839

and people who want to

1445

00:57:06,309 --> 00:57:04,319

explore that in relationship to

1446

00:57:07,829 --> 00:57:06,319

something as complex as human

1447

00:57:11,910 --> 00:57:07,839

intelligence

1448

00:57:13,670 --> 00:57:11,920

this is a formidable set of questions

1449

00:57:14,230 --> 00:57:13,680

have you heard of dissociative identity

1450

00:57:17,589 --> 00:57:14,240

disorder

1451

00:57:19,829 --> 00:57:17,599

okay

1452

00:57:21,430 --> 00:57:19,839

what i'm curious about is do the

1453

00:57:23,829 --> 00:57:21,440

multiple personalities have there ever

1454

00:57:26,390 --> 00:57:23,839

been studies where one has a drastically

1455

00:57:27,430 --> 00:57:26,400

higher iq than the other you know i

1456

00:57:30,069 --> 00:57:27,440

don't know the

1457

00:57:32,390 --> 00:57:30,079

answer to that i think studies of

1458

00:57:34,710 --> 00:57:32,400

multiple personality disorder were

1459

00:57:36,789 --> 00:57:34,720

fashionable a while ago and i never

1460

00:57:38,630 --> 00:57:36,799

really got into that literature

1461

00:57:40,549 --> 00:57:38,640

in your book you mentioned the finn

1462

00:57:42,309 --> 00:57:40,559

study of 2015 and you said it was

1463

00:57:43,910 --> 00:57:42,319

breathhtaking

1464

00:57:45,750 --> 00:57:43,920

it's what you've been waiting for for 40

1465

00:57:47,270 --> 00:57:45,760

years do you mind outlining for the

1466

00:57:48,870 --> 00:57:47,280

audience what that study is and then i'm

1467

00:57:50,630 --> 00:57:48,880

also curious have there been that was

1468

00:57:52,309 --> 00:57:50,640

2015.

1469

00:57:55,190 --> 00:57:52,319

plenty happens in just a few years

1470

00:57:56,150 --> 00:57:55,200

what's new so let's go over the fin 2015

1471

00:57:57,190 --> 00:57:56,160

study and then we'll talk about what's

1472

00:57:59,829 --> 00:57:57,200

new

1473

00:58:02,470 --> 00:57:59,839

okay so just as i was literally

1474

00:58:04,470 --> 00:58:02,480

finishing the book

1475

00:58:05,750 --> 00:58:04,480

and the final manuscript actually had

1476

00:58:08,950 --> 00:58:05,760

been submitted

1477

00:58:10,950 --> 00:58:08,960

i asked them to send it back

1478

00:58:12,150 --> 00:58:10,960

because i just sent it in a day or two

1479

00:58:14,309 --> 00:58:12,160

before

1480

00:58:16,630 --> 00:58:14,319

and i wanted to add the study that i

1481

00:58:20,069 --> 00:58:16,640

just read the finn study

1482

00:58:23,270 --> 00:58:20,079

a group at yale

1483

00:58:26,630 --> 00:58:23,280

took a database of uh

1484

00:58:28,710 --> 00:58:26,640

fmri um i think it was

1485

00:58:29,990 --> 00:58:28,720

now i can't remember who was fmri or

1486

00:58:33,190 --> 00:58:30,000

structural mri

1487

00:58:36,349 --> 00:58:33,200

i was fmri and um

1488

00:58:38,069 --> 00:58:36,359

from the connectome project one of the

1489

00:58:41,430 --> 00:58:38,079

multi-uh

1490

00:58:43,670 --> 00:58:41,440

site collaborative consortia that are

1491

00:58:46,470 --> 00:58:43,680

pooling brain imaging data

1492

00:58:47,430 --> 00:58:46,480

from from various sites into big sample

1493

00:58:48,829 --> 00:58:47,440

sizes

1494

00:58:51,910 --> 00:58:48,839

and they make it available to

1495

00:58:54,710 --> 00:58:51,920

researchers remember earlier i said we

1496

00:58:56,470 --> 00:58:54,720

not only had to pay for every scan we

1497

00:58:57,750 --> 00:58:56,480

had to do them ourselves and we had to

1498

00:58:59,430 --> 00:58:57,760

buy the equipment

1499

00:59:01,349 --> 00:58:59,440

right now there are data sets now there

1500

00:59:02,710 --> 00:59:01,359

are data sets you can access with a

1501
00:59:05,510 --> 00:59:02,720
thousand people

1502
00:59:06,470 --> 00:59:05,520
and they got a couple hundred people and

1503
00:59:09,510 --> 00:59:06,480
they did

1504
00:59:12,230 --> 00:59:09,520
one of the early connectome analyses

1505
00:59:13,510 --> 00:59:12,240
looking at brain connections and they

1506
00:59:16,549 --> 00:59:13,520
found

1507
00:59:16,950 --> 00:59:16,559
and and they had data from a couple

1508
00:59:21,750 --> 00:59:16,960
hundred

1509
00:59:25,030 --> 00:59:21,760
individuals doing six different tasks

1510
00:59:28,950 --> 00:59:25,040
and what they found was the

1511
00:59:31,910 --> 00:59:28,960
brain connectivity was

1512
00:59:34,870 --> 00:59:31,920
essentially the same in each person

1513
00:59:37,589 --> 00:59:34,880

irrespective of what the task was

1514

00:59:39,670 --> 00:59:37,599

and that you could identify and this

1515

00:59:41,990 --> 00:59:39,680

connectivity was so unique

1516

00:59:43,109 --> 00:59:42,000

to that individual that it was like a

1517

00:59:46,230 --> 00:59:43,119

fingerprint

1518

00:59:49,349 --> 00:59:46,240

right and moreover

1519

00:59:53,109 --> 00:59:49,359

aspects of that connectivity were

1520

00:59:55,270 --> 00:59:53,119

correlated with iq that's what was so

1521

00:59:58,630 --> 00:59:55,280

exciting to me

1522

01:00:01,030 --> 00:59:58,640

and since that time there have been

1523

01:00:02,630 --> 01:00:01,040

other connectivity studies looking at

1524

01:00:05,990 --> 01:00:02,640

intelligence

1525

01:00:09,510 --> 01:00:06,000

and predicting iq

1526
01:00:12,230 --> 01:00:09,520
from the brain image connectivity data

1527
01:00:13,670 --> 01:00:12,240
i had tried to predict iq from our early

1528
01:00:16,950 --> 01:00:13,680
pet studies

1529
01:00:17,670 --> 01:00:16,960
never was successful and even from our

1530
01:00:20,230 --> 01:00:17,680
early

1531
01:00:22,069 --> 01:00:20,240
mri studies our samples were just too

1532
01:00:22,710 --> 01:00:22,079
small and the individual differences

1533
01:00:25,990 --> 01:00:22,720
were too

1534
01:00:29,910 --> 01:00:26,000
big and so we never were able to cross

1535
01:00:32,789 --> 01:00:29,920
validate any of our correlations

1536
01:00:34,950 --> 01:00:32,799
but now with the connectome data the

1537
01:00:38,870 --> 01:00:34,960
sample sizes are large

1538
01:00:41,589 --> 01:00:38,880

they do cross validation and

1539

01:00:41,990 --> 01:00:41,599

it's now possible to predict iq from

1540

01:00:45,349 --> 01:00:42,000

brain

1541

01:00:52,230 --> 01:00:49,030

i think the highest i've seen

1542

01:00:54,630 --> 01:00:52,240

might be around 15 20 percent which

1543

01:00:56,470 --> 01:00:54,640

doesn't seem like a lot

1544

01:00:57,829 --> 01:00:56,480

but this is just the beginning of this

1545

01:01:01,030 --> 01:00:57,839

effort

1546

01:01:02,230 --> 01:01:01,040

and i think um that's why it was so

1547

01:01:04,230 --> 01:01:02,240

exciting to me

1548

01:01:05,750 --> 01:01:04,240

that i always wanted to do a study where

1549

01:01:08,630 --> 01:01:05,760

you could predict iq

1550

01:01:09,430 --> 01:01:08,640

from brain images and i always knew it

1551
01:01:10,470 --> 01:01:09,440
was going to

1552
01:01:13,109 --> 01:01:10,480
have something to do with the

1553
01:01:15,589 --> 01:01:13,119
connectivity among brain areas

1554
01:01:16,549 --> 01:01:15,599
was always my intuition and sure enough

1555
01:01:18,870 --> 01:01:16,559
this study

1556
01:01:21,109 --> 01:01:18,880
seemed to demonstrate that and there

1557
01:01:23,109 --> 01:01:21,119
have been some replications of this

1558
01:01:25,430 --> 01:01:23,119
and a lot of people almost everybody

1559
01:01:29,270 --> 01:01:25,440
working in brain imaging now

1560
01:01:31,109 --> 01:01:29,280
is working with connectivity analysis

1561
01:01:32,309 --> 01:01:31,119
so it's very exciting and what's

1562
01:01:34,789 --> 01:01:32,319
groundbreaking

1563
01:01:36,150 --> 01:01:34,799

since what has been released what study

1564

01:01:38,150 --> 01:01:36,160

has come out that you're like oh man

1565

01:01:41,030 --> 01:01:38,160

i've been waiting for this for 40 years

1566

01:01:42,549 --> 01:01:41,040

45 years it's not it's no one study but

1567

01:01:44,630 --> 01:01:42,559

it's now that the

1568

01:01:45,829 --> 01:01:44,640

what's what's groundbreaking is the

1569

01:01:48,950 --> 01:01:45,839

ability now

1570

01:01:52,069 --> 01:01:48,960

to take large samples of people

1571

01:01:55,430 --> 01:01:52,079

with brain imaging and predict their

1572

01:01:58,309 --> 01:01:55,440

general intelligence from that

1573

01:01:58,789 --> 01:01:58,319

the optimal way is not yet clear but

1574

01:02:01,750 --> 01:01:58,799

there's

1575

01:02:03,589 --> 01:02:01,760

very clever and very sophisticated

1576

01:02:06,710 --> 01:02:03,599

analysis techniques

1577

01:02:09,270 --> 01:02:06,720

looking not just at the structure not

1578

01:02:10,630 --> 01:02:09,280

just its structural data how brain areas

1579

01:02:13,109 --> 01:02:10,640

are structurally

1580

01:02:15,270 --> 01:02:13,119

related but how they're functionally

1581

01:02:18,230 --> 01:02:15,280

related so an fmri

1582

01:02:20,069 --> 01:02:18,240

if you're doing some cognitive task and

1583

01:02:22,630 --> 01:02:20,079

this area lights up and at the same

1584

01:02:23,829 --> 01:02:22,640

time this area lights up in the same way

1585

01:02:27,270 --> 01:02:23,839

those two areas are

1586

01:02:28,069 --> 01:02:27,280

functionally related they may or may not

1587

01:02:31,349 --> 01:02:28,079

be

1588

01:02:32,470 --> 01:02:31,359

structurally related directly and there

1589

01:02:35,510 --> 01:02:32,480

may be multiple

1590

01:02:37,750 --> 01:02:35,520

other areas that intervene and so what

1591

01:02:40,789 --> 01:02:37,760

you have is a net where you identify a

1592

01:02:42,549 --> 01:02:40,799

network of activity and then some of

1593

01:02:45,750 --> 01:02:42,559

that network might be

1594

01:02:49,109 --> 01:02:45,760

might develop genetically some might

1595

01:02:51,829 --> 01:02:49,119

develop in genetic interaction

1596

01:02:52,710 --> 01:02:51,839

with stress or other environmental

1597

01:02:56,230 --> 01:02:52,720

things as

1598

01:02:58,230 --> 01:02:56,240

when you're a child other aspects of

1599

01:03:00,549 --> 01:02:58,240

that network might develop by sheer

1600

01:03:01,670 --> 01:03:00,559

luck and random factors during

1601
01:03:04,470 --> 01:03:01,680
development

1602
01:03:05,589 --> 01:03:04,480
these are all possibilities but the the

1603
01:03:09,109 --> 01:03:05,599
takeaway

1604
01:03:10,390 --> 01:03:09,119
is that you can predict some portion of

1605
01:03:13,190 --> 01:03:10,400
iq

1606
01:03:15,190 --> 01:03:13,200
from brain images that's what is

1607
01:03:16,309 --> 01:03:15,200
exciting and we're just at the beginning

1608
01:03:20,549 --> 01:03:16,319
of that

1609
01:03:23,190 --> 01:03:20,559
besides predicting iq from dna

1610
01:03:24,390 --> 01:03:23,200
just at the beginning of that as well i

1611
01:03:27,270 --> 01:03:24,400
know that each brain

1612
01:03:27,990 --> 01:03:27,280
in the imaging is unique to the point of

1613
01:03:31,109 --> 01:03:28,000

fingerprint

1614

01:03:33,349 --> 01:03:31,119

like you mentioned what about for twins

1615

01:03:34,549 --> 01:03:33,359

there are there are imaging studies that

1616

01:03:37,910 --> 01:03:34,559

show that twins

1617

01:03:40,950 --> 01:03:37,920

are pretty similar but not necessarily

1618

01:03:43,670 --> 01:03:40,960

that identical twins have very similar

1619

01:03:46,549 --> 01:03:43,680

brains but not necessarily

1620

01:03:48,150 --> 01:03:46,559

a hundred percent identical you would be

1621

01:03:48,630 --> 01:03:48,160

able to differentiate them based on the

1622

01:03:52,309 --> 01:03:48,640

image

1623

01:03:53,589 --> 01:03:52,319

i i think so i've never really looked at

1624

01:03:55,750 --> 01:03:53,599

it quite like that

1625

01:03:56,710 --> 01:03:55,760

but but even though they have uh

1626
01:03:59,829 --> 01:03:56,720
identical

1627
01:04:02,789 --> 01:03:59,839
genes as their brains develop

1628
01:04:04,870 --> 01:04:02,799
in the womb and thereafter there are a

1629
01:04:06,710 --> 01:04:04,880
lot of random events that take place

1630
01:04:08,870 --> 01:04:06,720
that affect brain development

1631
01:04:10,309 --> 01:04:08,880
so they're going to be highly similar

1632
01:04:12,230 --> 01:04:10,319
but not necessarily

1633
01:04:15,430 --> 01:04:12,240
perfectly identical right and that's

1634
01:04:16,710 --> 01:04:15,440
something else metric is exactly

1635
01:04:19,349 --> 01:04:16,720
something else people need to keep in

1636
01:04:21,430 --> 01:04:19,359
mind is genetics doesn't mean 100

1637
01:04:23,829 --> 01:04:21,440
determination

1638
01:04:26,549 --> 01:04:23,839

there is a probability it does some

1639

01:04:28,950 --> 01:04:26,559

genetic things it does so if you have

1640

01:04:30,230 --> 01:04:28,960

like hunting the gene for huntington's

1641

01:04:33,270 --> 01:04:30,240

disease

1642

01:04:36,309 --> 01:04:33,280

that's bad yeah i you know

1643

01:04:40,789 --> 01:04:36,319

um but for some a complex

1644

01:04:44,470 --> 01:04:40,799

trait like uh intelligence

1645

01:04:47,829 --> 01:04:44,480

um then there are so many other factors

1646

01:04:51,190 --> 01:04:47,839

that the genes become probabilistic

1647

01:04:52,309 --> 01:04:51,200

right like having genes that put you at

1648

01:04:55,510 --> 01:04:52,319

higher risk for

1649

01:04:58,630 --> 01:04:55,520

heart disease you're at higher risk

1650

01:05:00,870 --> 01:04:58,640

that's probabilistic and then we know

1651
01:05:02,549 --> 01:05:00,880
there are things you can do to lower

1652
01:05:05,910 --> 01:05:02,559
your risk even though you're not

1653
01:05:07,109 --> 01:05:05,920
changing the genes so you can exercise

1654
01:05:10,390 --> 01:05:07,119
and diet

1655
01:05:15,109 --> 01:05:10,400
and other environmental factors can

1656
01:05:17,190 --> 01:05:15,119
can influence that probability

1657
01:05:19,430 --> 01:05:17,200
what does it look like when a man and

1658
01:05:20,630 --> 01:05:19,440
woman have a have a baby

1659
01:05:22,470 --> 01:05:20,640
i know that's a strange question what i

1660
01:05:24,789 --> 01:05:22,480
mean is like the woman has an average iq

1661
01:05:26,470 --> 01:05:24,799
the woman has an iq the man has an iq

1662
01:05:30,549 --> 01:05:26,480
does the baby then just have the average

1663
01:05:36,630 --> 01:05:33,109

generally speaking there's a statistical

1664

01:05:40,309 --> 01:05:36,640

phenomenon called regression to the mean

1665

01:05:44,150 --> 01:05:40,319

so if if a tall father and a tall

1666

01:05:47,109 --> 01:05:44,160

mother have children on average their

1667

01:05:48,390 --> 01:05:47,119

children will be tall but not as tall as

1668

01:05:51,109 --> 01:05:48,400

either parent

1669

01:05:51,990 --> 01:05:51,119

they're going to regress to the mean if

1670

01:05:55,349 --> 01:05:52,000

you have

1671

01:05:56,470 --> 01:05:55,359

two short parents on average their

1672

01:05:59,670 --> 01:05:56,480

children will be

1673

01:06:02,069 --> 01:05:59,680

short but not as short as the parents

1674

01:06:05,910 --> 01:06:02,079

and the same with intelligence it's it's

1675

01:06:07,829 --> 01:06:05,920

a general statistical phenomenon

1676

01:06:09,589 --> 01:06:07,839

but you breed two smart people together

1677

01:06:11,910 --> 01:06:09,599

they generally have smart kids you breed

1678

01:06:13,349 --> 01:06:11,920

to low iq people and they generally have

1679

01:06:14,630 --> 01:06:13,359

low i know that's been demonstrated in

1680

01:06:18,309 --> 01:06:14,640

rats

1681

01:06:20,630 --> 01:06:18,319

generally on average

1682

01:06:21,430 --> 01:06:20,640

i mean there's a lot of qualifiers there

1683

01:06:23,430 --> 01:06:21,440

one of the

1684

01:06:26,069 --> 01:06:23,440

things about genetics that's interesting

1685

01:06:28,950 --> 01:06:26,079

is it seems to mix up

1686

01:06:29,910 --> 01:06:28,960

things even within families so you can

1687

01:06:32,950 --> 01:06:29,920

have two bright

1688

01:06:35,910 --> 01:06:32,960

parents having two children one can be

1689

01:06:37,510 --> 01:06:35,920

very bright and the other pretty average

1690

01:06:40,870 --> 01:06:37,520

and the reverse can happen

1691

01:06:43,589 --> 01:06:40,880

because you don't both each child

1692

01:06:45,190 --> 01:06:43,599

inherited a different fifty percent from

1693

01:06:47,270 --> 01:06:45,200

each parent

1694

01:06:49,270 --> 01:06:47,280

i see here at the same 50 percent yeah

1695

01:06:50,950 --> 01:06:49,280

and they interact and it's complex

1696

01:06:52,549 --> 01:06:50,960

okay so there's something called

1697

01:06:54,309 --> 01:06:52,559

acquired cervantism

1698

01:06:56,150 --> 01:06:54,319

i think there's only 20 cases in the

1699

01:06:57,589 --> 01:06:56,160

world where people have had

1700

01:06:59,910 --> 01:06:57,599

brain damage and then acquired an

1701
01:07:01,349 --> 01:06:59,920
ability and still remain somewhat normal

1702
01:07:02,870 --> 01:07:01,359
you know usu you can get impaired in

1703
01:07:03,670 --> 01:07:02,880
other aspects like your social aspects

1704
01:07:05,990 --> 01:07:03,680
but

1705
01:07:07,270 --> 01:07:06,000
these 20 people or less than 20 people

1706
01:07:08,150 --> 01:07:07,280
have remained somewhat normal but

1707
01:07:09,910 --> 01:07:08,160
acquired

1708
01:07:11,510 --> 01:07:09,920
an extraordinary ability like

1709
01:07:13,990 --> 01:07:11,520
mathematical manipulation

1710
01:07:16,470 --> 01:07:14,000
is quick with them or musical

1711
01:07:19,510 --> 01:07:16,480
memorization is rapid as well

1712
01:07:20,630 --> 01:07:19,520
what i'm wondering is have you heard of

1713
01:07:24,309 --> 01:07:20,640

any studies

1714

01:07:26,069 --> 01:07:24,319

on brain damage that has increased iq

1715

01:07:28,069 --> 01:07:26,079

that's an excellent question i've been

1716

01:07:31,349 --> 01:07:28,079

asking it for years and i've

1717

01:07:31,829 --> 01:07:31,359

never come across a case where brain

1718

01:07:35,270 --> 01:07:31,839

damage

1719

01:07:39,190 --> 01:07:35,280

resulted in increased cognitive ability

1720

01:07:41,270 --> 01:07:39,200

and this acquired savanta syndrome i'm

1721

01:07:43,029 --> 01:07:41,280

very dubious about the cases that have

1722

01:07:45,829 --> 01:07:43,039

been publicized

1723

01:07:47,270 --> 01:07:45,839

usually we don't know anything factual

1724

01:07:51,190 --> 01:07:47,280

about the history

1725

01:07:51,200 --> 01:07:54,789

diagnosis of autism

1726

01:07:59,510 --> 01:07:57,670

i'm just very skeptical of this but i

1727

01:08:03,190 --> 01:07:59,520

don't know of any case

1728

01:08:05,430 --> 01:08:03,200

of any kind of lesion or brain damage

1729

01:08:06,870 --> 01:08:05,440

that resulted in people scoring higher

1730

01:08:09,430 --> 01:08:06,880

on an iq test

1731

01:08:11,190 --> 01:08:09,440

the only exception seem to be there are

1732

01:08:14,309 --> 01:08:11,200

some cases

1733

01:08:17,990 --> 01:08:14,319

of brain damage or lesions or

1734

01:08:21,510 --> 01:08:18,000

frontal lobe dementia where people get

1735

01:08:23,910 --> 01:08:21,520

a bit more creative artistically right

1736

01:08:25,910 --> 01:08:23,920

that seems to be a real thing even

1737

01:08:29,110 --> 01:08:25,920

though how creative it is

1738

01:08:32,149 --> 01:08:29,120

sometimes is subjective um

1739

01:08:34,630 --> 01:08:32,159

but as far as increasing intelligence is

1740

01:08:36,550 --> 01:08:34,640

i have never heard of such a case you

1741

01:08:38,229 --> 01:08:36,560

used to be a personality researcher

1742

01:08:41,269 --> 01:08:38,239

i think you started out as one was that

1743

01:08:43,430 --> 01:08:41,279

correct uh yes was that in the book

1744

01:08:44,950 --> 01:08:43,440

i i researched you i don't know where i

1745

01:08:47,829 --> 01:08:44,960

found where i found it

1746

01:08:49,430 --> 01:08:47,839

but either way there's a relationship

1747

01:08:50,789 --> 01:08:49,440

between openness and intelligence and

1748

01:08:52,229 --> 01:08:50,799

there's a relationship between openness

1749

01:08:55,590 --> 01:08:52,239

and creativity

1750

01:08:59,030 --> 01:08:58,550

openness is one of the uh so-called big

1751
01:09:01,510 --> 01:08:59,040
five

1752
01:09:02,709 --> 01:09:01,520
personality factors personality

1753
01:09:04,829 --> 01:09:02,719
dimensions

1754
01:09:06,070 --> 01:09:04,839
some people are just more open to

1755
01:09:09,349 --> 01:09:06,080
experience

1756
01:09:11,990 --> 01:09:09,359
than other people and the more

1757
01:09:13,030 --> 01:09:12,000
open you are to experience that seems to

1758
01:09:16,470 --> 01:09:13,040
go with higher

1759
01:09:16,789 --> 01:09:16,480
intelligence whether that's causal or

1760
01:09:20,550 --> 01:09:16,799
just

1761
01:09:24,630 --> 01:09:20,560
correlative i don't know

1762
01:09:31,669 --> 01:09:29,590
and generally um

1763
01:09:33,430 --> 01:09:31,679

personality that's the only real

1764

01:09:34,070 --> 01:09:33,440

personality factor that seems to be

1765

01:09:36,229 --> 01:09:34,080

correlated

1766

01:09:38,550 --> 01:09:36,239

to intelligence what was the other part

1767

01:09:41,749 --> 01:09:38,560

of your question

1768

01:09:43,669 --> 01:09:41,759

okay forget that question lsd

1769

01:09:45,430 --> 01:09:43,679

is known and psychedelics in general are

1770

01:09:47,110 --> 01:09:45,440

known to increase your openness somewhat

1771

01:09:49,030 --> 01:09:47,120

maybe permanently at least three months

1772

01:09:50,709 --> 01:09:49,040

later with some of the studies

1773

01:09:52,950 --> 01:09:50,719

does that mean have there been studies

1774

01:09:55,270 --> 01:09:52,960

that have demonstrated one's iq after

1775

01:09:55,990 --> 01:09:55,280

a dosage of lsd like say three months

1776

01:09:58,070 --> 01:09:56,000

afterwards

1777

01:09:59,510 --> 01:09:58,080

not while they're on the trip to my

1778

01:10:02,310 --> 01:09:59,520

knowledge people

1779

01:10:03,430 --> 01:10:02,320

have talked about being more creative

1780

01:10:06,550 --> 01:10:03,440

after certain drug

1781

01:10:09,189 --> 01:10:06,560

experiences um

1782

01:10:11,030 --> 01:10:09,199

i don't know systematically if this has

1783

01:10:12,950 --> 01:10:11,040

been studied

1784

01:10:14,149 --> 01:10:12,960

it may well have been i don't i don't

1785

01:10:16,630 --> 01:10:14,159

know

1786

01:10:19,110 --> 01:10:16,640

is there a relationship between iq and

1787

01:10:23,030 --> 01:10:19,120

synesthesia

1788

01:10:26,149 --> 01:10:23,040

very odd

1789

01:10:30,070 --> 01:10:26,159

condition where people

1790

01:10:33,510 --> 01:10:30,080

report seeing numbers as colors

1791

01:10:35,510 --> 01:10:33,520

or shapes it seems like the wiring of

1792

01:10:38,070 --> 01:10:35,520

the sensory parts of the brain got

1793

01:10:41,590 --> 01:10:38,080

scrambled in some way

1794

01:10:42,709 --> 01:10:41,600

it's very rare uh i'm not an expert on

1795

01:10:46,550 --> 01:10:42,719

it

1796

01:10:49,750 --> 01:10:46,560

to iq

1797

01:10:53,030 --> 01:10:49,760

um now homosexuality is in

1798

01:10:54,630 --> 01:10:53,040

is related to increased openness

1799

01:10:56,470 --> 01:10:54,640

and increased openness is also related

1800

01:10:56,950 --> 01:10:56,480

to an increase in iq as you mentioned

1801
01:10:58,790 --> 01:10:56,960
before

1802
01:11:00,790 --> 01:10:58,800
so does that mean have you had have you

1803
01:11:02,470 --> 01:11:00,800
seen any studies that demonstrate that

1804
01:11:05,350 --> 01:11:02,480
homosexuality is associated with higher

1805
01:11:07,030 --> 01:11:05,360
iq no

1806
01:11:09,189 --> 01:11:07,040
how about happiness the relationship

1807
01:11:12,390 --> 01:11:09,199
between intelligence and happiness

1808
01:11:14,950 --> 01:11:12,400
if you think intelligence is hard to

1809
01:11:21,830 --> 01:11:18,790
happiness how happy are you right now

1810
01:11:25,110 --> 01:11:21,840
on a scale of one to ten oh

1811
01:11:27,189 --> 01:11:25,120
i'm i'm so glad to be speaking

1812
01:11:30,390 --> 01:11:27,199
i with you to flatter you too much how

1813
01:11:31,750 --> 01:11:30,400

happy were you exactly 24 hours ago on a

1814

01:11:35,189 --> 01:11:31,760

scale of one to ten

1815

01:11:37,270 --> 01:11:35,199

i mean that that's about it i i'm

1816

01:11:39,030 --> 01:11:37,280

i'm sure i'm annoying some happiness

1817

01:11:42,070 --> 01:11:39,040

researchers

1818

01:11:46,149 --> 01:11:42,080

but it it's

1819

01:11:49,750 --> 01:11:46,159

a hard concept to operationalize

1820

01:11:51,990 --> 01:11:49,760

and and get a metric that's uh

1821

01:11:53,590 --> 01:11:52,000

any better than uh kind of a rating

1822

01:11:57,990 --> 01:11:53,600

scale

1823

01:12:01,189 --> 01:11:59,430

what i was thinking is that you know the

1824

01:12:03,110 --> 01:12:01,199

way that stephen hawking did

1825

01:12:05,110 --> 01:12:03,120

formulated that the early universe was a

1826

01:12:05,510 --> 01:12:05,120

singularity was just by taking a black

1827

01:12:07,270 --> 01:12:05,520

hole

1828

01:12:09,430 --> 01:12:07,280

and extra sorry taking the expansion of

1829

01:12:10,709 --> 01:12:09,440

the universe and extrapolating backwards

1830

01:12:12,149 --> 01:12:10,719

so it's like okay if we're moving

1831

01:12:13,669 --> 01:12:12,159

forward by a certain amount per year

1832

01:12:14,149 --> 01:12:13,679

then you just go back and back and back

1833

01:12:15,669 --> 01:12:14,159

and back

1834

01:12:17,189 --> 01:12:15,679

it's more complicated than that but

1835

01:12:18,550 --> 01:12:17,199

either way you get to a singularity

1836

01:12:19,990 --> 01:12:18,560

so then i was thinking about the flynn

1837

01:12:21,030 --> 01:12:20,000

effect and that's maybe three points

1838

01:12:23,350 --> 01:12:21,040

every decade

1839

01:12:24,470 --> 01:12:23,360

okay so that it's something like this

1840

01:12:26,070 --> 01:12:24,480

but it can't be

1841

01:12:28,070 --> 01:12:26,080

it can't be absolutely correct because

1842

01:12:31,350 --> 01:12:28,080

then it would mean socrates is an iq

1843

01:12:32,950 --> 01:12:31,360

of of five or minus 600. yes

1844

01:12:35,430 --> 01:12:32,960

so what are the limitations on the flynn

1845

01:12:36,470 --> 01:12:35,440

effect the flint effect is the

1846

01:12:44,790 --> 01:12:36,480

observation

1847

01:12:49,030 --> 01:12:44,800

over the uh decades of the 20th century

1848

01:12:52,149 --> 01:12:49,040

average iq scores went up

1849

01:12:55,750 --> 01:12:52,159

this was discovered because you have to

1850

01:12:59,270 --> 01:12:55,760

re-norm iq iq scores

1851
01:13:00,630 --> 01:12:59,280
are based on normative values right

1852
01:13:03,110 --> 01:13:00,640
and every once in a while you have to

1853
01:13:04,709 --> 01:13:03,120
renorm the test because the raw scores

1854
01:13:08,470 --> 01:13:04,719
are going up

1855
01:13:11,189 --> 01:13:08,480
and that's called the flint effect and

1856
01:13:13,830 --> 01:13:11,199
whether whether you can extrapolate back

1857
01:13:16,390 --> 01:13:13,840
whether this has been a constant thing

1858
01:13:17,430 --> 01:13:16,400
unlikely whether you can extrapolate

1859
01:13:19,430 --> 01:13:17,440
into the future

1860
01:13:21,270 --> 01:13:19,440
unlikely because there are recent

1861
01:13:21,910 --> 01:13:21,280
studies that show the flynn effect is

1862
01:13:25,350 --> 01:13:21,920
largely

1863
01:13:27,990 --> 01:13:25,360

stopped interesting

1864

01:13:28,709 --> 01:13:28,000
and was it related to sorry was it

1865

01:13:30,790 --> 01:13:28,719
related to

1866

01:13:32,229 --> 01:13:30,800
increasing nutrition like the bottom

1867

01:13:35,430 --> 01:13:32,239
lifted right

1868

01:13:38,709 --> 01:13:35,440
that is one hypothesis that seems to be

1869

01:13:41,750 --> 01:13:38,719
a good one plus

1870

01:13:45,830 --> 01:13:41,760
there uh is better schooling people

1871

01:13:46,550 --> 01:13:45,840
kids are more exposed to visual spatial

1872

01:13:50,149 --> 01:13:46,560
things and

1873

01:13:53,910 --> 01:13:50,159
other things that uh other cognitive

1874

01:13:57,430 --> 01:13:53,920
abilities that might account for this

1875

01:13:59,750 --> 01:13:57,440
um this increase whether the

1876

01:14:01,350 --> 01:13:59,760

increase has been in the g factor

1877

01:14:04,149 --> 01:14:01,360

however

1878

01:14:04,870 --> 01:14:04,159

is still controversial remember an iq

1879

01:14:07,510 --> 01:14:04,880

score

1880

01:14:08,550 --> 01:14:07,520

includes the g factor plus visual

1881

01:14:11,110 --> 01:14:08,560

spatial

1882

01:14:13,669 --> 01:14:11,120

plus numerical plus some verbal

1883

01:14:17,110 --> 01:14:13,679

abilities

1884

01:14:19,270 --> 01:14:17,120

and any one of those

1885

01:14:21,510 --> 01:14:19,280

other than the g factor could go up and

1886

01:14:24,310 --> 01:14:21,520

you'd get an increasing iq score that's

1887

01:14:27,350 --> 01:14:24,320

not necessarily due to that underlying g

1888

01:14:31,030 --> 01:14:27,360

factor i see i see and so i think most

1889

01:14:32,950 --> 01:14:31,040

researchers believe it's still an open

1890

01:14:34,149 --> 01:14:32,960

question as to whether or not the flint

1891

01:14:37,669 --> 01:14:34,159

effect relates

1892

01:14:38,470 --> 01:14:37,679

to g it's a it's kind of a mysterious

1893

01:14:41,350 --> 01:14:38,480

phenomenon

1894

01:14:44,310 --> 01:14:41,360

almost everyone believes it's true that

1895

01:14:46,470 --> 01:14:44,320

it's a correct observation

1896

01:14:48,470 --> 01:14:46,480

but what it means is not so clear where

1897

01:14:49,510 --> 01:14:48,480

it comes from is not so clear but i

1898

01:14:51,990 --> 01:14:49,520

don't think

1899

01:14:52,950 --> 01:14:52,000

you can extrapolate it into the future

1900

01:14:56,149 --> 01:14:52,960

and it certainly

1901

01:14:59,350 --> 01:14:56,159

doesn't mean that

1902

01:15:01,110 --> 01:14:59,360

because iq changes generation to

1903

01:15:04,149 --> 01:15:01,120

generation

1904

01:15:05,830 --> 01:15:04,159

it can't be genetic because evolution

1905

01:15:09,189 --> 01:15:05,840

doesn't work that quickly

1906

01:15:11,830 --> 01:15:09,199

when the flynn effect was first observed

1907

01:15:13,830 --> 01:15:11,840

a lot of the anti-genetic people seized

1908

01:15:17,030 --> 01:15:13,840

on it as evidence that you see

1909

01:15:18,070 --> 01:15:17,040

it can't be genetic it's malleable now

1910

01:15:20,390 --> 01:15:18,080

we know it it's

1911

01:15:21,430 --> 01:15:20,400

malleable within certain limits but

1912

01:15:24,390 --> 01:15:21,440

whether or not

1913

01:15:25,270 --> 01:15:24,400

that includes the g factor is still not

1914

01:15:27,910 --> 01:15:25,280

so clear

1915

01:15:29,910 --> 01:15:27,920

what can one do to decrease their iq so

1916

01:15:31,590 --> 01:15:29,920

we know what to avoid

1917

01:15:34,470 --> 01:15:31,600

drug abuse does that permanently

1918

01:15:37,430 --> 01:15:34,480

decrease your iq amphetamines

1919

01:15:38,950 --> 01:15:37,440

well those things can cause long-term

1920

01:15:42,229 --> 01:15:38,960

abuse

1921

01:15:45,750 --> 01:15:42,239

can cause brain uh

1922

01:15:48,630 --> 01:15:45,760

i i want to say damage

1923

01:15:49,590 --> 01:15:48,640

but it it's it might not reach a

1924

01:15:51,510 --> 01:15:49,600

threshold

1925

01:15:53,350 --> 01:15:51,520

they might cause changes in the brain

1926

01:15:54,870 --> 01:15:53,360

that could be damaged or just more

1927

01:15:58,229 --> 01:15:54,880

subtle changes

1928

01:16:00,229 --> 01:15:58,239

and we don't really know if the more

1929

01:16:03,350 --> 01:16:00,239

subtle changes have an impact on

1930

01:16:08,229 --> 01:16:03,360

something as complex as iq

1931

01:16:11,750 --> 01:16:08,239

which is kind of a trait over time

1932

01:16:14,550 --> 01:16:11,760

if you abuse your brain

1933

01:16:16,070 --> 01:16:14,560

uh does that have an impact on your

1934

01:16:19,110 --> 01:16:16,080

reasoning ability

1935

01:16:21,270 --> 01:16:19,120

it could in some some cases

1936

01:16:25,510 --> 01:16:21,280

but again there are so many different

1937

01:16:29,910 --> 01:16:28,790

i don't i can't believe there's any

1938

01:16:32,950 --> 01:16:29,920

positive effect

1939

01:16:35,750 --> 01:16:32,960

on your the physiology of the brain

1940

01:16:36,630 --> 01:16:35,760

and people who do hallucinogens many

1941

01:16:39,510 --> 01:16:36,640

people

1942

01:16:41,350 --> 01:16:39,520

swear by the positive effect on

1943

01:16:44,229 --> 01:16:41,360

creativity and

1944

01:16:46,790 --> 01:16:44,239

expanding consciousness i don't know

1945

01:16:49,910 --> 01:16:46,800

about any of those things empirically

1946

01:16:53,350 --> 01:16:49,920

but i'm really uh unaware

1947

01:16:56,390 --> 01:16:53,360

of any impact that would have

1948

01:16:59,750 --> 01:16:56,400

other than abuse and brain damage on

1949

01:17:01,110 --> 01:16:59,760

um on cognitive ability

1950

01:17:03,030 --> 01:17:01,120

you just mentioned you just made me

1951

01:17:04,470 --> 01:17:03,040

light up man you mentioned consciousness

1952

01:17:06,310 --> 01:17:04,480

so i'm curious about the relationship

1953

01:17:08,070 --> 01:17:06,320

between intelligence and consciousness

1954

01:17:09,189 --> 01:17:08,080

just as an aside for the people

1955

01:17:09,990 --> 01:17:09,199

listening as well as for yourself

1956

01:17:11,750 --> 01:17:10,000

professor

1957

01:17:13,669 --> 01:17:11,760

my goal with this channel as well as

1958

01:17:15,910 --> 01:17:13,679

myself for the next few years

1959

01:17:17,030 --> 01:17:15,920

and maybe my whole life i was i'm

1960

01:17:18,550 --> 01:17:17,040

interested in something called the

1961

01:17:20,390 --> 01:17:18,560

theory of everything in physics so what

1962

01:17:22,229 --> 01:17:20,400

are the fundamental laws of physics

1963

01:17:24,070 --> 01:17:22,239

and i have a suspicion that

1964

01:17:27,350 --> 01:17:24,080

consciousness is related somehow and

1965

01:17:28,709 --> 01:17:27,360

which is completely unlike most of the

1966

01:17:31,669 --> 01:17:28,719

physicists who are

1967

01:17:33,189 --> 01:17:31,679

ardent materialists and i might maybe

1968

01:17:36,310 --> 01:17:33,199

materialism is true i'm

1969

01:17:37,990 --> 01:17:36,320

i'm just not convinced but either way

1970

01:17:40,070 --> 01:17:38,000

i'm exploring theories of consciousness

1971

01:17:41,270 --> 01:17:40,080

too so let's talk about consciousness

1972

01:17:42,709 --> 01:17:41,280

what heck what the heck is the

1973

01:17:44,070 --> 01:17:42,719

relationship between intelligence and

1974

01:17:45,590 --> 01:17:44,080

consciousness is it that the more

1975

01:17:47,750 --> 01:17:45,600

intelligent you are the more

1976

01:17:49,189 --> 01:17:47,760

conscious you are is there a measurement

1977

01:17:50,870 --> 01:17:49,199

of conscious i know you can knock it out

1978

01:17:54,870 --> 01:17:50,880

with anesthesia

1979

01:17:55,590 --> 01:17:54,880

well um you may know that i was involved

1980

01:17:59,590 --> 01:17:55,600

in the first

1981

01:18:02,630 --> 01:17:59,600

brain imaging studies of consciousness

1982

01:18:03,110 --> 01:18:02,640

and i did these with my colleague and

1983

01:18:07,510 --> 01:18:03,120

friend

1984

01:18:09,430 --> 01:18:07,520

mike alkire who is an anesthesiologist

1985

01:18:11,510 --> 01:18:09,440

and i met him when he came to me he was

1986

01:18:11,990 --> 01:18:11,520

a resident in the anesthesiology

1987

01:18:15,030 --> 01:18:12,000

department

1988

01:18:17,510 --> 01:18:15,040

he knew about pet scanning he said can

1989

01:18:21,350 --> 01:18:17,520

you help me do pet scans

1990

01:18:23,350 --> 01:18:21,360

in people under anesthesia

1991

01:18:24,390 --> 01:18:23,360

he says what i want to do is i want to

1992

01:18:28,070 --> 01:18:24,400

scan the same

1993

01:18:31,510 --> 01:18:28,080

person three times okay

1994

01:18:33,910 --> 01:18:31,520

once while they're conscious once when i

1995

01:18:35,910 --> 01:18:33,920

give them enough anesthetic drugs so

1996

01:18:38,229 --> 01:18:35,920

they're barely conscious

1997

01:18:39,430 --> 01:18:38,239

you know okay steve can you hear me and

1998

01:18:42,870 --> 01:18:39,440

steve says

1999

01:18:45,189 --> 01:18:42,880

uh yeah

2000

01:18:46,550 --> 01:18:45,199

okay and once while steve is completely

2001

01:18:48,390 --> 01:18:46,560

unconscious

2002

01:18:50,550 --> 01:18:48,400

because i've given him enough anesthetic

2003

01:18:51,510 --> 01:18:50,560

drugs so we did a series of pet studies

2004

01:18:53,430 --> 01:18:51,520

like this

2005

01:18:55,110 --> 01:18:53,440

yeah uh with a couple of different

2006

01:18:56,470 --> 01:18:55,120

anesthetic drugs because they're all

2007

01:18:57,590 --> 01:18:56,480

alleged to have different brain

2008

01:18:59,990 --> 01:18:57,600

mechanisms

2009

01:19:01,990 --> 01:19:00,000

and the question was what's the last

2010

01:19:05,030 --> 01:19:02,000

part of the brain to turn off

2011

01:19:06,790 --> 01:19:05,040

when someone loses consciousness and

2012

01:19:08,870 --> 01:19:06,800

what's the first part of the brain to

2013

01:19:10,709 --> 01:19:08,880

turn on when they regain

2014

01:19:12,630 --> 01:19:10,719

consciousness we published a whole

2015

01:19:14,149 --> 01:19:12,640

series of studies on this in the late

2016

01:19:15,830 --> 01:19:14,159

1990s

2017

01:19:17,189 --> 01:19:15,840

and since then there have been a lot of

2018

01:19:18,550 --> 01:19:17,199

imaging studies of

2019

01:19:20,229 --> 01:19:18,560

intelligence i don't think there were

2020

01:19:23,590 --> 01:19:20,239

any before us

2021

01:19:27,510 --> 01:19:23,600

and uh when you talk about consciousness

2022

01:19:30,390 --> 01:19:27,520

i'm talking about literal consciousness

2023

01:19:32,870 --> 01:19:30,400

and so there are imaging studies that

2024

01:19:34,870 --> 01:19:32,880

are trying to find the brain areas and

2025

01:19:38,310 --> 01:19:34,880

the brain networks

2026

01:19:40,950 --> 01:19:38,320

that underlie consciousness

2027

01:19:44,149 --> 01:19:40,960

by manipulating those networks with

2028

01:19:47,430 --> 01:19:44,159

anesthetic drugs it's an experimental

2029

01:19:49,510 --> 01:19:47,440

approach not just a correlation approach

2030

01:19:51,110 --> 01:19:49,520

and i'm not up on the latest of that i

2031

01:19:54,470 --> 01:19:51,120

haven't done those

2032

01:19:57,750 --> 01:19:54,480

projects in a while um but

2033

01:20:00,870 --> 01:19:57,760

one of the questions i first posed to dr

2034

01:20:03,910 --> 01:20:00,880

alkire as an anesthesiologist

2035

01:20:05,590 --> 01:20:03,920

i said when you have a clinical patient

2036

01:20:08,550 --> 01:20:05,600

and you are dosing them

2037

01:20:09,910 --> 01:20:08,560

for surgery to put them under does it

2038

01:20:13,110 --> 01:20:09,920

make a difference

2039

01:20:15,110 --> 01:20:13,120

if you know if they're what we call

2040

01:20:19,030 --> 01:20:15,120

mentally if they have

2041

01:20:22,310 --> 01:20:19,040

very low iqs

2042

01:20:24,149 --> 01:20:22,320

that is to say it made no difference

2043

01:20:25,830 --> 01:20:24,159

that's what you're investigating more or

2044

01:20:27,830 --> 01:20:25,840

less anesthetic

2045

01:20:29,590 --> 01:20:27,840

yeah that's an interesting question and

2046

01:20:31,590 --> 01:20:29,600

he had no idea

2047

01:20:33,910 --> 01:20:31,600

i said well is there a textbook we can

2048

01:20:35,430 --> 01:20:33,920

go to that will have some information on

2049

01:20:39,189 --> 01:20:35,440

this and he said no

2050

01:20:41,350 --> 01:20:39,199

this is all just kind of clinical feel

2051
01:20:42,870 --> 01:20:41,360
he said we don't really know how

2052
01:20:46,550 --> 01:20:42,880
unconscious a person

2053
01:20:48,390 --> 01:20:46,560
is we give them enough medication

2054
01:20:51,030 --> 01:20:48,400
we'll poke them with a needle at some

2055
01:20:52,790 --> 01:20:51,040
point to see if they respond

2056
01:20:55,030 --> 01:20:52,800
and that's how we know how if somebody's

2057
01:20:56,709 --> 01:20:55,040
deep enough for surgery

2058
01:20:58,709 --> 01:20:56,719
and he says we give them memory

2059
01:21:01,750 --> 01:20:58,719
disrupting drugs so if they wake up

2060
01:21:04,390 --> 01:21:01,760
during surgery they won't remember it

2061
01:21:05,830 --> 01:21:04,400
it's horrifying horrified horrifying

2062
01:21:07,830 --> 01:21:05,840
information to me

2063
01:21:10,229 --> 01:21:07,840

but this is the way the state of the art

2064

01:21:11,590 --> 01:21:10,239

was in the 1990s i'm not sure it's much

2065

01:21:15,350 --> 01:21:11,600

different now

2066

01:21:17,110 --> 01:21:15,360

there are monitors that allegedly

2067

01:21:19,750 --> 01:21:17,120

monitor how deeply someone is

2068

01:21:20,070 --> 01:21:19,760

anesthetized that is how unconscious

2069

01:21:23,189 --> 01:21:20,080

they

2070

01:21:26,709 --> 01:21:23,199

are whether these work or

2071

01:21:28,310 --> 01:21:26,719

very well or not i don't really know

2072

01:21:30,310 --> 01:21:28,320

but that's how i think about

2073

01:21:30,870 --> 01:21:30,320

consciousness but there's a much bigger

2074

01:21:33,750 --> 01:21:30,880

group of

2075

01:21:35,750 --> 01:21:33,760

of people who think about consciousness

2076

01:21:39,270 --> 01:21:35,760

in a more philosophical

2077

01:21:40,390 --> 01:21:39,280

uh less anesthetic sense more of a

2078

01:21:44,390 --> 01:21:40,400

meditation

2079

01:21:48,709 --> 01:21:44,400

sense yeah and i'm not aware of any

2080

01:21:54,470 --> 01:21:51,830

meditate in meditating to changes in

2081

01:21:55,990 --> 01:21:54,480

intelligence that would go with

2082

01:21:59,110 --> 01:21:56,000

so-called changes in

2083

01:21:59,510 --> 01:21:59,120

consciousness i just don't know whether

2084

01:22:01,590 --> 01:21:59,520

that

2085

01:22:03,030 --> 01:22:01,600

data exists or not speaking of

2086

01:22:03,990 --> 01:22:03,040

meditation some people would say

2087

01:22:05,750 --> 01:22:04,000

mindfulness

2088

01:22:07,669 --> 01:22:05,760

meditation helps them with an increase

2089

01:22:09,669 --> 01:22:07,679

in attention and attention

2090

01:22:11,669 --> 01:22:09,679

is related to intelligence it's not

2091

01:22:14,790 --> 01:22:11,679

synonymous with it but have you seen

2092

01:22:17,669 --> 01:22:14,800

any research that you find

2093

01:22:17,990 --> 01:22:17,679

that you find credible about mindfulness

2094

01:22:21,030 --> 01:22:18,000

and

2095

01:22:24,070 --> 01:22:21,040

iq no um

2096

01:22:27,430 --> 01:22:24,080

remember attention is is one component

2097

01:22:30,709 --> 01:22:27,440

so if you are doing an intelligence

2098

01:22:33,990 --> 01:22:30,719

test and you take some drug

2099

01:22:37,430 --> 01:22:34,000

or some manipulation like meditation

2100

01:22:39,590 --> 01:22:37,440

that increases your attention

2101
01:22:40,629 --> 01:22:39,600
you might work through the test a little

2102
01:22:43,030 --> 01:22:40,639
faster

2103
01:22:43,669 --> 01:22:43,040
whether you work through it better is

2104
01:22:45,990 --> 01:22:43,679
not so

2105
01:22:47,669 --> 01:22:46,000
clear if you work through it and you

2106
01:22:48,790 --> 01:22:47,679
receive the same score but you did that

2107
01:22:52,709 --> 01:22:48,800
faster is that not an

2108
01:22:55,750 --> 01:22:52,719
increase in intelligence because it

2109
01:22:58,870 --> 01:22:55,760
it depends on what what the test is

2110
01:23:02,229 --> 01:22:58,880
and uh many of the the good tests are

2111
01:23:05,750 --> 01:23:02,239
time limited so the more you finish

2112
01:23:07,350 --> 01:23:05,760
correctly right and you did mention in

2113
01:23:09,669 --> 01:23:07,360

the book that the timed tests

2114

01:23:10,550 --> 01:23:09,679

tend to be highly more highly correlated

2115

01:23:13,270 --> 01:23:10,560

than

2116

01:23:13,750 --> 01:23:13,280

not with g right because given enough

2117

01:23:15,990 --> 01:23:13,760

time

2118

01:23:17,110 --> 01:23:16,000

a lot more people can solve a lot of the

2119

01:23:19,189 --> 01:23:17,120

problems

2120

01:23:20,709 --> 01:23:19,199

but the idea is by truncating the time

2121

01:23:21,830 --> 01:23:20,719

you're really kind of stressing the

2122

01:23:24,229 --> 01:23:21,840

system

2123

01:23:25,590 --> 01:23:24,239

and the people who can do it very fast

2124

01:23:27,590 --> 01:23:25,600

tend to do better on

2125

01:23:28,950 --> 01:23:27,600

some of these other things i don't know

2126
01:23:29,910 --> 01:23:28,960
if you had a chance to look at the video

2127
01:23:32,149 --> 01:23:29,920
that i sent you

2128
01:23:34,149 --> 01:23:32,159
of joshua bach have you taken a look at

2129
01:23:34,950 --> 01:23:34,159
it briefly looked at it and it's not

2130
01:23:37,590 --> 01:23:34,960
something i know

2131
01:23:38,390 --> 01:23:37,600
anything about so i just you know okay

2132
01:23:40,470 --> 01:23:38,400
okay well i'll

2133
01:23:42,629 --> 01:23:40,480
outline it he was putting forth a theory

2134
01:23:44,790 --> 01:23:42,639
that perhaps plants are more intelligent

2135
01:23:46,790 --> 01:23:44,800
than humans because maybe they they

2136
01:23:47,669 --> 01:23:46,800
communicate clearly but it takes quite

2137
01:23:49,990 --> 01:23:47,679
some time

2138
01:23:51,110 --> 01:23:50,000

and maybe throughout the course say a

2139

01:23:52,709 --> 01:23:51,120

thousand years from now

2140

01:23:54,229 --> 01:23:52,719

we would be gone but the plants would

2141

01:23:55,590 --> 01:23:54,239

still be communicating and they serve as

2142

01:23:56,229 --> 01:23:55,600

their own hive mind or on their own

2143

01:23:58,470 --> 01:23:56,239

brain

2144

01:23:59,590 --> 01:23:58,480

in some interconnected manner and i was

2145

01:24:01,669 --> 01:23:59,600

curious what you think

2146

01:24:03,030 --> 01:24:01,679

of that theory from an intelligence

2147

01:24:05,189 --> 01:24:03,040

point of view given that you have a

2148

01:24:06,310 --> 01:24:05,199

very specific definition of intelligence

2149

01:24:08,709 --> 01:24:06,320

yes it has no

2150

01:24:09,510 --> 01:24:08,719

bearing to human intelligence and what

2151
01:24:12,790 --> 01:24:09,520
we study

2152
01:24:15,030 --> 01:24:12,800
for human intelligence and you might say

2153
01:24:16,149 --> 01:24:15,040
that certain instincts are more

2154
01:24:17,910 --> 01:24:16,159
intelligent

2155
01:24:20,149 --> 01:24:17,920
than humans as they've been around

2156
01:24:21,990 --> 01:24:20,159
millions of years

2157
01:24:23,910 --> 01:24:22,000
it's a it's a use of the word

2158
01:24:26,149 --> 01:24:23,920
intelligence

2159
01:24:27,510 --> 01:24:26,159
that is kind of interesting but has no

2160
01:24:30,470 --> 01:24:27,520
meaning to me

2161
01:24:32,070 --> 01:24:30,480
i see i see have you looked at the link

2162
01:24:32,870 --> 01:24:32,080
that i sent you about eric weinstein on

2163
01:24:35,030 --> 01:24:32,880

intelligence

2164

01:24:36,470 --> 01:24:35,040

yes i watched the whole thing okay now

2165

01:24:37,590 --> 01:24:36,480

that i haven't watched in quite a while

2166

01:24:38,629 --> 01:24:37,600

so i don't i don't actually know what

2167

01:24:40,070 --> 01:24:38,639

i'm gonna ask you about it but do you

2168

01:24:41,990 --> 01:24:40,080

mind expounding like what did you

2169

01:24:43,669 --> 01:24:42,000

think about his theories on intelligence

2170

01:24:43,990 --> 01:24:43,679

if you can even articulate them to the

2171

01:24:45,750 --> 01:24:44,000

audience

2172

01:24:47,189 --> 01:24:45,760

first that'd be great well it was a

2173

01:24:49,189 --> 01:24:47,199

discussion between joe

2174

01:24:50,950 --> 01:24:49,199

rogan and eric weinstein two very

2175

01:24:52,550 --> 01:24:50,960

intelligent people

2176

01:24:55,669 --> 01:24:52,560

talking about their views about

2177

01:24:57,669 --> 01:24:55,679

intelligence and it was amusing

2178

01:25:00,149 --> 01:24:57,679

to hear intelligent people talk about

2179

01:25:03,110 --> 01:25:00,159

something they had limited knowledge of

2180

01:25:04,550 --> 01:25:03,120

uh and uh and they were quite

2181

01:25:07,590 --> 01:25:04,560

opinionated about it

2182

01:25:08,950 --> 01:25:07,600

uh joe rogan was much seemed much more

2183

01:25:11,270 --> 01:25:08,960

open about it

2184

01:25:11,990 --> 01:25:11,280

uh eric weinstein had some interesting

2185

01:25:15,270 --> 01:25:12,000

views

2186

01:25:17,990 --> 01:25:15,280

about what uh tests mean and what uh

2187

01:25:20,229 --> 01:25:18,000

intelligence tests don't mean all of

2188

01:25:21,590 --> 01:25:20,239

which i've heard for decades i mean

2189

01:25:22,870 --> 01:25:21,600

for example do you mind saying some of

2190

01:25:23,669 --> 01:25:22,880

them some of the voices he says it

2191

01:25:25,590 --> 01:25:23,679

doesn't measure

2192

01:25:27,510 --> 01:25:25,600

everything that makes people intelligent

2193

01:25:29,990 --> 01:25:27,520

it's very narrow

2194

01:25:30,870 --> 01:25:30,000

and it doesn't include creativity for

2195

01:25:33,910 --> 01:25:30,880

example

2196

01:25:34,390 --> 01:25:33,920

and that some he's specifically talked

2197

01:25:37,510 --> 01:25:34,400

about

2198

01:25:40,229 --> 01:25:37,520

uh africa african americans being more

2199

01:25:43,270 --> 01:25:40,239

creative musically and iq tests don't

2200

01:25:47,430 --> 01:25:43,280

do that and it was a kind of a

2201

01:25:50,470 --> 01:25:47,440

an unfocused discussion

2202

01:25:52,550 --> 01:25:50,480

that threw in stuff about intelligence

2203

01:25:54,070 --> 01:25:52,560

and intelligence testing in almost

2204

01:25:57,830 --> 01:25:54,080

random ways it wasn't

2205

01:25:59,430 --> 01:25:57,840

a really coherent discussion about

2206

01:26:01,910 --> 01:25:59,440

intelligence the way you and i are

2207

01:26:03,990 --> 01:26:01,920

having a discussion about intelligence

2208

01:26:05,910 --> 01:26:04,000

so it was amusing it was a little

2209

01:26:09,030 --> 01:26:05,920

frustrating

2210

01:26:12,470 --> 01:26:09,040

because they were talking about things

2211

01:26:14,550 --> 01:26:12,480

uh in a way that uh intelligence

2212

01:26:17,270 --> 01:26:14,560

researchers would kindly say

2213

01:26:18,629 --> 01:26:17,280

would be unsophisticated uh and they

2214

01:26:20,629 --> 01:26:18,639

were talking a lot about

2215

01:26:23,189 --> 01:26:20,639

the race issue which made them both

2216

01:26:26,550 --> 01:26:23,199

uncomfortable understandably

2217

01:26:28,709 --> 01:26:26,560

about the average differences among

2218

01:26:30,070 --> 01:26:28,719

between blacks and whites specifically

2219

01:26:32,070 --> 01:26:30,080

on iq tests

2220

01:26:34,629 --> 01:26:32,080

and what this means i think they missed

2221

01:26:37,910 --> 01:26:34,639

the bigger point on this

2222

01:26:39,270 --> 01:26:37,920

if you want to uh underst if you want to

2223

01:26:41,910 --> 01:26:39,280

fix that difference

2224

01:26:42,790 --> 01:26:41,920

like compensatory education like head

2225

01:26:45,030 --> 01:26:42,800

start

2226

01:26:46,790 --> 01:26:45,040

like almost every developmental and

2227

01:26:49,430 --> 01:26:46,800

educational psychologist

2228

01:26:51,030 --> 01:26:49,440

would like to do including myself you

2229

01:26:52,229 --> 01:26:51,040

have to understand where the difference

2230

01:26:54,149 --> 01:26:52,239

comes from

2231

01:26:56,070 --> 01:26:54,159

if there's a genetic component to that

2232

01:26:58,790 --> 01:26:56,080

you got to know that

2233

01:27:00,310 --> 01:26:58,800

if it's a cultural problem you got to

2234

01:27:03,030 --> 01:27:00,320

know that

2235

01:27:05,910 --> 01:27:03,040

and so it's still an uncomfortable

2236

01:27:08,229 --> 01:27:05,920

subject most people stay away from it

2237

01:27:10,550 --> 01:27:08,239

and ironically the longer people the

2238

01:27:12,390 --> 01:27:10,560

longer scientists stay away from it

2239

01:27:13,830 --> 01:27:12,400

the longer the underlying problem

2240

01:27:17,430 --> 01:27:13,840

whatever it is

2241

01:27:17,830 --> 01:27:17,440

will persist have you been keeping up

2242

01:27:20,709 --> 01:27:17,840

with

2243

01:27:23,110 --> 01:27:20,719

elon musk and neuralink i've been

2244

01:27:26,950 --> 01:27:23,120

following it to the best of my ability

2245

01:27:29,430 --> 01:27:26,960

um what he's doing is very interesting

2246

01:27:30,870 --> 01:27:29,440

i'm not sure how much real neuroscience

2247

01:27:33,830 --> 01:27:30,880

there is underlying

2248

01:27:34,550 --> 01:27:33,840

what they're actually trying to do but

2249

01:27:36,070 --> 01:27:34,560

it's it's

2250

01:27:39,030 --> 01:27:36,080

it's worth doing this they're playing

2251
01:27:41,750 --> 01:27:39,040
around with something very interesting

2252
01:27:43,270 --> 01:27:41,760
and there might be a feature in it have

2253
01:27:44,390 --> 01:27:43,280
you seen anything that would increase

2254
01:27:46,950 --> 01:27:44,400
someone's iq

2255
01:27:47,669 --> 01:27:46,960
by by injecting i'm not injecting by

2256
01:27:50,310 --> 01:27:47,679
inserting

2257
01:27:52,070 --> 01:27:50,320
electrodes uh no because we don't know

2258
01:27:55,189 --> 01:27:52,080
where to insert them and what to tell

2259
01:27:58,870 --> 01:27:57,510
but doesn't mean we can't find out i

2260
01:28:00,550 --> 01:27:58,880
don't know if you look into

2261
01:28:02,310 --> 01:28:00,560
artificial intelligence but the

2262
01:28:03,110 --> 01:28:02,320
generalizability is what held watson

2263
01:28:05,350 --> 01:28:03,120

back from being

2264

01:28:06,229 --> 01:28:05,360

considered to be a high iq computer

2265

01:28:09,669 --> 01:28:06,239

let's say

2266

01:28:12,950 --> 01:28:09,679

that is that it was great in one domain

2267

01:28:14,709 --> 01:28:12,960

is there a test for iq for computers

2268

01:28:17,830 --> 01:28:14,719

that you know of or that you can think

2269

01:28:21,189 --> 01:28:17,840

of or do you have any speculations

2270

01:28:23,030 --> 01:28:21,199

well let's see about 15 years ago i gave

2271

01:28:27,189 --> 01:28:23,040

a talk

2272

01:28:31,110 --> 01:28:27,199

at a group

2273

01:28:34,550 --> 01:28:31,120

of artificial intelligence researchers

2274

01:28:37,669 --> 01:28:34,560

about what they might learn from people

2275

01:28:39,270 --> 01:28:37,679

like myself who study real human

2276

01:28:41,990 --> 01:28:39,280

intelligence

2277

01:28:42,870 --> 01:28:42,000

and my whole talk was a pitch on the g

2278

01:28:45,910 --> 01:28:42,880

factor

2279

01:28:49,189 --> 01:28:45,920

the general ability it was a pitch

2280

01:28:49,510 --> 01:28:49,199

on understanding the general factor the

2281

01:28:52,550 --> 01:28:49,520

g

2282

01:28:55,990 --> 01:28:52,560

factor in humans and how important

2283

01:28:57,750 --> 01:28:56,000

the g factor was and at the time

2284

01:29:00,149 --> 01:28:57,760

a lot of a lot of artificial

2285

01:29:03,910 --> 01:29:00,159

intelligence was trying to break

2286

01:29:07,030 --> 01:29:03,920

human cognition into discrete pieces

2287

01:29:07,910 --> 01:29:07,040

this task that task and i said the key

2288

01:29:11,270 --> 01:29:07,920

is how you're going to

2289

01:29:14,790 --> 01:29:11,280

integrate all that and that

2290

01:29:23,350 --> 01:29:14,800

when they did statistical analysis on

2291

01:29:27,030 --> 01:29:25,750

okay so with respect to artificial

2292

01:29:28,629 --> 01:29:27,040

intelligence

2293

01:29:31,189 --> 01:29:28,639

i gave a lecture to a group of

2294

01:29:33,910 --> 01:29:31,199

artificial intelligence researchers

2295

01:29:34,950 --> 01:29:33,920

many years ago and i emphasized the g

2296

01:29:36,950 --> 01:29:34,960

factor

2297

01:29:38,390 --> 01:29:36,960

that it wasn't so much the individual

2298

01:29:41,430 --> 01:29:38,400

components

2299

01:29:44,790 --> 01:29:41,440

but how they would be related in

2300

01:29:47,910 --> 01:29:44,800

artificial intelligence and

2301

01:29:50,470 --> 01:29:47,920

i've subsequently understood that the

2302

01:29:53,590 --> 01:29:50,480

field of artificial intelligence is now

2303

01:29:57,590 --> 01:29:53,600

paying much more attention to this

2304

01:29:59,030 --> 01:29:57,600

general factor and algorithms that would

2305

01:30:00,790 --> 01:29:59,040

simulate it

2306

01:30:02,550 --> 01:30:00,800

what they're doing i don't really know

2307

01:30:03,750 --> 01:30:02,560

i'm not really up on artificial

2308

01:30:07,350 --> 01:30:03,760

intelligence

2309

01:30:10,470 --> 01:30:07,360

but you asked if there was any uh

2310

01:30:11,910 --> 01:30:10,480

test computer test for artificial

2311

01:30:15,750 --> 01:30:11,920

intelligence

2312

01:30:19,270 --> 01:30:15,760

um i have wanted to

2313

01:30:22,470 --> 01:30:19,280

ask uh compare siri

2314

01:30:27,189 --> 01:30:22,480

to echo and alexa

2315

01:30:31,590 --> 01:30:29,830

just kind of general information i would

2316

01:30:33,350 --> 01:30:31,600

imagine they'd score extremely high on a

2317

01:30:38,790 --> 01:30:33,360

ravens test

2318

01:30:42,709 --> 01:30:41,669

right because they're audio only yeah so

2319

01:30:45,910 --> 01:30:42,719

i mean it's an

2320

01:30:47,669 --> 01:30:45,920

interesting question um

2321

01:30:49,990 --> 01:30:47,679

there might be computer programs already

2322

01:30:53,189 --> 01:30:50,000

that that solve raven's problems

2323

01:30:55,189 --> 01:30:53,199

uh i'm not aware of it uh it seems like

2324

01:30:58,470 --> 01:30:55,199

it would be an easy visual input

2325

01:31:00,229 --> 01:30:58,480

relatively easy visual input

2326

01:31:02,310 --> 01:31:00,239

so yeah i don't really know that much

2327

01:31:05,030 --> 01:31:02,320

about artificial intelligence but my

2328

01:31:08,149 --> 01:31:05,040

hunch is the more they can simulate

2329

01:31:12,229 --> 01:31:08,159

real human intelligence uh

2330

01:31:15,430 --> 01:31:12,239

not an easy thing to do but that

2331

01:31:16,709 --> 01:31:15,440

must be where they're trying to go

2332

01:31:18,390 --> 01:31:16,719

i think it's in this book you mentioned

2333

01:31:18,870 --> 01:31:18,400

that there's some studies with rats and

2334

01:31:20,950 --> 01:31:18,880

the g

2335

01:31:22,390 --> 01:31:20,960

factor in rats now that's extremely

2336

01:31:23,350 --> 01:31:22,400

interesting if that's true you can

2337

01:31:26,870 --> 01:31:23,360

extract a g

2338

01:31:28,790 --> 01:31:26,880

factor from animals

2339

01:31:31,430 --> 01:31:28,800

not only are there stuff can you tell me

2340

01:31:35,350 --> 01:31:31,440

a little bit about that

2341

01:31:38,709 --> 01:31:35,360

um two interesting things about the g

2342

01:31:41,830 --> 01:31:38,719

factor there is a a good

2343

01:31:45,189 --> 01:31:41,840

research uh report showing

2344

01:31:45,750 --> 01:31:45,199

that the g factor occurs in i think it

2345

01:31:48,229 --> 01:31:45,760

was over

2346

01:31:49,590 --> 01:31:48,239

30 different cultures where they gave a

2347

01:31:51,270 --> 01:31:49,600

battery of tests

2348

01:31:53,590 --> 01:31:51,280

from which they could extract the g

2349

01:31:56,870 --> 01:31:53,600

factor so it's

2350

01:31:59,910 --> 01:31:56,880

not culturally specific it seems to be

2351
01:32:00,790 --> 01:31:59,920
more of a cultural universal that's

2352
01:32:04,149 --> 01:32:00,800
number one

2353
01:32:07,310 --> 01:32:04,159
number two there are animal studies

2354
01:32:10,149 --> 01:32:07,320
where you can have animals do various

2355
01:32:14,470 --> 01:32:10,159
problem-solving activities

2356
01:32:17,910 --> 01:32:14,480
you know and score how well they do

2357
01:32:19,910 --> 01:32:17,920
and then factor analyze the different

2358
01:32:22,550 --> 01:32:19,920
problems they do and you can come up

2359
01:32:25,110 --> 01:32:22,560
with a g factor that's very similar

2360
01:32:26,870 --> 01:32:25,120
to the g factor in humans this has been

2361
01:32:31,350 --> 01:32:26,880
done in rats

2362
01:32:37,350 --> 01:32:34,470
uh it's uh so

2363
01:32:38,229 --> 01:32:37,360

interesting yeah so there's it seems to

2364

01:32:41,510 --> 01:32:38,239

be

2365

01:32:43,669 --> 01:32:41,520

this general reasoning factor in

2366

01:32:45,590 --> 01:32:43,679

a number of animal species now what it

2367

01:32:47,910 --> 01:32:45,600

means i'm not clear

2368

01:32:50,229 --> 01:32:47,920

but it's important for intelligence

2369

01:32:53,510 --> 01:32:50,239

researchers to know that this may not be

2370

01:32:54,870 --> 01:32:53,520

a uniquely human thing

2371

01:32:56,709 --> 01:32:54,880

there's that age-old question what

2372

01:32:58,390 --> 01:32:56,719

separates man from the beast

2373

01:33:00,149 --> 01:32:58,400

us from the animals do you have any

2374

01:33:01,910 --> 01:33:00,159

speculations any ideas

2375

01:33:03,189 --> 01:33:01,920

maybe humans are humans the only ones

2376

01:33:05,590 --> 01:33:03,199

that would sacrifice food for

2377

01:33:07,750 --> 01:33:05,600

intellectual stimulation

2378

01:33:09,830 --> 01:33:07,760

the only differences i know of are the

2379

01:33:12,709 --> 01:33:09,840

obvious

2380

01:33:13,590 --> 01:33:12,719

i i i don't know how to conceptualize an

2381

01:33:15,830 --> 01:33:13,600

answer to that

2382

01:33:19,350 --> 01:33:15,840

that question it used to be when i was

2383

01:33:26,390 --> 01:33:23,510

people would say that tool use separated

2384

01:33:26,870 --> 01:33:26,400

uh humans but in an anthropology course

2385

01:33:29,830 --> 01:33:26,880

i took

2386

01:33:30,790 --> 01:33:29,840

and way back in college they were

2387

01:33:34,390 --> 01:33:30,800

showing

2388

01:33:37,830 --> 01:33:34,400

some i think with jane goodall film of

2389

01:33:40,470 --> 01:33:37,840

monkeys using sticks to extract termites

2390

01:33:41,910 --> 01:33:40,480

uh and then lick the stick so they were

2391

01:33:45,669 --> 01:33:41,920

using tools

2392

01:33:47,110 --> 01:33:45,679

um so yeah uh there are obvious

2393

01:33:50,149 --> 01:33:47,120

differences

2394

01:33:53,510 --> 01:33:50,159

but uh the brains are different uh

2395

01:33:55,270 --> 01:33:53,520

humans seem to have more uh cognitive

2396

01:33:59,270 --> 01:33:55,280

capability

2397

01:34:01,510 --> 01:33:59,280

especially for abstract things

2398

01:34:04,709 --> 01:34:01,520

so i i don't really know much professor

2399

01:34:09,270 --> 01:34:04,719

where can people find out more about you

2400

01:34:12,669 --> 01:34:09,280

um what you're working on

2401

01:34:14,550 --> 01:34:12,679

uh people can go to my website

2402

01:34:17,990 --> 01:34:14,560

richardhire.com

2403

01:34:21,830 --> 01:34:18,000

you will find links to the book

2404

01:34:25,350 --> 01:34:21,840

the neuroscience of intelligence

2405

01:34:26,870 --> 01:34:25,360

they will see links to the two books in

2406

01:34:30,149 --> 01:34:26,880

progress

2407

01:34:32,550 --> 01:34:30,159

and they will see pdfs of many of my

2408

01:34:35,669 --> 01:34:32,560

research papers and

2409

01:34:41,030 --> 01:34:35,679

some links to various videos of

2410

01:34:45,750 --> 01:34:43,830

thank you so much i appreciate it well

2411

01:34:46,790 --> 01:34:45,760

please send me a link to the final

2412

01:34:49,430 --> 01:34:46,800

version

2413

01:34:56,310 --> 01:34:49,440

and i enjoy talking to you it's pretty

2414

01:34:59,990 --> 01:34:57,990

yeah that's right and it doesn't look

2415

01:35:01,750 --> 01:35:00,000

like i read it because i don't make a

2416

01:35:04,470 --> 01:35:01,760

single note in any of my books and

2417

01:35:06,629 --> 01:35:04,480

as if you know the personality research

2418

01:35:07,990 --> 01:35:06,639

i score extremely high on orderliness

2419

01:35:11,109 --> 01:35:08,000

which means i like things to be in their

2420

01:35:13,669 --> 01:35:11,119

place i don't like i don't want to

2421

01:35:14,310 --> 01:35:13,679

desecrate this book with my ink so i

2422

01:35:17,910 --> 01:35:14,320

keep it

2423

01:35:23,990 --> 01:35:17,920

pristine but i read a cover to cover

2424

01:35:28,070 --> 01:35:26,550

yeah yeah i don't recommend books i

2425

01:35:29,350 --> 01:35:28,080

think i think

2426

01:35:31,270 --> 01:35:29,360

i don't i think this might be the only

2427

01:35:32,149 --> 01:35:31,280

book that i'll be recommending on the

2428

01:35:33,669 --> 01:35:32,159

entire channel