**Coincidence Script**

Hi. Good morning. Thanks for coming. Today, I want to talk to you about coincidences. Or, rather, why humans see and think there are coincidences. I want to talk to you about four different things. The law of large numbers, how humans don’t understand odds, something called the gambler’s fallacy, and something called selective recall or cherry picking. Ok?

I’m going to start with the law of large numbers. Now, lots of things happen in this world that are unusual or surprising. For example, you might have seen a photo floating around the Internet. What it is, it’s a picture of some people at Disneyland in about the 1970s, maybe. The story behind it is … erm … a man and a wife were getting married and they were looking through some family photographs and the woman pulled out a photo of herself at Disneyland when she was a child. The guy looked at the photo and said, “Woah! Hang on! That’s my father!” And in the background, behind the young girl is a man pushing a stroller. And in the stroller is, of course, a baby. And that baby, of course, is the man that then goes on to marry the girl who is in the photo. Wow! An amazing coincidence! Yeah? Very very unusual. Well, it is, unless you think about it. If you apply a little bit of logic, then it’s not quite so surprising.

So, for example, since Disneyland opened in the 1950s, six or seven hundred million people have visited there. And that’s just the one Disneyland. Six or seven hundred million people have visited that Disneyland. Ok? Then, of course, if you consider the fact that people who get married are usually the same age, within a couple of years, that means they were children at about the same age. And then, of course, if you consider that children usually visit Disneyland at the same time. Well, when? They go during the school vacations, of course, summer or winter. So, the chances of children being at Disneyland at the same time are already great. And now, if you think of the 600,000,000 people, that’s a lot of people that have been to Disneyland. Out of those 600,000,000 people, a lot of them have met and got married. There is a very high chance that your partner has been to Disneyland at some time in their life. Now, if we say that the probability of finding a photograph with the two of you together is one in a million, that means it should have happened 600 times. If we say it’s one in ten million, it should have happened 60 times. If we say it’s one in a hundred million, it should have happened six times. The thing is, though, we don’t see the other photographs. We don’t go looking through our photographs, of course, trying to find our husband or wives in them. So, it will happen a lot.

The law of large numbers says if you have a large enough field … if something happens enough times, it will happen. Now, if you consider the amount of people on the earth, the population of the earth is 7.5 billion right now. If something has a one in a billion chance of happening, it should happen seven times. If it has a one in a hundred million chance of happening, it should happen … er … 70 times. Of course. So, because there are so many people, because there are so many chances for something to happen, it will happen. If strange things didn’t happen, that would be unusual.

Now, the second thing is that humans, we don’t understand odds. We don’t understand probability. There are two examples of this. The first one is the famous … er ... Abraham Lincoln John F Kennedy assassination conspiracy, coincidence thing that’s floating round the Internet. There are many many things that are written there that are supposed to be coincidences between JFK and Lincoln. One of them, of course, is that they were both assassinated on a Friday. Now, people say, “Woah! That is an amazing coincidence! The chance of Lincoln being killed on a Friday, well, there are seven days, so it’s one in seven. And the chance of Kennedy being killed on a Friday? Well, seven days, it’s one in seven. So, you multiply the odds together. One in seven times one in seven is one in forty-nine. What are the chances? That’s amazing!” But, that’s wrong. That’s not how you think about it. Because, Abraham Lincoln has already been killed. We are only trying to calculate the odds of Kennedy being killed on the same day as Lincoln. We’re not trying to work out the odds of them both being killed on a Friday. We’re trying to work out the odds of Kennedy being killed on the same day that Lincoln was already killed on. And he was killed on a Friday. So the chances of Lincoln … sorry .. the chances of Kennedy being killed on a Friday are one in seven. There are seven days, one in seven. Although, of course, the chances raise because if you look at assassins, if you look at the paths, if you look at the way they live their lives, the chances of somebody being killed on a Friday or a Saturday are greater than any other day. So, it’s not really a conspiracy, it’s just a way of understanding the odds.

The second thing, of course, is the double lottery winner. Quite often you’ll see it in the newspaper: “So and so have won the lottery again!” “They’ve won the lottery twice in three years!” “They won ten million dollars, now they’ve won a hundred million dollars!” “What are the chances?” “It’s a coincidence!” Well, of course, it’s not a coincidence. Yes, they are very very lucky, but again, we’re not understanding the odds. The chances of winning the lottery are about one in fourteen million. Let’s say there are 49 numbers and you choose six numbers, that means it’s 49 times 48 times 47 times 46 times 45 times 44 divided by 6. Which is, to be exact, 1 in 13,983,816. Let’s say 1 in 14 million. So, we think, the same as with the Kennedy thing, well, the chances of winning the lottery twice must be one in 14 million times one in 14 million, which is one in 200 trillion (200,000,000,000,000). So, if somebody wins the lottery twice, “Oh my God! It’s an amazing coincidence!” But, that’s wrong, again. We’re not calculating the odds of somebody who hasn’t won winning twice. We’re calculating the odds of somebody who has already won winning again. Now, in the UK, I’m from the UK, there are approximately 7,000 lottery winners at the moment. As time goes on, some will die, more will enter, it stays about the same, at about 7,000. So, we have to work out the odds of those 7,000 people winning again. Now, if the odds of winning are one in 14,000,000, and you have 7,000 people, well, now your odds are one in 2,000. So, the chance of a lottery winner winning again is one in 2,000, which isn’t that extreme. It should happen. If you have a given field of about twenty years, the chances of somebody winning the lottery again are greater than 50%. There is more chance that they will win than that they won’t win. So, it should happen. If it didn’t happen, that would be strange.

Now, another thing I want to talk about is something called the gambler’s fallacy. Gambling, of course, is when you put money on an outcome of something. You bet on red, or you bet on a sports game. And if you’re correct, you get the money back, and if you’re incorrect, you lose the money. The gambler’s fallacy is, humans, we think that there is a connection between events. So, for example, if you’re playing roulette, and you’re putting your money on red or black, there is a 50% chance of red and a 50% chance of black. But, as humans, we think if black has just come up, next time black probably won’t come up. If red has come up, red probably won’t come up again. We think there is a connection between unconnected events. A good example, of course, is the old toin … coin … is the old coin toss. Now, most coins have a head on one side and the other side is called the tails. If you flip a coin. Heads or tails? It’s 50% chance it’ll be heads, 50% chance it will be tails. Well, actually, it’s about 49.9 in favor of heads because the metal on the head side is ever so slightly heavier, but it’s about 50 50, about one in two. If I flip the coin once, it’s 1 in 2. If I flip the coin again, it’s 1 in 2. What are the chances I will get heads heads heads? Well, that, of course, is 1 in 2 times 1 in 2 times 1 in 2. But, if I’ve just flipped a head, what is the chance that the next coin will be a head? It’s still 1 in 2. No matter how many times I flip the coin, the next one is always going to be 1 in 2. Now, humans don’t understand that. If you give one group of people a regular coin and you ask them to flip it 200 times, and if you give another group a piece of paper and you ask them to replicate flipping a coin 200 times, what do you think the results are? Well, here’s two charts. Here is A. And here is B. One of these has been flipped randomly, the other I have created, or somebody has created. Now, if you look at them, if you look at A, there are long strings of black. Let’s say black is heads. And if you look at this one, it’s about even. If you look at this one, there are 60 tails and 140 heads. This one, 97 tails and 103 heads. Which one of these is random, do you think? Well, of course, the answer is A. If you flip a coin randomly, you are very likely to get long strings of heads. Look at this one, there is a string of 18 heads in a row. But, if you ask someone to replicate randomness, they don’t do that. We think, we believe that there is a connection. We believe that if four heads have come up, the next one should be tails. We feel unnatural, we feel it’s unnatural to put another head. But, of course, that doesn’t happen. If I flip this coin a thousand times, ten thousand times, it will even out. It will probably end up being about 50% heads 50% tails. But, of a small sample of 200 flips, it’s very likely that one will come up more than the other. Humans don’t do that. And that is the gambler’s fallacy.

Now, the last thing I want to talk about is something called selective recall, or cherry picking. The other day, I was at home, I was thinking about my friend Joe, (phone rings) the telephone rang. I answer the telephone, it’s Joe! What a coincidence. I couldn’t believe it. And then the following Friday, again I’m thinking about Joe (phone rings) the phone rings. It’s Joe again! What are the chances of that? What an amazing coincidence! Joe and I must have some kind of psychic connection. But, of course, that’s wrong. I work with Joe, so, it’s not unnatural for me to be thinking about him or about work at home. So, if he was to phone me it’s probably likely that I would sometimes be thinking about him. But, that’s not the point. The point here is that I get hundreds of phone calls, 98% of them, 99 … 99.9% of them I’m not thinking about the person before they phone me. But, the two times I am thinking about it, I remember it. Why? Because it’s already happened once. I’m expecting, I’m waiting, I’m ready for it to happen again. And when it does happen again I think, “Yes! See!” But I ignore all the times it doesn’t happen. And that is called selective recall. We remember the times something does happen, but we conveniently forget or don’t think about all the times it doesn’t happen.

And another thing like this is called cherry picking. Cherry picking refers to people that pick cherries from the trees. They take the good cherries, they leave the bad cherries. People do that with information or statistics. For example, someone that smokes. If you say to them, “Smoking will kill you.” They say, “No. My grandmother smoked until she was 95. So, therefore, smoking won’t kill you.” What they are doing is they are taking a statistic that supports their argument and they are ignoring all the rest of the information that doesn’t support their argument. And that is selective recall or cherry picking. And that is one of the reasons why we believe in coincidences.

So, to summarize. Coincidences do happen. Unusual things do happen. But, they shouldn’t be that surprising. They should happen. If something does happen that’s unusual, you have to think about the amount of people that are taking part, the amount of people that there are on the earth that this could happen to. If you have a large enough number of people, if you have a large enough number of events, it will happen. So, next time you have a coincidence, next time something surprising happens, step back a bit, and try and think about it a little bit more logically.

All right. Have a nice week. Talk to you later. Bye.

**Coincidence Questions**

1. What is surprising about the Disneyland photograph?

A: It shows many children that later went on to get married.

B: It shows a wedding taking place at Disneyland.

C: It shows 600 million visitors to Disneyland.

D: It shows a future husband and wife as children.

2. Which of these is not something that explains this photograph?

A: Millions of people have visited Disneyland.

B: Many children visit Disneyland at the same time.

C: If we look through our photographs we will probably find a picture of our partner.

D: People usually get married at a similar age.

3. If something has a one in a hundred million chance of happening, how often should it happen in the world?

A: 7

B: 17

C: 70

D: 700

4. Why are the odds of a double lotter winner not 1/200,000,000,000,000?

A: Because we are only looking at people who have already won.

B: Because the odds are really 1/7000

C: Because it’s not possible to win the lottery twice.

D: Because some people die, and some people enter.

5. Which of these are likely to be random?

A: ●〇●〇●〇●〇●〇●〇

B: 〇〇〇〇〇〇●●●●●●

C: ●●●〇〇●●●〇〇●〇

D: All of them.

6. Why do people think a tail should come after a long string of heads?

A: Because they didn’t flip the coin enough times

B: Because they think it should be 50% heads and 50% tails

C: Because they think there is a connection between all of the coin tosses

D: Because they think red will come up more often that black.

7. Where does the expression “cherry picking” come from?

A: People who believe in coincidences

B: People who eat cherries

C: People who pick cherries from trees

D: People who like to gamble

8. Which is this an example of? A man is struck by lightning 7 times.

A: Cherry picking

B: Selective recall

C: The gambler’s fallacy

D: The law of large numbers

9. Why do people cherry pick?

A: They want facts to support their argument

B: They don’t know all of the information

C: They don’t understand the probability

D: They want to smoke

10. Steven gave an example of a phone call where he was thinking about the person before they called. Why do people think this is surprising?

A: Because they don’t think about the times when it doesn’t happen

B: Because it has never happened to them

C: Because they have psychic connections with all of their friends

D: Because they always know who is going to call them before it happens

11. Why do people misunderstand the odds of Lincoln and Kennedy both being killed on a Friday?

12. Explain why this isn’t a coincidence: Lincoln was elected in 1860 and Kennedy was elected in 1960.

13. People say they know when someone is looking at them from behind. Which of the reasons Steven talked about proves this to be wrong, and how?

14. People very often attribute mystical properties to coincidences. Why do they do that?

15. All coincidences can be explained away by logic. Is it wrong for people to hold the belief that coincidences are amazing?

16. Does fate exist?

**Coincidence Answers**

1. D 2. C 3. C 4. A 5. D (trick question – gambler’s fallacy – any sequence is possible) 6. C 7. C 8. D (If you have enough people, somebody will be struck by lightning multiple times and survive) 9. A 10. A

11. Why do people misunderstand the odds of Lincoln and Kennedy both being killed on a Friday?

They get confused because they think we are looking at the possibility of both presidents being assassinated on a Friday. But that isn’t the issue. The first president, Lincoln, was killed on a Friday so we have to work out the odds of Kennedy being killed on a Friday. If Lincoln had been killed on a Wednesday, we would have to work out the odds of Kennedy being killed on a Wednesday. Which would be 1/7.

12. Explain why this isn’t a coincidence: Lincoln was elected in 1860 and Kennedy was elected in 1960.

Well, there are a few reasons but, before that, we should probably address the fact that 100 is not a magic number. Humans have given supernatural powers to numbers such as 10, 50, 100, 1000 and so on. If Kennedy had become president 96 years after Lincoln, would it be any different? The fact that it is 100, a simple number, seems to make it somehow special, which it isn’t. However, to answer the question, elections in the US are only held every four years. Kennedy was born 108 years after Lincoln. There were elections in 1952, 56, 60, 64, 68, 72 etc. Assuming that nobody becomes president before they are 40, then Kennedy could only be elected in 1960, 64, 68 etc. So, Lincoln and Kennedy could only ever be 100, 104, 108 … years apart. The fact that it is 100 is not that surprising.

13. People say they know when someone is looking at them from behind. Which of the reasons Steven talked about proves this to be wrong, and how?

This would be disproved by selective recall. Sometimes people have a sense that they are being watched. They turn around and, low and behold, someone is watching them! Thus, the idea that we can sense when we are being watched spreads. Of course, we don’t remember the times we thought someone was watching us, turned around and there was no one there. And, of course, we don’t know about the times someone was watching us and we didn’t realize. Creepy! Researchers have done experiments into this and, unsurprisingly, we don’t know when we are being watched. How could we? Which of our senses would be picking it up? People like to use it as proof of intuition, or some kind of ESP (extra sensory power), which would be nice, but unfortunately it just doesn’t happen. Selective recall.

14. People very often attribute mystical properties to coincidences. Why do they do that?

We like to think that we are somehow special and that the universe has meaning or some kind of grand plan. The thought that everything is purely random can be scary. By mystifying coincidences, people grant a humanity to nature. If things like coincidences happen, the thinking goes, then maybe there is some kind of plan and, perhaps, we are not alone. Coincidence implies thought. Random implies cold emptiness.

15. All coincidences can be explained away by logic. Is it wrong for people to hold the belief that coincidences are amazing?

I think that depends on why people are believing that coincidences are amazing. If people are using selective recall to bolster an incorrect belief, that can be harmful. The case of the connection between the MMR (Measles, Mumps and Rubella) vaccine and autism could be a good example. A UK doctor basically lied and said that the MMR vaccine (or something used to bind the vaccine together) caused autism. The media picked this up and it caused a panic. People stopped getting the vaccine. Mumps made a comeback as kids were no longer vaccinated against it. The doctor was found to be a fraud. The media, as is their wont, printed a tiny retraction on page 98, which no one saw. The panic continued. Now, selective recall comes in because there are obviously autistic children. And these children will almost definitely have had the MMR vaccine. The fearmongers point to these children and say, “see!”. They don’t stop to think about the millions, the hundreds of millions of children who have had the vaccine and not developed autism. This is selective recall and it is harmful.

On the other hand, believing there is something special in a double lottery winner, a man struck 7 times by lightning, or two men on different continents with the same name both dying in the same way, is not harmful. If it makes you feel better and less alone in the universe, then there is no harm in it whatsoever.

16. Does fate exist?

Well, that is quite a question. It is as impossible to answer as am I alive or am I really feeling these emotions. Let’s take an example to illustrate the complete impossibility of proving this question. I go to Starbucks. I like Starbucks. I usually have a café latte with an extra shot of espresso. Today, though, I feel like something with more of a coffee taste, so I order the coffee of the day. A strong, dark, rich blend from Ethiopia. Now, I walked into that coffee shop and I ordered a coffee that I don’t usually drink. Why? Did I make that choice? Or was it fate that I would make that choice? The result is exactly the same. If I chose the coffee out of true free will, I end up with the coffee. If I chose the coffee because of some plan written out eons ago that says, “on November 4th, 2017 at 20:45, Steven will walk into a Starbucks and order a house coffee instead of his usual,” I end up with the coffee. How can you know? Do I do it because I chose to, or because I had to?

Personally, I think two things. Firstly, I can’t imagine any kind of plan that would cover every single action, from me scratching my nose to Hitler starting a war. That doesn’t mean it doesn’t exist, just that, using Occam’s razor, it is incredibly improbable. Secondly, it is utterly unprovable and therefore not worth the slightest worry. It was a good coffee.