

An Analysis of The Unexpected Hanging Paradox

Chris Francis Anto

Abstract

While the origin of the unexpected hanging paradox is disputed, it is common knowledge that John O'Connor first released its details in text in the *Mind* Journal in 1948. The prompt is as follows:

Sentencing a man on Friday, a judge says: 'You will be hanged at noon on a day next week, but you will not know which day it is until the morning of the fateful day.' The prisoner reasons that he cannot be hanged next Saturday, because by Friday afternoon he would know that he was to be hanged the next day, and that he cannot be hanged on Friday because, with Saturday ruled out, by Thursday afternoon he would know that he was to be hanged on Friday, and that all the other days of the week can be excluded by the same argument, so he concludes with relief that he cannot be hanged on any day next week and that therefore the judge's sentence cannot be correctly carried out.

The crux of the matter lies in the hanging:

However, if he is hanged on Wednesday, the judge's sentence is correctly carried out, because the hanging would indeed be a surprise, given the prisoner's reasoning, because he appears to have ruled out every day including Wednesday.

In this paper, the author attempts to logically resolve the hanging paradox (sometimes presented as the surprise test paradox) by considering the elements constituting a 'surprise' in the context of the prompt, while incorporating certainty and logical flow to arrive at an answer.¹

I. Introduction

This paper begins with a definition of the word surprise, derived from the limits and conditions presented in the paradox introduced in Section I. This will serve as a basis for our subsequent conclusions. There are also certain assumptions to be made throughout, which I will first attempt to rationalize. After the declarations mentioned above, the paper takes a logical step-by-step method to analyze the 3 different scenarios that can play out. The paper analyzes how a surprise is

essentially linked to what the prisoner's expectations are, and how that is directly related to probability.

II. Definitions and assumptions

Firstly, we must appreciate what constitutes a surprise, both contextually and absolutely. According to Cambridge Dictionary², a surprise is: *An unexpected event, or the feeling caused when something unexpected happens.*

Dictionary definition aside momentarily, we must assess the definition of the word in the paradox. The prisoner draws the notion that due to the fact that he will *know* by Thursday evening that he is due for execution the next day, the surprise element is no longer fulfilled. Hence, we can infer: *If he knows the execution is on day x , the requirements for having surprised him is not met, and the execution cannot occur on day x .*

We can further conclude that the word 'know' here refers to a 100% certainty. Hence: *If he is 100% sure the execution is on day x , the requirements for having surprised him is not met, and the execution cannot occur on day x .*

Here, we have one key assumption to make. Does a close-to-100% certainty meet mean that the subject 'knows'. The author argues no, it doesn't. For the man to 'know', he must be 100% sure. Hence, if he is 99% sure, he does not 'know', and he is surprised. In other words, he must be certain. We can conclude: *If certainty of hanging on day $x < 100%$, the hanging is a surprise.*

Another important note to make is that, in this context, the level of certainty is determined by the man. This is because a surprise for one subject does not need to be a surprise for another subject. If someone tells you that they'll come to your house tomorrow, you may not believe him. Only if you are certain that he will indeed come to your house will this event not be a surprise to you. If you are 50% sure he will carry out his words, the event will meet the requirements of a surprise. This proves both that certainty is subjective and that surprises are dependent on these subjective certainties.

Hence, the mindset of the man is imperative. In section IV we tackle each of the different mindsets the man could have.

III. 3 potential mindsets

From the conclusions drawn in section III, we have appreciated that the mindset of the prisoner directly affects whether or not an event is a surprise.

In scenario A, the prisoner is certain that the hanging cannot happen. Because of the derivations that he has come up with, he has convinced himself that it is impossible for the event to occur. Remember, as noted in section III, certainty is subjective. And so, simply because the prisoner is certain the hanging won't occur, this doesn't necessarily mean the hanging won't occur. In other words, the prisoner could be proven wrong. Here, *certainty of hanging occurring in given week=0%*

Scenario B is a state of uncertainty. Anywhere between the 2 extremes of certainty. The prisoner is neither sure the hanging will occur, nor is he sure the hanging will not occur. Here, *0%<certainty of hanging occurring in given week<100%*.

Lastly, scenario C is the opposite end of the spectrum. Here, *certainty of hanging occurring in given week=100%*.

In each of these scenarios, the outcome varies. We can now we tackle scenario A, B and C respectively.

As mentioned, scenario A is when the prisoner is certain that it is impossible for the hanging to occur, and hence, he is 0% sure of the hanging occurring. In his mind, the event will not occur.

Now we must refer back to section III. We concluded that: *If certainty of hanging on day $x < 100%$, the hanging is a surprise.* Using this, we can go further.

A 0% certainty that the hanging will occur in the entirety of the week translates to a 0% certainty that the hanging will occur on any given day of the week, which is less than a 100%. Hence, if the notice for the hanging is on any day of the week, including Saturday, the prisoner will inevitably be surprised.

Scenario B invokes reasoning similar to that of scenario A. Here, the prisoner is unsure but not entirely certain that the hanging will occur at all. Using the same line of reasoning, we can see that the certainty of getting hung on any day of the week is less than 100%. This can be inferred by noticing that the certainty of being hung at all, during the entirety of the week, is less than 100%. This proves that, for any given day, the certainty of being hung is also less than 100%.

One again, the prisoner would be surprised if the hanging took place on any day of the week-including Saturday. There is reason to assume that the prisoner's certainty of being hung would be maximum on Friday evening. In other words, on Friday night, he will be most certain about his hanging on the following day (Saturday), compared with any other day of the week. However, the certainty is less than 100%, because the prisoner still considers it a possibility that the hanging won't occur at all.

Lastly, in scenario C, the prisoner is indeed certain the hanging will occur, which is a fair assumption, considering the point of a 'surprise trial' would be expected to be the trial itself, and not the specifics of the surprise. Regardless, in this paper, we consider all the 3 scenarios with equal respect.

In this situation, the author concedes it is indeed impossible for the hanging to be on Saturday, the last day of the week. Why?

We first need to ask ourselves (or rather, the prisoner): does the hanging have to be a surprise? From here, there are 2 ways to go.

Firstly, if we say yes, then we are back at the result of scenario 1, wherein the hanging is in itself a surprise due to the fact that the prisoner deems the hanging won't occur at all, which is a less-than-100% certainty the hanging will occur on any given day. This mindset is self-destructive, for the idea that the hanging won't occur at all allows means the hanging can occur on any day: even Saturday.

The other option is to say no, the hanging will occur, regardless of whether it happens to be a surprise. The first step here is to consider Friday evening. If the hanging hasn't occurred yet, is the prisoner willing to accept that the hanging will occur the next day (Saturday)?

Firstly, let's consider that the prisoner is NOT willing to accept on Friday evening that the hanging will occur the next day. This, once again, takes us back to the result of scenario 1, where the certainty that the hanging cannot occur the next day means it can occur the next day: a self-destructive mindset.

If the prisoner is willing to accept, on Friday evening, that the hanging will occur the next day(Saturday), then the hanging cannot logically occur on Saturday. He is 100% sure that the hanging will occur on Saturday, due to the fact that the other days are all over, and due to the fact that he is certain the hanging will inevitably occur. Here, although he is 100% of the hanging occurring, it doesn't mean the

hanging will in fact occur. Certainty, as mentioned above, is subjective, and is not indicative of the way future events will truly play out.

Having said that, although the hanging cannot occur on Saturday, if it did somehow occur on Saturday, the prisoner would not be surprised. Hence the element of surprise is gone if it occurs on Saturday, meaning it cannot occur on Saturday, although the prisoner is (wrongly) certain it will. This essentially means that, at the start of the week, if the prisoner is 100% certain the hanging will occur one way or the other, Saturday is no longer a viable option, but the rest of the days are.

To demonstrate this, let's take Thursday evening. The prisoner is certain that the hanging will occur on one of the next 2 days. Perhaps the prisoner feels it is more probable for the hanging to occur on Friday, because he is aware the element of surprise is gone if it occurs on Saturday. Having said that, he is not entirely sure that the hanging has to be a surprise at all, and therefore, he feels there is a chance that it may occur on Saturday. This, of course, is factually incorrect, but the prisoner's subjective mindset causes him to feel so. This is exactly why the prisoner's mindset is key. So, the hanging will occur on Friday: he is not 100% sure that the hanging will occur on Friday, so it will meet our requirements of being a surprise hanging. Similar logic can be used to realize that, given this particular mindset, scenario C, the hanging can occur on any day of the week, except Saturday.

With scenario A and B, the hanging can occur on any day of the week, including Saturday.

IV. Conclusion

The aim of this paper has been to show that the state of mind of the prisoner affects the way a 'surprise' could occur. However, it is evident that regardless of this variable, the hanging could occur on Wednesday with no problem at all.

The author is not suggesting that there exists no dilemma, for it is quite interesting that on Friday evening, if the man expects a hanging the next day, there cannot be a hanging, but if the man does not expect a hanging, there can be a hanging. This, however, is not enough to call the entire situation a paradox, per se.

There exists a fine line between an individual 'knowing' something, and the individual's 'knowledge' being factually correct. This becomes even more distinct when the individual tries to predict the future, as he does here. The man cannot

‘know’ that the hanging will not happen due to the apparent lack of a surprise for the simple fact that nobody ‘knows’ anything about the future. He also can’t ‘know’ that the hanging has to happen. What if the judge decides he’s innocent after being presented with new information? The future is unpredictable. In that sense, everything the future holds is a surprise.

This paper has taken 2 unrealistic extremes and analyzed them, so that even if the man were to ‘know’, there exists an answer.

V. References

¹ Andrew M.Colman(2009), “A Dictionary of Psychology(3 ed.)” ISBN 9780199534067, *Oxford University Press*, 224-225.

² <https://dictionary.cambridge.org/dictionary/english/surprise> (date accessed: 11-Aug-2020), *Cambridge Dictionary*.