CRITICAL gambling studies

ISSN: 2563-190X. Available Open Access at https://criticalgamblingstudies.com

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APA Citation: Brown, N. (2022). The gambler's fallacy: Aristotle's Sea Battle Paradox and Kierkegaard's response. *Critical Gambling Studies*, *3*(2), 152–159. https://doi.org/10.29173/cgs66

Article History:
Received July 2020
Accepted March 2021
Published July 2022

Critical Gambling Studies (2022)
Vol. 3, No. 2
Philosophy and Gambling: Reflections from Macao

The Gambler's Fallacy: Aristotle's Sea Battle Paradox and Kierkegaard's Response

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Abstract: I offer a conceptual study of Aristotle's Sea Battle Paradox and propose that analysis of the paradox, as well as of its various solutions, can help to shed light on the psychology behind and the structure of the gambler's fallacy. I compare Aristotle's response to the paradox with Kierkegaard's subsequent response in his chapter of *Philosophical Fragments* "Is the Past More Necessary than the Future?" I argue that proponents of each solution lead us to a different diagnosis of the gambler's preoccupation with predetermination and future determination.

Keywords: the gambler's fallacy, the Sea Battle Paradox, possibility, necessity, Aristotle, Kierkegaard

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Available Open Access from https://doi.org/10.29173/cgs66

Introduction

One of the biggest mistakes of reasoning we make when we play games of chance is to assume that independent events happening in the past help to reveal the course of the future. If a fair and unbiased coin toss results in tails nine times in a row, it is compelling but fallacious to think that the next coin toss has a greater than fifty percent chance of resulting in heads. This mistake of reasoning is commonly referred to as the "gambler's fallacy". The gambler's fallacy happens when we mistakenly view the history of independent patterns in the past as exposing the determinations in the future of contingent outcomes. What causes us to make this mistake of reasoning? What causes the gambler's fallacy to be so compelling?

Patrick J. Hurley offers an answer to this question in his popular logic textbook *A Concise Introduction to Logic*. Hurley views the gambler's fallacy as a variation on the false cause fallacy, which occurs whenever "the link between premises and conclusion depends on some imagined causal connection that probably does not exist" (Hurley, 2015, p. 149). The reason why the gambler's fallacy is so compelling, Hurley argues, is because the gambler mistakes a false cause with a real cause, or sees the independent pattern of the past as having a legitimate effect on the future. "The false cause fallacy is often convincing," Hurley writes, "because it is often difficult to determine whether two phenomena are causally related" (Hurley, 2015, p. 150). We are sometimes tricked by causal connections, especially when they occur over a long period of time or when we do not have all of the information we need to judge the causal relationship. Hurley's analysis suggests that one reason why we are compelled by this fallacy is because we are sometimes confused by whether there is a legitimate causal relationship between the past and the future. Based on this analysis, the gambler commits a lapse in judgment in a similar way to how a superstitious person sees causal relations as going beyond the facts of existence.

Although a person who believes a black cat crossing the street is a bad omen does appear to have committed the false cause fallacy, the superstitious person might nevertheless object that we do not have enough information about the facts of existence, and that once we do grasp these facts better, we will eventually recognize a legitimate causal connection between the black cat and future bad effects. This possibility of ambiguity over false and real causes also reinforces the fallacy. The gambler thinks that perhaps there is skill involved in these games of chance after all, or that the future is not as independent of the past as most people think, or that he or she is "touched" by superhuman perception.

The logician Jonathan Weisberg gives a different answer than Hurley gives to the question of what causes the gambler's fallacy to be so compelling. In *Odds &*

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Ends, Weisberg (n.d.) claims that we are compelled to commit the fallacy because of a shift in the point of view of the gambler. When we start to play a game of chance, Weisberg reasons, we begin from the correct insight that it would be quite rare for a fair coin toss to result in heads nine times in a row. When these rare patterns do happen, we are sometimes compelled by the erroneous idea that the next coin toss has a higher probability of going the other way. This is the case because, although the probability of a coin resulting in heads nine times in a row was already quite low, the probability from the point of view at the start of the game of it landing on heads ten times in a row is even less likely. This leads to an inferential error. Assuming the game is fair, the next coin toss has, of course, a fifty percent chance of resulting in heads. Weisberg views this as an issue of point of view (using the roulette wheel in the following quote as an example):

> Imagine the gambler's point of view at two different times: before the ten spins of the wheel, and after. Before, the gambler is contemplating the likelihood of getting ten black spins in a row:
>
> _ _ _ _ _ _ _ _ _ _?
>
> From that vantage point, the gambler is exactly right to think it's unlikely these ten spins will all land on black. But now imagine their point of view after observing (to their surprise) the first nine spins all landing black:
>
> BBBBBBBBB_?
>
> Now how likely is it these ten spins will all land black? Well, just one more spin has to land black now to fulfill this unlikely prophecy. So it's not such a long shot anymore. In fact it's a 50-50 shot. Although it was very unlikely the first nine spins would turn out this way, now that they have, it's perfectly possible the tenth will turn out the same. (Weisberg, n.d., see section 4.1)

In different ways, Hurley and Weisberg both effectively explain why the gambler's fallacy is so compelling, even though it is obviously a fallacy of reasoning. Both explanations offer significant insights into the psychology of the gambler. My aim in this article is to outline a third explanation through the recognition that the gambler's fallacy shares a lot in common with Aristotle's Sea Battle Paradox. This third explanation is not meant to conflict with Hurley's and Weisberg's insights about the fallacy, but is meant, rather, to be in addition, to help to shed light on the ontological complexities that predispose us, psychologically, to commit the fallacy. I argue that what is at stake in the gambler's fallacy is a misunderstanding about the determination of the future. The gambler's fallacy is about more than an erroneous calculation over the nature of chance in a game. It is about more than the conflation of the gambler's point of view at two different times, one before the game begins and the other after an unusual pattern happens. Certainly, these false cause factors contribute to our desire to commit the fallacy. However, I claim that there is also a modal paradox underlying the gambler's fallacy, and that this paradox should be understood in addition to Hurley's and Weisberg's analysis. The modal paradox has to do with a confusion over the differences between the three grammatical stages of time (the past, present, and future). When we commit the gambler's fallacy, we hold an incongruent view of the future as both indeterminate and yet already determined. Since Aristotle articulated this paradox through his example of a sea battle, I will analyze his description of the problem as well as his solution. I will then outline Kierkegaard's response to Aristotle as a way to explore the paradox and its solutions in more detail. In a final section, I will qualify the relationship between the logical consequences of the Sea Battle Paradox and the psychological disposition of the gambler's fallacy, and argue that the paradox is an important element for only one interpretation of the gambler's fallacy.

The general claim I make is that we learn a lot about the ontology behind and the psychology of the gambler's fallacy when we view the Sea Battle Paradox as a significant component of the fallacy. The subsequent explication I offer of Aristotle's and Kierkegaard's respective solutions to the Sea Battle Paradox, and the comparative contrast that goes along with this, aims to expose, not only the relationship between the gambler's fallacy and the paradox, but also various ways out of the paradox. I hope that this analysis will be valuable to readers who are interested in the historical implications of the gambler's fallacy, but also to readers who want to come to terms with the conceptual nature of Aristotle's paradox and solution, as well as Kierkegaard's solution. As a result of the comparison of the solutions, I claim that, for Aristotle, there is a deep separation between the future and the past, while, for Kierkegaard, emergence in time cannot have the character of necessity at all.

Aristotle's Sea Battle Paradox

The Sea Battle Paradox is one of the strangest riddles of Aristotle's whole corpus. There have been a number of excellent studies of Aristotle's Sea Battle Paradox. For example, see Anscombe (1956), Frede (1985), Hintikka (1964), and Lowe (1980). In division 9 of *De Interpretatione*, Aristotle proposes that because things are always in one way or the other in the past (e.g., the sea battle either happened or it did not happen; the coin toss either landed on heads or tails; the gambler either won or lost at baccarat), isn't it the case that things are determined to happen in one way or the other in the future as well? (Aristotle, 1984, 18a28-19b4). The reason why Aristotle calls this a paradox is because of an incompatibility between two claims

about the future: (1) from the perspective of the future, the possible appears to be in both ways, or at any rate, its way has not yet been decided. Before tomorrow becomes actualized in the present, the event of the sea battle seems not yet to have been determined – it might or might not happen. Before the coin lands in actuality, it has not yet been determined to be either heads or tails. However, (2) it is equally true that whatever comes about in the present will be in only one or the other way. Everything that *is* is always only an affirmation or a denial (by the law of the excluded middle). Future possibilities will also have to affirm or deny, and cannot be in both ways. From the perspective of the past and the present, proponents of the paradox view the future as already one way or another, already an affirmation or a denial. It is determined. We just do not yet have access to which way it is. But this does not mean that it is not already in one of these ways. Once something becomes determined in the present and the past, it appears as if it was always going to be this way.

Bivalence is at the heart of the paradox. The present is always divided into the *is* and the *is not*. The past is always divided into the *was* and the *was not*. Aristotle recognizes this in the opening sentence of *De Interpretatione* 9 when he writes: "with regard to what is and what has been it is necessary for the affirmation or the negation to be true or false." (Aristotle, 1984, 18a28-29). Aristotle emphasizes that this bifurcation happens of necessity. The present and the past must be divided. Actualization is, essentially, the modal version of the law of the excluded middle. "If one person says that something will be and another denies this same thing, it is clearly necessary for one of them to be saying what is true – if every affirmation is true or false; for both will not be the case together under such circumstances." (Aristotle, 1984, 18a35-39). The sea battle either happens or it does not happen. If someone asserts that the sea battle will happen tomorrow, this is either true or false. Moreover, whatever does come about cannot be undone or taken back. In this sense, the present and the past are determined as what they are and were, over against what they are not and were not able to be. Obviously, the sea battle cannot both happen and not happen. The coin toss cannot show both sides. Either the player or the banker wins at baccarat.

We feel the force of the Sea Battle Paradox when we ask, specifically, about the bivalence of the future. Isn't it the case that whatever will be will also either affirm or deny, but not both? "If it is white now," Aristotle explains, "it was true to say earlier that it would be white; so that it was always true to say of anything that has happened that it would be so." (Aristotle, 1984, 18b10-11). The present and the past cannot be undone or taken back. We feel the force of the paradox when we ask, "how could it be different than this in the future?" Isn't it also either one way or the other, either true or false? Doesn't the law of the excluded middle also divide the future in the same way as it divides the present and the past? The coin toss lands on heads. Isn't it true to say earlier that it would land on heads? Certainly, it is determined to be heads once it does land on heads. When we look from the perspective of the present and the past, isn't it the same for the future? The coin toss that lands on heads was always going to do this. As Aristotle says when speaking from the terms of the paradox: "there is nothing to prevent someone's having said ten thousand years beforehand that this would be the case" (Aristotle, 1984, 18b33-34). There is an element of causal determinism built into the paradox. We know perfectly well what the future had in store for us once it is in the present and the past. The gambler knows perfectly well once the cards are revealed whether the banker will have taken the hand or not. Once the present comes about, it cannot be undone. But it then also appears, from the perspective of the paradox, to be determined in the future as well. It seems determined to have always been the way that it is in the present and the past. The Sea Battle Paradox is triggered by the strangeness of this thought.

As a brief digression, let's restate Aristotle's Sea Battle Paradox in terms of the analytic philosophy of time debate. This debate has become quite popular with excellent introductory volumes published recently (e.g., Dyke & Bardon, 2013; Curtis & Robson, 2016). The philosophy of time debate originates as a response to McTaggart's classic distinction between the A-theory and B-theory of time, and has to do generally with the question of whether all or only some of the three stages of time can truly be said to exist. While the intricacies of this debate extend beyond the scope of this article, I would like to borrow from one of the fundamental ontological distinctions (the distinction between eternalism and presentism; Curtis & Robson, 2016, p. 67) to help to articulate the Sea Battle Paradox more precisely. Proponents of eternalism claim that all three stages of time – the past, present, and future – equally exist. In contrast, proponents of presentism claim that the present exists but that the past and the future do not exist. Borrowing from this terminology, we can restate Aristotle's Sea Battle Paradox as a paradox produced from the conflation of eternalism and presentism. The paradox comes about when we hold both that (1) the future exists and is already predetermined, as per eternalism, but also that (2) the future only exists once it has emerged into actuality in the present, as per presentism. The paradox comes about because these two views are held together but are at the same time incompatible. Either the future exists and is already predetermined, or it is open and does not exist until it becomes present. Yet, the paradox emerges as a form of fallacious thinking from the ambiguous conflation of these two equally compelling and yet incompatible views. The specific result of this conflation of eternalism and presentism is that we have the tendency to view the future as already determined but as not yet revealed to us in the present. Given the deterministic nature of the future, it might seem that the paradox is primarily under the domain of

eternalism; nevertheless, the subtlety here is to recognize that what makes the paradox paradoxical in the first place is the mixture of eternalism and presentism. That the future is already determined is an effect of eternalism. But that the determination of the future has not yet been revealed (and potentially cannot be revealed, although the gambler disputes this detail) is an effect of presentism.

Aristotle attempts to solve the Sea Battle Paradox by arguing that although the law of the excluded middle is necessary, neither side of the exclusion, that is, neither the affirmation nor the denial, is necessary of itself. In this way, Aristotle can be interpreted to reject the eternalism element of the paradox, which makes the position incompatible. It could not be otherwise than that the sea battle either will or will not happen. But that it will or will not happen remains undetermined until the present moment, when either its affirmation or denial comes into existence through actualization. If something is merely possible in the future, it might be but it also might not be. This conception of the contingent future lingers even in the present and the past. What is and was cannot be undone, of course, but we also know that whatever is or was could have been otherwise, in the sense that the future could have been either way. Tomorrow becomes today. The sea battle happens. Now it cannot be undone, and yet, of course, it could have been its opposite. The present and the past are marked in this way as much by a conception of what had been future contingency, of a contingency which has been determined in the present and the past only because of actualization.

Essentially, Aristotle claims that actualization is itself the embodiment of the law of the excluded middle, and that because actualization must occur, things must come into existence in one way or another. The future contains multiple possibilities of all sorts of ways that things could go. But in actuality, the way is always one. What was a multiplicity becomes a singularity. To actualize the future means either to affirm or deny but not both.

Does the affirmation (or the denial) *remain* true or does it *become* true? To claim that it remains true and that there should be a way to know this in advance is to immerse oneself in the paradox. Aristotle's solution, in contrast, builds from the assumption that the affirmation (or the denial) *becomes* true with the actualization of the future in the present, but that, unlike the past, which can no longer be undone, the future has not yet bifurcated and a determination has not yet emerged.

Aristotle concludes from this that the future is ontologically distinct from the past and the present. The future cannot be said to fully exist. It only exists in a determinate way once it has come into existence in the present as the actual. A by-product of his solution is that, while the present and the past share the commonality of being determinate and therefore, in a sense, irrevocable and necessary, the future is altogether different. Aristotle's strategy for solving the Sea Battle Paradox is, therefore, quite simple: because the tenses of time are ontologically distinct, and the future has not yet been determined, it would be a mistake to characterize the future as having the same necessity that comes from the irrevocability of the past. In other words, we should not conflate the necessity of actualization (e.g., either the sea battle will or will not happen), the necessity of the excluded middle, with the necessity of determinate actualization (e.g., the sea battle must happen). Anyone who is preoccupied with the paradox – the gambler, for instance – and who projects the certainty of the past onto the future as well, fundamentally distorts the nature of modal and temporal reality. Aristotle recognizes that the past and the present are determinate and cannot be undone. The mistake of the Sea Battle Paradox comes about, however, when we project the determinateness of the past and the present onto the future. By marking off a significant difference between the past and the future in terms of existence and non-existence, Aristotle attempts to save us from this distortion of reality.

Kierkegaard's Response to Aristotle's Sea Battle Paradox

What is the change, if there is a change at all, when something comes into existence? Does anything really transform in the process of actualization? Is there a difference between the past and the future? Is the past somehow more necessary than the future? Is the future, conversely, somehow more contingent than the past? These are the sorts of questions that Kierkegaard asks in his chapter "Is the Past More Necessary than the Future? Or Has the Possible, by Having Become Actual, Become More Necessary than It Was?" (Kierkegaard, 1985, p. 73.) Although Kierkegaard does not mention it by name, it is clear that his chapter is intended to be a response to Aristotle's Sea Battle Paradox.

We should recognize that, by asking these questions about what happens when something comes into existence, Kierkegaard is not asking about transformations that occur *from within existence*. He is not asking about the change from one determinate state of being into another determinate state. Instead, he is asking the more elusive and yet more substantive question of whether there is any real change in the constitution of something when it goes from possibility to actuality, from the future to the past, or from non- or projected existence into existence. Because transformations that occur *from within existence* do not have the quality of coming into existence from a state of non-existence, these sorts of transformations, while prevalent in everyday experience, are not of the same subject matter as that which Kierkegaard addresses in the chapter. In contrast, the investigation Kierkegaard proposes has to do with the modal and temporal nature of things, which change in status. But then the question arises of what kind of change this is.

If we follow Aristotle's reasoning in his response to the Sea Battle Paradox, our first instinct would be to answer Kierkegaard's questions by asserting that there is, indeed, something that changes in the transformation from possibility into actuality, as from the future to the present. There is a change in terms of necessity. What is merely possible can or can *not* be. It is open and free of determination. However, the present and the past, in becoming actual, have become determined. They can no longer be otherwise than they are. When presenting this view of an Aristotelian ontological distinction between the past and the future, Kierkegaard echoes the phrase from Shakespeare's *Macbeth*: "what's done cannot be undone" (Shakespeare, 1992, p. 222; Kierkegaard, 1985, p. 75). People who are preoccupied with the Sea Battle Paradox find themselves in conflict about whether this determination should also carry over into the future. In contrast, people who follow Aristotle's rebuttal respond to Kierkegaard by saying that, yes, the past is more necessary than the future. Aristotle's solution to the riddle comes from his claim that there is a significant ontological distinction to be made between the past and the future. The past is bound together with necessity in a way that the future is not.

In contrast to Aristotle, and as an alternative solution to the paradox, Kierkegaard claims that coming into existence can have nothing to do with the necessary:

> Can the necessary come into existence? Coming into existence is a change, but since the necessary is always related to itself and is related to itself in the same way, it cannot be changed at all. All coming into existence is a *suffering* and the necessary cannot suffer, cannot suffer the suffering of actuality – namely, that the possible (not merely the possible that is excluded but even the possibility that is accepted) turns out to be nothing the moment it becomes actual, for possibility is *annihilated* by actuality. Precisely by coming into existence, everything that comes into existence demonstrates that it is not necessary, for the only thing that cannot come into existence is the necessary, because the necessary *is.* (Kierkegaard, 1985, p. 74)

In order to articulate the paradox at all, Aristotle has to concede that it is possible for the necessary to come into existence. Kierkegaard argues, to the contrary, that the necessary never comes into existence. "The actual," he writes, "is no more necessary than the possible, for the necessary is absolutely different from both" (Kierkegaard, 1985, p. 75). According to Kierkegaard, Aristotle makes a category mistake when he claims that "everything necessary is possible". For example, Aristotle claims in the *Metaphysics* Book *Theta* 9.8B that eternal substances (*eidos*) are the perfect and total unity of actuality and possibility (potentiality, *dunamis*) together (Aristotle, 1984, 1050b7-1051a3). This conception of the necessary has continued from Aristotle into the contemporary analytic tradition with the axiom of necessity, which states that if something is necessary, then it is, of course, also possible. Modal logicians claim, as a basic inference of modality, that anything necessary infers that it is also possible (Fitting and Mendelsohn, 1998, p. 5). The implication here is that while the future is not yet a unity of actuality and possibility, in the sense that the future remains unactualized until it is present, the present and the past are, for Aristotle, a unity of the actual and the possible together. They are the possible once it becomes actualized, a process that both removes the contrariety (i.e., the notion that the future is open to both affirmation and denial) and also makes the quality of the event concrete and factual. This unity of actuality and possibility is at the same time a specific conception of the necessary, a form produced from the irrevocability of the present and the past. Kierkegaard rejects this specific conception of the necessary as the unity of actuality and possibility when he writes: "how could there be formed from this heterogeneity [of possibility and actuality] a unity that would be necessity, which is not a qualification of being but of essence, since the essence of the necessity is to be?" (Kierkegaard, 1985, p. 74).

Kierkegaard's solution to the paradox is, in this sense, quite different from Aristotle's solution. While Aristotle argues that there is a stark separation between the future and the past, Kierkegaard claims, instead, that the past is no more necessary than the future, that the actuality of possibility is always a process of coming into existence, and that the necessary is absolutely different and cut off from this process since it always only *is*. Kierkegaard offers a distinct modal vision of reality, which is quite unique in its own right. The necessary is not the product of combining actuality and possibility in some way; nor is it a limitation of the possible; nor is it an affirmation of the actual. Although it is true that the past cannot be altered or changed, this unchangeability is altogether different from the necessary. According to Kierkegaard, the tenses of time, as well as the constant emergence of actuality out of possibility, and the constant loss (or, in Kierkegaard's strong term, "annihilation") of the possible – are expressions of the freedom of concrete reality. Coming into existence is the embodiment and proof of contingency. Reality is completely divorced from the necessary. It is the constant enactment of freedom itself. This makes Kierkegaard a strong advocate of indeterminism, while Aristotle is still a moderate advocate of determinism, in the one sense that he views the necessary to be the unity of actuality and possibility, and views the past to be this unity as well.

Proponents of Aristotle's solution share a commonality with people who are initially tricked by the Sea Battle Paradox. Advocates of both of these positions make the same mistake of assuming that the present and the past have anything whatsoever to do

with the necessary. The only difference for Aristotle is that the necessity of the past does not carry over into the future. This saves Aristotle from the paradox, but according to Kierkegaard's account, Aristotle continues to repeat some of the same thinking of the paradox.

Kierkegaard's own solution – which completely divorces the necessary from the relationship between actuality and possibility – has the advantage of both rejecting the paradox while also rejecting the claim that the past is somehow more necessary than the future. In this way, Kierkegaard's response salvages the insight, which is central to the paradox in the first place, that the future is not ontologically distinct from the other tenses of time. Instead, he takes the necessary out of the matter altogether. The paradox emerges when we say that the future is as necessary as the past. Kierkegaard rejects this by saying that neither the past nor the future has anything to do with the necessary. Possibility is that which can (or can not) come into existence. So possibility has nothing to do with the necessary. This is Kierkegaard's reasoning. Aristotle makes the mistake of applying the necessary to a specific type of possibility. He claims that eternal things are the perfect coincidence of possibility and actuality together, and that the necessary itself is the absolute unity of possibility and actuality. According to Kierkegaard, Aristotle should have said that, because the necessary does not come into existence at all, there is no way to apply a concept of possibility to it. Since it is outside of emergence in time, the necessary should not be viewed as a unity of possibility and actuality. Conversely, although the determinations of the past and the present cannot be undone, it would be a mistake to conflate their irrevocability with the necessary.

In doing this brief explication of Aristotle's and Kierkegaard's respective solutions to the Sea Battle Paradox, my aim is not to argue in favour of one or the other solution, but rather to begin to explore how these various responses to the paradox prepare the way for a diagnosis of the gambler's fallacy. Aristotle's initial solution can be viewed as plausible in the sense that, by arguing that there is a stark ontological distinction to be made between the future and the past, Aristotle acknowledges the indeterminacy of the future while, at the same time, interprets the past as irrevocable. The upshot of Kierkegaard's subsequent revision of Aristotle's solution is that, by removing the concept of necessity from the stages of time entirely, Kierkegaard claims that the emergence of time is the constant expression of freedom. As a further development of this analysis, let's turn to the question of the relationship between the Sea Battle Paradox and the gambler's fallacy.

The Relationship between the Sea Battle Paradox and the Gambler's Fallacy

Aristotle's Sea Battle Paradox is usually considered to be primarily a logical paradox about semantics. The paradox is usually interpreted to be about the truth value of statements in the future. Is it the case that the event of the sea battle – which will either happen or not happen tomorrow – already has truth value in the future? And if it does already have truth value, is it somehow possible to know this truth value ahead of time? Based on this interpretation, we might come to the conclusion that the problem Aristotle has uncovered deals with *logical* necessitation only, but does not thereby bear significance for a gambler who is caught up in the psychological dimensions of false thinking about the determination and causation of the future. But I disagree with the exclusivity of this interpretation. I contend that, although Aristotle's paradox is primarily a logical and semantic problem, it is nevertheless productive to apply it to the psychological condition of the gambler's fallacy. There is nothing in Aristotle's text to suggest that the logical implications of the paradox cannot also be applied to causation and psychology. After all, logical fallacies are, generally, causal and psychological applications of logical structures. Moreover, there is a real upshot to viewing the logical complications that arise from the paradox as a central element of the fallacy. We gain a better grasp of the intricacies of the fallacy if we expose the underlying ontological complexities inherent in the temporal and modal nature of time.

However, I am not claiming that the Sea Battle Paradox is the same as the gambler's fallacy, nor that the logical implications of the paradox alone lead directly or sufficiently to the psychology of the gambler. I am only claiming that the anticipation brought about by the assumptions that the future is determined, that its determination has not yet been revealed, but that it could possibly be revealed ahead of time – is one of the central conditions of the gambler's fallacy. The gambler's fallacy comes about when the gambler assumes that the future is already determined but that some work would have to be done on the part of the gambler to reveal this future determination in the present. The logical implication of the Sea Battle Paradox is, therefore, only one of the elements that contribute to the complex nature of the fallacy. The other main element of the fallacy is a false cause inference between the patterns of the past and the projected patterns of the future. This second element should be viewed as an addition to the applied logical structure of the Sea Battle Paradox. It is this "false cause" element of the fallacy, which, in different ways, Hurley and Weisberg both effectively come to terms with in their respective analyses. What needs to be added to their analyses is the ontological dimension, which leads to the gambler's supposition that the future *should be* as determinate as the past, however difficult this determination is to reveal in the present.

If we look closely at the details of this additional false cause inference, which combines with the complexities of the logical paradox to produce the fallacy, we will see that there are really two different types of false cause

inference that are common to gamblers, but that only one type leads to the gambler's fallacy proper:

(1) A determinate pattern of the future can be *revealed* based on a determinate pattern that is known to be true of the past, even though the game is a game of pure chance.

(2) By blowing on dice or somehow channelling luck, the gambler can *influence* the determinate result of the future.

I contend that only (1) is the gambler's fallacy proper. (2) is a different type of false cause fallacy, which is often related to games of chance and gambling, but which should not be mistaken for the gambler's fallacy, and which does not draw from the logical implications of the Sea Battle Paradox. To see this, let's look at (1) and (2) in more detail.

Based on (1), the determinate pattern in the future already exists and the gambler can learn to see this pattern by interpreting the pattern of the past and coming to recognize what the past shows about the future. In this respect, the gambler's activity is passive. The gambler does not attempt to influence or change the results of the determination of the future, since this determination is assumed to have already been fixed, but merely to reveal these results in the present, to see them clearly, and to gamble accordingly. However, based on (2), the gambler attempts to determine the result of the future by taking an action (e.g., blowing on the dice, etc.). This is a significantly different type of false cause fallacy because, in (2), the gambler tries to actively change the determination of the future, rather than to passively reveal the determination. The implication here is that, based on (2), the future is not already determined, or at least not completely determined, since there might still be a way to influence the outcome. (2) is still a false cause fallacy, nevertheless, because the gambler mistakenly thinks that blowing on dice or somehow channelling luck is a viable way to dictate the course of a game, which is, in fact, purely based on chance. While this is a popular false cause fallacy that relates to gambling, since it draws on the idea that the gambler can change the course of events, it should be recognized as a different type of fallacy from (1), which embodies the pure form of the gambler's fallacy.

Even when we focus on (1), we still cannot say that the Sea Battle Paradox is the same as the gambler's fallacy. All we can say is that the logical implications of the Sea Battle Paradox help to produce the psychological attitude that the future is determined and that work would have to be done – e.g., deciphering the patterns of the past and relating these to the future – to reveal this determination. The gambler's fallacy combines this with the assumption that there is a causal inference between the patterns of the past and the future. The gambler assumes that the past, present, and future are really one interconnected series of determinations, while forgetting the fact that the game is pure chance and that the determinations of the past cannot show us anything about the future. As a by-product of assuming that the future is already determined, the gambler assumes also that there is more consistency between the three stages of time than there is. Based on this attitude, the difference between the future and the past is merely the difference of revelation. The future and the past are both equally determined, and are both thoroughly interconnected in this determinate pattern; however, the future has not yet been revealed, while the past has. From this perspective, actualization is merely the process of revelation, not the process of emergence or transformation. In this respect, the gambler's fallacy comes about when the gambler thinks that it is possible through skilful interpretation of the past to uncover the future ahead of its actualization. The gambler tries to view the future as if it were a stage of time that does not have to undergo transformation. This is fallacious, either because the purely random determinations of the future already exist but cannot be uncovered ahead of time (which fits a coherent model of eternalism), or because, as Aristotle and Kierkegaard both argue in their respective responses, the future has not yet been determined.

Based on the Aristotelian response to the Sea Battle Paradox, we view the gambler as someone who projects necessity and predetermination onto the future by conflating the ontological distinctions between the tenses of time, in other words, by projecting the necessity of the past inappropriately onto the future. Or, based on Kierkegaard's response to Aristotle, we view the gambler as a character who fundamentally misunderstands the ontological nature of "coming into existence." The gambler is the person who forgets that the past has come into existence, and from this forgetfulness, thinks that the future can be combined with necessity, as if it were a matter of skill whether the gambler can learn to see how the future will fork.

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Funding and Conflict of Interest Statement

I presented an early draft of this article at the 2019 "Philosophy of Gambling" conference hosted and funded by the University of Macau. I have also received funding from the Chiang Mai University Faculty Research Grant, which relates to this project. I received two Miyazaki International College Research Grants in 2019 and 2020, which do not relate to this project. There are no conflicts of interest.

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