Abstract

This paper argues that time travellers can kill their infant grandfathers even though their succeeding has probability zero. Time travellers can kill their infant grandfathers because they have the ability. I argue, contrary to Kadri Vihvelin (1996), that abilities should not be analysed in terms of their 'outputs' – i.e. whether an agent will succeed – but more in terms of their 'inputs' – i.e. whether an agent 'has what it takes' to carry out an action. First, I outline the Lewisian response to the Grandfather Paradox. Second, I outline Vihvelin's counterargument which follows a conditional analysis of ability. Then, I introduce a counterexample to the conditional analysis of ability using the case of an infinite fair lottery. Finally, I build on the Lewisian analysis and use the lottery case to motivate my own analysis of ability. I argue that the relevant sense of ability tracks inputs, thus showing how time travellers can kill their grandfathers despite the success being logically impossible.

Introduction

David Lewis (1976) presented one of the most famous arguments in favour of the logical possibility of time travel. He concluded that the Grandfather Paradox does not necessitate the logical impossibility of time travel *and* time travellers retain their 'ordinary'[1] abilities. His argument for the latter concerns the equivocality of 'can'; specifically, a time traveller both can and cannot kill their grandfather, since 'can' means different things 'under different delineations of the relevant facts' (Lewis, 1976: 151). Unsurprisingly many philosophers have taken issue with Lewis' conception of 'can', most notably Kadri Vihvelin (1996), who argues that there is no sense of 'can' in which a person will always fail. This paper first presents the views of both Lewis and Vihvelin before giving a more detailed explanation of the conditional analysis of ability (CA) which Vihvelin uses against Lewis.

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[1] By 'ordinary' abilities, I am referring to the fact that according to Lewis, time travellers can kill their grandfathers, and they can do many other things on their time travel journey even if they do not succeed. Time travellers retain all the abilities they had pre-time travel including the ability to kill their grandfathers.

This paper's second half presents a new rebuttal of Vihvelin, which expands and cements the Lewisian conception of 'can'. This paper aims to show that evaluating ability should focus more on inputs rather than outputs. and concludes that time travellers are able to kill their grandfathers (although there is a question of why they would want to in the first place).

Section 1: Does ability imply the possibility of success?

The Grandfather Paradox poses one of the most famous, but now frequently refuted, challenges to the logical possibility of time travel. The paradox purports to show that time travel is logically impossible. This paper addresses the latter, 'ability' claim. The most famous rebuttal of the Grandfather Paradox comes from David Lewis (1976). In a nutshell Lewis argues that the Grandfather Paradox does not entail that time travellers lose their 'ordinary' abilities (abilities that a time traveller has pre-time travel). This is because for Lewis a time traveller both can and cannot kill their grandfather under different delineations of ability. A time traveller cannot kill their grandfather as to succeed would be contradictory (the time traveller would both be alive and not be alive at the same time). Most philosophers of time travel[2] tend to agree on this element of Lewis' argument, however the way in which a time traveller can kill their grandfather is a lot more contentious. Lewis argues that a time traveller can kill their grandfather because she 'has what is takes' (Lewis, 1976: 150). She need not succeed; she can because she has everything required of her to carry out the action. As Lewis argues 'conditions are perfect in every way: the best rifle money could buy, Grandfather an easy target only twenty yards away, not a breeze, door securely locked against intruders, Tim a good shot to begin with and now at the peak of his training, and so on…' (Lewis, 1976: 149). Thus, for Lewis ability does not imply the possibility of success. Crucially, even though the time traveller will always fail at her grandfather, she nonetheless can.

Vihvelin (1996) argues, contrary to Lewis, that there is no sense in which a time traveller can kill her grandfather. In order to cement her case Vihvelin builds upon a traditional analysis of ability known as the Conditional Analysis (CA). (CA) has been interpreted in

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[2] See Horwich (1989), Smith (1997), Kiourti (2007).

many ways but for brevity's sake of space this paper delineates (CA) in a way that fits with Vihvelin's interpretation:

(CA) S has an ability A if and only if, if S tried to A then S would A

(CA) suggests that having an ability requires fulfilling a certain conditional – 'if S tried to A then S would A'. For example I can determine whether I have the ability to play piano by asking myself whether I would play the piano *if I tried*. If I do play the piano when I try to play the piano, I have the ability to play piano (according to (CA)). For the sake of argument this analysis will be assumed to be correct. Vihvelin makes a slightly weaker claim, but maintains a similar framework to (CA):

(CA*) S has an ability A if and only if, if S tried to A then S would or *at least might* succeed

This is a slightly weaker claim because it is not simply about whether the agent will definitely do the action, but more about whether there is a possibility of the agent succeeding. That is, (CA*) is crucially a modal claim about ability. Vihvelin then applies this ability principle to the Grandfather Paradox. So, in order for a time traveller to be able to kill their grandfather, the following counterfactual should hold true:

(CF) If a time traveller tried to kill their grandfather, they would or *at least might* succeed.

In order to analyse whether this counterfactual is true Vihvelin follows the traditional truth-conditional analysis of counterfactuals which uses possible world semantics. Hence, in order to determine whether the (CF) is true, look to the closest possible worlds at which the antecedent is true. As Vihvelin writes:

'If P, it would be the case that Q' is true just in case Q is true at all the closest P-worlds. 'If P, it would or might be the case that Q' is true just in case Q is true in at least some of the closest P-worlds' (Vihvelin, 1996: 319).

The worlds considered 'closest' tend to be worlds which are most similar to actuality. Specifically, worlds governed by the same physical laws. It is logically possible for a time

traveller to kill their grandfather before the time traveller was born only for their grandfather to be resurrected a day later, but such 'resurrection worlds' are not ones that should be considered relevant in the analysis of (CF), as they are not worlds nomogically similar to the actual world. As a result, Vihvelin discounts these worlds when analysing (CF). Ultimately, for Vihvelin, if a time traveller can kill their grandfather (in a meaningful sense) then there must be at least some occasions under which (CF) would be true. However, there are no occasions under which (CF) would hold true, for if it were true then this would generate the very paradox that Lewis and other proponents of time travel wish to avoid. Crucially, if the time traveller succeeded in killing her grandfather then it would be the case that she was both alive and not alive at the same time.

Section 2: Inputs vs. outputs

This section argues against Vihvelin's conception of 'can' by illustrating why we should not focus on the outputs of actions when evaluating an ability. The argument rests on considering the inputs of actions. First appealing to an example, then semi-formalising the analysis. Finally, this paper will show how the analysis can be applied to the Grandfather Paradox,

Consider the case of Tina who wins an infinite, fair lottery. Tina is an avid gambler and has bought a ticket for a lottery. What Tina does not know is that this is an infinite, yet fair, lottery. In an infinite, but fair, lottery (in a nomologically accessible world) the probability of success is at 0[3], since there are infinitely many tickets available[4], each agent who buys a ticket has a $1/\infty$ chance of winning. However, intuitively they each have 'what it takes' to win because each agent has a ticket, the infinite lottery is fair. So, although Tina has exactly

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[3] Technically the probability is not 0 but infinitesimal, but for the sake of argument I will say 0. As Pruss writes 'if we allow for the possibility of infinitesimal probabilities, we may not wish to say that the probability of a particular ticket in an infinite fair lottery is zero. Rather, we might say that the probability is zero or infinitesimal. I will henceforth say that x is nearly equal to y provided that x − y is either zero or infinitesimal, and that a proposition or event is nearly certain provided that its probability is nearly equal to 1. It is thus nearly certain that one will lose in an infinite fair lottery if one holds a single ticket— or any finite number of tickets, for that matter''. (Pruss, 2018: 2)

[4] For more information about the logistics behind constructing an infinite lottery machine see Norton (2018).

what it takes to win the lottery, the probability of her winning is still zero. Saying that, Tina does win the lottery, i.e. her winning the lottery is logically and maybe even physically possible. Indeed, John D. Norton (2018) attempted to show how one might build a physically possible infinite lottery. That is, Norton is not just concerned with the logical possibility of an infinite lottery machine he is concerned with whether it is *physically realizable* to create an infinite lottery machine. It is logically possible for Tina to win the lottery, likewise it is logically possible to succeed in killing your grandfather before you were born, only for your grandfather to be resurrected a day later. What is not logically possible in the grandfather case is for a time traveller to kill their grandfather and for him to *stay dead*. However, the point is an infinite lottery *could* be physically possible (which is exactly what Norton wishes to prove). Tina has what it takes to win the lottery, i.e. she has bought the ticket and her winning occurs in a nomologically-accessible world, since the infinite fair lottery could be physically possible, but the probability of success is still zero.

This example presents a case in which having a zero chance of success is not a sufficient condition for having an ability or not. Tina has a zero chance of success, it is a fair, infinite lottery. Yet her winning occurs at infinitely many nomologically accessible worlds. It is these inputs which are important in determining whether she can win the lottery, she has a ticket, the lottery is fair *and* her winning occurs at a nomologically accessible world. Crucially, relevant inputs can suffice to underwrite an ability claim even if the probability of success is zero (or strictly, infinitesimal). Here we have a case of indefinitely prolonged failures (much like the Grandfather Paradox) but a case which crucially shows that the agent still retains their ability, despite these prolonged failures. This case strengthens the main claim, what is important for ability are the inputs not the probability of success. Tina has zero chance of success and yet she still retains the ability. Ultimately, we now we have a potentially physically possible example which occurs in a nomologically-accessible world and which the chance of success is zero, yet the agent still has the ability because the agent has what it takes in a very strong sense.

Perhaps one could point out a certain asymmetry between the time travel and lottery cases and retort that whilst it is logically possible for Tina to win the lottery, it is not logically possible for a time traveller to successfully kill her grandfather. However, it *is* logically possible for a time traveller to kill her grandfather, what is not possible is for a time traveller to kill her grandfather and for her grandfather to stay dead. There are no possible worlds in which a time traveller successfully kills her grandfather (before they were born etc…),

the grandfather stays dead, and that the now dead grandfather is co-existing with the living grandfather. Hence there is no asymmetry, it is logically possible for (i) Tina to win the infinite, fair lottery and (ii) a time traveller to successfully kill her grandfather (but her grandfather will be resurrected after).

As a result, the revised analysis of ability is as follows:

> (ABILITY) an agent S has an ability A if and only if S meets/possesses the required input conditions

Taking this analysis even further, I argue that 'inputs conditions' can be split into 'skill' based input conditions and 'context' based input conditions. Using Lewis, I now illustrate an example of both of these types. Lewis writes 'Tim a good shot to begin with and now at the peak of his training…' (Lewis, 1976: 149). It is clear that Tim being a good shot is a skill based input condition because he has been practicing and honing this skill months before the trip. However, input conditions need not always be skills, in the same quote Lewis states 'conditions are perfect in every way: the best rifle money could buy, Grandfather an easy target only twenty yards away, not a breeze' (Lewis, 1976 p149). As per my analysis above, the lack of breeze is a context based input condition. In this scenario it is the combination of skill based *and* context based input conditions which entail that Tim has the ability to kill his grandfather. However, an agent need not meet or possess both skill based and context based input conditions in order to have an ability.

In addition, my analysis is not simply restricted to time travel cases. Under my analysis an agent's ability to play a specific piano sonata should be analysed by looking to these required input conditions. The required input conditions in this scenario could be whether the agent has played the sonata or even the piano before (skill based), or whether the agent possesses a piano (context based). If the agent in question meets or possesses these required input conditions then according to (ABILITY) she can play the specific piano sonata.

Finally, a return to time travel. Recall that for Vihvelin due to (CA*) a time traveller is only able to kill their grandfather if there is a chance of the time traveller succeeding. However, if we adopt (ABILITY) then we can return to the original Lewisian framework. Lewis argues that a time traveller can kill their grandfather because they 'have what it takes',

however he fails to provide a particularly in-depth analysis of ability, specifically how we can push back against the traditional analyses of ability that focuses on outputs (success). Ultimately, in accordance with (ABILITY) we have the following scenario: A time traveller has the ability to kill their grandfather because they have met the required input condition, these input conditions may be skill or context based. For example, the time traveller has been practicing at a shooting range, they have planned the attack meticulously, they are in very close proximity to their grandfather etc… Both the skill based or context based input conditions entail that the time traveller has the ability to kill their grandfather. This leads to a rejection of Vihvelin's counterfactual analysis because it rests of an interpretation of ability which is counterintuitive to how we would normally evaluate ability; in particular we usually do not evaluate ability by asking what would happen if I tried and failed. Hence, we can confidently return to a Lewisian framework and conclude that a time traveller can kill their grandfather because they have the ability to do so.

Conclusion

This paper has argued that a time traveller is able to kill their grandfather. First, it explained the Lewisian answer to the Grandfather Paradox before outlining the ways in which Vihvelin disagrees. Vihvelin uses a traditional conditional analysis of ability which focuses on outputs as a measure of ability, this combined with a counterfactual analysis the conditionals within the Grandfather Paradox leads her to the conclusion that there is no sense in which a time traveller can meaningfully kill their grandfather. I then proposed a different interpretation of ability. My interpretation focuses on the inputs for actions rather than the outcome of actions, it highlights the importance of inputs in determining ability by presenting an analogous case of indefinitely prolonged failures. Finally, I applied the analysis to the original case of the Grandfather Paradox and concluded with Lewis that time travellers are able to kill their grandfathers because they possess or meet the required input conditions.

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