The Rationality of Near Bias toward both Future and Past Events

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Abstract

In recent years, a disagreement has erupted between two camps of philosophers about the rationality of bias toward the near ("near bias") and bias toward the future ("future bias"). According to the traditional *hybrid* view, near bias is rationally impermissible, while future bias is either rationally permissible or obligatory. *Time neutralists*, meanwhile, argue that the hybrid view is untenable. They claim that those who reject near bias should reject both biases and embrace time neutrality. To date, experimental work has focused on future-directed near bias. The primary aim of this paper is to shed light on the debate by investigating *past-directed* near bias. If people treat the past and future differently with respect to near bias, by being future-directed but not past-directed near biased, then this supports a particular version of the hybrid view: temporal metaphysic hybridism. If people treat the past and future the same with respect to near bias, then this supports a simple version of time neutralism, which explains both future bias and near bias in terms of the functioning of a single mechanism: the anticipatory/ retrospectory mechanism. Our results undermine the claim that people are future-directed, but not past-directed, near biased, and hence do not support temporal metaphysic hybridism. They also fail to support simple time-neutralism; instead, they suggest that there are multiple mechanisms that differently shape future- and past-directed preferences.

1 Introduction

A person is biased toward the near (i.e., *near biased*) when, all else being equal, they prefer positive events to be near rather than distant, and they prefer negative events to be distant rather than near. Social scientists identify near bias with the concept of

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temporal discounting, which uses a mathematical function to model how much an agent cares about a future event based on its temporal nearness.[1] Normatively, social scientists tend to claim that near bias (i.e., temporal discounting) is rationally permissible only if the agent's preferences are consistent over time, while philosophers traditionally claim that near bias is irrational.[2]

Philosophers are also interested in the rational status of bias toward the future (i.e., *future bias*). A person is future biased when, all else equal, they prefer positive events to be future rather than past, and they prefer negative events to be past rather than future. In contrast to their view on near bias, philosophers have tended to claim that future bias is either rationally permissible or rationally obligatory.[3] Call the combination of the view that future bias is permissible or obligatory, with the view that near bias is impermissible, the *hybrid view*.

According to adherents of the hybrid view, future and past events should, and in fact do, affect us in very different ways. This is most clear, they claim, when we consider our reactions to the temporal locations of painful experiences. We are pleased when painful experiences are "over and done with" (Heathwood 2008, 57), we say things like "thank goodness that's over" (Prior 1959), and we are "greatly relieved" that a painful experience has already occurred (Parfit 1984, 165). We have no such reaction when painful experiences are in the future, and this, hybridists claim, helps to establish the rationality of future bias.

Hybridists suppose that there is some difference between past and future events that justifies future bias but does not justify near bias. This difference is often thought to arise due to a deep *metaphysical* temporal asymmetry between past and future. On such a view, it is supposed that there is some objective property of presentness that only one moment instantiates, and that which moment this is changes: there is robust temporal passage. Future events have a property—futurity—that past events lacks, while past events have a property—pastness—that future events lack. Future events are coming ever closer to us as time passes, and past events are receding away from us. The idea, then, is that we do, and ought to, devalue past events because those events have the property of *being past*. Since we ought devalue negative events relative to positive events, this justifies future bias.[4] We will call this common version of hybridism, *temporal metaphysic hybridism*.

In recent years, a group of philosophers have taken up a position contrary to the hybrid view. According to *time neutralists*, near and future bias should not be evaluated

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[1] While discount rates feature prominently in economic models of decision making, there is an important difference between the discounting of positive and negative experiences—which John Broome (1991) calls "pure" discounting—and the discounting of commodities used by economists in cost-benefit analysis. This paper concerns pure discounting.

[2] See Greene and Sullivan (2015, §2). Sidgwick (1884, 380–1) writes, "The mere difference of priority and posteriority in time is not a reasonable ground for having more regard to the consciousness of one moment than to that of another. The form in which it practically presents itself to most men is 'that a smaller present good is not to be preferred to a greater future good' (allowing for difference of certainty)." Rawls (1971, 293) reiterates the point: "A present or near future advantage may be counted more heavily on account of its greater certainty or probability, and we should take into consideration how our situation and capacity for particular enjoyments will change. But none of these things justifies our preferring a lesser present to a greater future good simply because of its nearer temporal position." (See also Lewis (1946); Nagel (1970); Broome (1991); and Brink (2011)).

[3] Explicit supporters of the rationality of hedonic future bias include Prior (1959); Hare (2007, 2008), and Heathwood (2008).

[4] Defenders of this view include Prior (1959); Schlesinger (1976); Craig (1999); and Pearson (2018).

independently of each other: if near bias is irrational, then so is future bias.[5] Time neutralists think that we should treat both biases in the same manner, not because they think we should be both future and near biased, but because they think we should be neither. Against temporal metaphysic hybridism, time neutralists argue that there is no deep metaphysical asymmetry between past and future that justifies future bias. For instance, Yehezkel (2014, 6–7) writes:

> The failure to offer any substantial justification for the asymmetry in our attitudes based on the flow of time stems from the inability to offer any non-trivial account of the flow of time. It is difficult to see what difference is made by the claim that 'future events are moving closer to reality,' given that all that is meant by this claim is that 'in the future, future events will be closer to the present.' This is a mere truism, as evident by the analogous claim, regarding the past, according to which 'in the past, past events were closer to the present.' The attempt to justify the asymmetry between past and future based on the flow of time *per se* thus seems to collapse into triviality.

Similar sceptical remarks about the role of the flow of time in justifying future bias are made by Parfit (1984, 178) and Hare (2013, 510–11) (though Hare defends the rationality of future bias).

The most prominent form of near bias is *future-directed*, but another way a person can be near biased is *past-directed*. A past-directed near-biased agent prefers positive events to be in their near past rather than their distant past, and prefers negative events to be in their distant past rather than their near past. There is very little experimental work focussing on past-directed near bias,[6] and philosophers have paid no attention to what little work there is. But any theory of the rational permissibility or impermissibility of time bias ought to have something to say about past-directed near bias. As we will see in the next section (§2), time neutralism and temporal metaphysic hybridism make different predictions about the past-directed preferences people will display. Temporal metaphysic hybridism predicts future-directed near bias but no past-directed near bias. So this view predicts that people will display asymmetrical past and future-directed preferences. By contrast, the simplest version of time neutralism predicts that people will display symmetrical past/future preferences. In §3 we test whether people's preferences are past/future symmetric or not, and we present the results. Finally, in §4 we discuss the implications of these results for theorising in this area.

2 Time Neutralism vs Temporal Metaphysic Hybridism

There are various hypotheses one could have regarding our preferences over the nearness of past events:

(1)   People have symmetrical past- and future-directed near-biased preferences.

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[5] Critics of hedonic future bias include Brink (2011); Greene and Sullivan (2015); and Dougherty (2015).
[6] To our knowledge this literature is exhausted by Yi et al. (2006); Bickel et al. (2008) and Molouki et al. (2019).

(2)   People have preferences regarding the nearness of past events, but these preferences differ in important ways from their preferences regarding the nearness of future events.

(3)   People are not past-directed near biased; i.e., all near bias is future-directed.

Temporal metaphysic hybridists will likely endorse (3). Here is why. Temporal metaphysic hybridists hold that we both *do*, and *ought* to, devalue past events relative to future events, and that is why we prefer negative events to be past and positive events to be future. Some philosophers have reported that they *completely* devalue past events.[7] Temporal metaphysic hybridists might take this attitude to be rational. If people have this attitude, then they will not show past-directed near bias: for they will not value past events, and hence will not value nearer past events over more distant past events. Other philosophers report that they devalue past events relative to future events, but do not completely devalue those events.[8] Temporal metaphysic hybridists could also take this attitude to be rational. If people value past events less than future events, then it remains an open question whether they will display past-directed near bias: of course, temporal metaphysic hybridists think they *ought* not display such bias, but they also think people *ought* not display future-directed near bias, and, with some important qualifications, there is good evidence that people do display future-directed near bias.[9]

We think the temporal metaphysic hybridist will predict a lack of past-directed near bias. The temporal metaphysic hybridist needs to connect our displayed preferences to the underlying metaphysics that justifies future, but not near, bias. She can argue that we only *fully* value non-present events that we can anticipate, and the asymmetric structure of time makes it possible to value future events, but not past events. This explains why we devalue past events relative to future events, and justifies our so doing. She can then explain why we display future-directed near bias by pointing to the psychological fact that we more strongly anticipate closer events than more distant ones. She can note that evidence shows that the greater the temporal, spatial, hypothetical, or social distance from an event, the more the event is represented in an abstract, structured, and high-level manner (Liberman et al. (2003); Wakslak et al. (2006)), and further, the more emotional intensity is associated with the representation of an event, the less psychologically distant that event seems to be (Van Boven et al. 2010). Jointly, this suggests that temporally more distant events will be represented in a more abstract manner, with less associated emotional intensity. That explains why we will prefer to have positive events in the near future, and negative events in the far future: it explains future-directed near bias. Thus, the temporal metaphysic

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[7] Heathwood (2008, 56–7): "[A future-biased agent] is being completely reasonable in preferring that his pain be in the past. In fact, even his no longer caring at all that it occurred is perfectly fitting—not at all in inappropriate. Why should he care about it now? No reason—it's over and done with." Likewise, Sullivan (2018, 58) claims that "we assign no value to a merely past painful experience or pleasurable experience". See also Parfit (1984, 173) and Dorsey (2018) (though neither defends this view as part of a commitment to temporal metaphysic hybridism.).

[8] This view is suggested by Hume (1738) and by Suhler and Callender (2012, 5). It is endorsed by Yehezkel (2014, 11).

[9] Early experiments on future-directed near bias—what social scientists call temporal discounting—indicate a "pervasive devaluation of the future" (Ainslie and Haslam (1992, 59)). For example, in the experiments of Thaler (1981); Hausman (1979); and Akerlof (1991), people assigned less value to future money, time, and effort, respectively, than their present analogues. Similar results in animal studies backed this idea; e.g., Green et al. (1981). However, a meta-analysis done between 1978 and 2002 (Frederick et al. (2002, 377)), found "tremendous variability" in estimates of people's average discount rate.

hybridist claims that the nature of anticipation explains both future bias and future-directed near bias. And since we do not anticipate past events, this account predicts that people do not display past-directed near bias: for they cannot more strongly anticipate past near events relative to past far events, if they cannot anticipate past events at all. Hence the temporal metaphysic hybridist will predict that people will not display past-directed near bias, and so she will predict that we will find a past/future asymmetry in our preferences.

By contrast, we think that the time neutralist could make any number of predictions about the relationship between our past- and future-directed preferences. After all, like the temporal metaphysic hybridist, she must explain why we display near bias, despite her supposing this bias to be irrational, and, in addition, she must explain why we display future bias, despite her supposing that this, too, is irrational. For, with some qualifications, there is evidence that people do display future bias.

Caruso et al. (2008). More recently, Greene et al. (2020) found that people exhibit future bias when it comes to hedonic events, but not when it comes to non-hedonic events, where non-hedonic events are those that do not concern pleasurable or painful experiences. These are typically events that are not experienced directly by the agent, or where the agent's experience is not tied to the temporal location of the event.

Since the time neutralist must explain both sets of displayed preferences—future bias and future-directed near bias—and do so in a way that does not justify them, there is any number of strategies that she might pursue. Depending on what these strategies are, she might have different views about whether we should expect to find past/future asymmetries in our displayed preferences. Nevertheless, there is an attractively simple version of time neutralism—what we call *simple time neutralism*—which predicts that our preferences will be past/future symmetric. Here, we borrow an account of why we display future bias that has been offered by Latham, Miller, Tarsney and Tierney (unpublished) in the wake of their recent empirical findings that actual beliefs about temporal passage appear to have no effect on the extent to which people report future-biased preferences, but the simulating of those beliefs does. Latham et al. suggest that simulating these beliefs might tend to lead people to have more anticipatory and recollective experiences (or simulations thereof) and that it might be these experiences that in fact explain (at least in part) future-biased preferences.

Latham et al. note that people experience more intense emotions during anticipation than during retrospection of the same experience for both actual and hypothetical experiences (Caruso et al. 2008; D'Argembeau et al. 2003; Van Boven and Ashworth 2007). It has been suggested that this difference is explained by asymmetries of influence and of certainty. We can typically influence future, but not past, experiences, and thus we have developed a heightened emotional reaction to the former (Frijda 1988). In addition, our emotional reactions to consideration of past experiences are less extreme than our reactions to consideration of future experiences, in part because our episodic memories constrain our representations of the former in a way that they do not constrain our representations of the latter (Bar-Anan et al. 2009; Van Boven et al. 2010). Latham et al., argue that the functioning of the anticipatory and what we might call "retrospectory" systems, jointly, might partly explain why we display future bias for hedonic events.

We can extend their explanation to also explain an asymmetry between our preferences regarding hedonic and non-hedonic events. After all, only hedonic events are such that we can anticipate or retrospect them; non-hedonic events fail to have this feature. In turn, we would expect to prefer positive hedonic events in the future (and be

anticipating them) and negative events in the past (and be retrospecting them) given the relative differences in emotional salience of anticipation and retrospection. By contrast, we would expect to be indifferent to the location of non-hedonic events.

The simple time neutralist can then explain future-directed near bias in the same manner as does the temporal metaphysic hybridist: by noting that we more strongly anticipate near future events relative to far ones. Since she thinks there is an analogous system—the retrospectory system—for past events, she will predict that we will also display past-directed near bias: for near past events will be more strongly retrospected than will distant past events, so we will prefer negative past events to be in the far past, and positive past events to be in the near past. Hence simple time neutralism will predict past/future symmetry in our preferences.

This paper aims to experimentally test the hypothesis above: that insofar as individuals show certain patterns of future-directed near-biased preferences, they will show the same pattern of past-directed near-biased preferences. We call this the *past/future symmetry hypothesis*. Though there is very little previous research on past-directed near-biased preferences, what little research there is tends to support the past/future symmetry hypothesis (Yi et al. (2006); Bickel et al. (2008)). Given this, we predicted that we would find evidence consistent with this hypothesis. In particular, based on previous research (Greene et al. (2020)) showing a difference in hedonic and non-hedonic future-biased preferences, we predicted that when the events in question are hedonic, participants would be both future- and past-directed near biased, and when the events are non-hedonic, participants would be both future- and past-directed time neutral.

In fact, we found that at population level our results support the past/future symmetry hypothesis. This, however, does not appear to be the result of individual past/future symmetries. We found no correlation between an individual's preferences over future events and their preferences over past events. Hence, these results do not support temporal metaphysic hybridism. Nor do they support simple time neutralism. Instead, we found a good deal of variation in the population regarding these preferences: for almost every preference that can be had with regard to future events, there is some substantial sub-population that expressed that preference; mutatis mutandis for preferences over past events. In all, these results support a more complex version of time neutralism that posits a plurality of mechanisms that explain near bias for future-directed preferences, and a different (perhaps overlapping) plurality that explain near bias for past-directed preferences.

3 Experimental Design and Results

3.1 Method

3.1.1 Participants

534 people participated in the study. Participants were U.S. residents, recruited and tested online using Amazon Mechanical Turk and Qualtrics, and compensated $0.50 for approximately 5 min of their time. 46 participants had to be excluded for failing to follow task instructions. This means that they failed to answer the questions (40), or failed the attentional check question (6). The remaining sample was composed of 488 participants (aged 17–83; 193 female; 4 preferred not to answer). Mean age 36.8 ($SD =$

12). We used only those MTurk participants who have a HIT (task) approval rate of at least 95% and who have had their HITs (tasks) approved at least 1000 times. That means that all our participants had already successfully completed at least 1000 other studies, and received at least a 95% approval rating on these tasks. Participants were recruited and tested the same way in all experiments reported. Ethics approval for this study was obtained from the University of Sydney Human Research Ethics Committee. Informed consent was obtained from all participants prior to testing.

3.1.2 Materials and Procedure

Participants were randomly assigned to one of four conditions: positive or negative valence; hedonic or non-hedonic event, in a mixed within/between-subjects design. These four conditions reflected all possible combinations of valence (positive or negative) and kind of event (hedonic or non-hedonic). Hence we tested the following four conditions: hedonic positive valence; hedonic negative valence; non-hedonic positive valence; non-hedonic negative valence. Each participant was assigned to only one condition.

We developed a single base vignette[10] that could be minimally modified for each of these conditions. Participants either read a vignette describing a positively valenced non-hedonic event (receiving a community award) or a negatively valenced non-hedonic event (having embarrassing photographs released), or a positively valenced hedonic event (receiving a most favoured meal) or a negatively valenced hedonic event (receiving a most disfavoured meal).

The vignettes are below. The first is the non-hedonic base vignette with both positively and negatively valenced substitutions listed. The second is the hedonic base vignette with both positively and negatively valenced substitutions listed.

Imagine you are an astronaut on a 10-year voyage from Earth to set up a colony on a new planet. It is a one-way mission, and there is no way you can return to Earth. You are 5 years into the voyage. Just before you left, you learned that [your home-town mayor plans to award you an important community service prize]/[someone plans to release embarrassing photos of you] at some time during the 10-year period in which you are traveling. You do not know when they will [award the prize]/[release the photos], and it is not possible to communicate with Earth during the trip, or even once you have arrived on the new planet. You find yourself wondering whether [the prize has been awarded]/[photos have been released] yet.

Imagine you are an astronaut on a 10-year voyage between planets. You are 5 years into the voyage. The ship's food dispenser normally produces bland meals containing only essential nutrients. However, it is programmed to dispense your [favourite meal]/[most disliked meal] — [which you really like]/[which you really dislike] — during one day of the voyage. One morning, you awake from a dream concerning your [favourite]/[most disliked] meal and for a moment you cannot remember whether you have received it yet.

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[10] These vignettes are based on those used in Greene et al. (2020).

We developed these vignettes to avoid potential confounds arising due to participants having preferences over the location of events that do not reflect any pure time preference. For instance, they might reflect the fact that participants reason that in time, others will forget negatively valenced events—the embarrassing photos—(which is desirable) and positively valenced events—the community award—(which is not desirable).[11] To avoid this confound the vignette describes a one-way trip from Earth to another planet, with no communication between Earth and the ship.

In each condition, participants were asked how much they agree, on a Likert scale from 1 (strongly disagree) to 7 (strongly agree) with two randomly selected statements.

Participants in the non-hedonic conditions were asked how much they would agree with *one* of the following statements:

(a)   I would prefer to learn that the [important community service prize]/[embarrassing photos] will be [awarded]/[released] tomorrow, and will not be [awarded]/[released] 1 year into the future.

(b)   I would prefer to learn that the [important community service prize]/[embarrassing photos] will be [awarded]/[released] 1 year into the future, and will not be [awarded]/[released] tomorrow.

And *one* of the following statements:

(c)   I would prefer to learn that the [important community service prize]/[embarrassing photos] [was awarded]/[were released] yesterday, and [was not awarded]/[were not released] 1 year in the past.

(d)   I would prefer to learn that the [important community service prize]/[embarrassing photos] [was awarded]/[were released] 1 year in the past, and [was not awarded]/[were not released] yesterday.

Participants in the hedonic conditions were asked how much they would agree with *one* of the following statements:

(a)   I would prefer to learn that my [favourite]/[most disliked] meal will be dispensed tomorrow, and will not be dispensed 1 year into the future.
(b)   I would prefer to learn that my [favourite]/[most disliked] meal will be dispensed 1 year into the future, and will not be dispensed tomorrow.

And *one* of the following statements:

(c)   I would prefer to learn that my [favourite]/[most disliked] meal was dispensed yesterday, and was not dispensed 1 year in the past.

(d)   I would prefer to learn that my [favourite]/[most disliked] meal was dispensed 1 year in the past, and was not dispensed yesterday.

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[11] Cf. Greene et al. (2020).

After responding to each statement, participants were then asked to indicate their level of confidence in their judgement. After having done so for both statements participants proceeded to a new screen, where they answered a comprehension question: "In this vignette, you were asked to imagine that you were…" with the answer options (1) an astronaut (2) a dog. Participants who chose (2) were excluded. At no point could participants return to a previous screen.

3.2 Results

Before reporting the statistics and details, here we first provide a summary of the findings. We found that participants preferred hedonic events to be nearer to them in time than non-hedonic events, and that they preferred positively valenced events to be nearer to them than negatively valenced events.

We found similar average judgments for the past as for the future. However, there was a high degree of heterogeneity, with a large proportion of people that did not show future-directed near bias or past-directed near bias.

At the individual participant level, we had hypothesised that participants who showed a particular bias for the future, or not, would show the same bias (or lack of bias) for the past. In other words, we expected participants' judgments would show temporal symmetry. Instead, we found no correlation between participants' judgments about the past and their judgments about the future.

In order to control for effects of the wording of the questions, in each condition participants were asked two of four question types. For example, half of the participants in the positive hedonic condition were asked how much they *agreed* with the statement that they would prefer their favourite meal to be dispensed tomorrow, and not one year in the future, while the other half were asked how much they *agreed* with the statement that they would prefer their favourite meal to be dispensed one year in the future, and not tomorrow. To appropriately combine the results from these two forms of the questions, levels of agreement with the latter question were reverse-coded (i.e., a response of 1 was transformed into a response of 7; a response of 2 was transformed into a response of 6, and so on). After this reverse coding, the results are *as if* all participants had been asked their levels of agreement that they would prefer the event in question be located tomorrow, and not 1 year in the future. More generally, in what follows, *higher levels of agreement* indicate participants' collective preference for the event in question to be located in the *near* past or future (whichever is relevant).

Level of agreement and level of confidence judgments were analysed using separate repeated-measures ANOVAs. The ANOVAs included a within-subjects factor of temporal direction (past; future) and between-subjects factors of valence (negative; positive) and event type (hedonic; non-hedonic). We also calculated Pearson correlation coefficients to assess the association between levels of agreement for the past with that of the future.

3.2.1 Level of Agreement

The 2x2x2 repeated-measures ANOVA revealed a main effect of event type $F(1, 484) = 7.122$, $p = .008$ and valence $F(1, 484) = 23.003$, $p < .001$. The third factor, direction, did not have a significant effect, $F(1,484) = 1.660$, $p = .198$. No significant interaction effects were observed.

The main effect of event type showed that levels of agreement were significantly higher for hedonic events ($M = 4.17$, $SD = 1.45$) than for non-hedonic events ($M = 3.82$, $SD = 1.46$). That is, participants overall preferred hedonic events to be nearer to them in time than non-hedonic events.

The main effect of valence showed that levels of agreement were significantly higher for positively valenced events ($M = 4.31$, $SD = 1.46$) than for negatively valenced events ($M = 3.68$, $SD = 1.45$). That is, participants overall preferred positively valenced events to be nearer to them than negatively valenced events.

There was no main effect of direction (past versus future), suggesting that participants overall behaved similarly in the past and the future. Critically, however, little to no correlation was evident between individual participants' responses for the questions about the past and those about the future. The Pearson correlation coefficient calculated between levels of agreement in the past conditions and levels of agreement in the future conditions was not statistically significant ($r = .023$, $t(486)$, $p = .607$) and the narrow 95% confidence interval (-0.067, 0.112) suggests there is in fact close to no relationship. Breaking the data down by the four conditions (negative hedonic, negative non-hedonic, positive hedonic, positive non-hedonic), the estimated correlations are similarly close to zero (rs $= -.008$, $.093$, $-.017$, $-.118$) and not statistically significant (ps = 0.933, 0.315, 0.850, 0.196). Hence, the overall apparent symmetry between past and future was not representative of individuals' preferences.

When presented with certain sorts of questions, participants give a restricted range of Likert scale responses, and restriction of range can result in very small correlations. Here, however, while indifference was sometimes the modal response, participants did use the entire range of responses (see Fig. 1). Substantial numbers of people strongly preferred, strongly did not prefer, and indicated they were completely neutral on, the questions in this study. This may well reflect distinct groups of people in the population, but getting strong support for that would require further investigation.

The pattern of data underlying the net zero or close to zero correlation within participants is shown in Fig. 2. The lack of a statistically significant correlation is consistent with the proposition that a participant's preference for near or remote events in the past provides no information about whether they prefer an event to be near or remote in the future.

Although there is no correlation between participants' past- and future-directed preferences, participants do appear to differ in the *magnitude* of the responses they tend to give: that is, the same participants who have more extreme preferences about the past, tend to have more extreme preferences about the future. This could account for the apparent clustering of responses at the corners and in the centre—consider that if all participants gave the same magnitude of answers for the past questions as for the future questions, the data would form an "X" in Fig. 2. To explore this possibility, we calculated the magnitude of participants' answers, subtracting 4 from every response and then taking the absolute value.

The magnitude scores were positively correlated for past and future, suggesting that participants' responses to different questions do tend to be similar in magnitude. For negative hedonic events $r = 0.252$ ($t(123) = 2.893$, $p = 0.005$), negative non-hedonic $r = 0.546$ ($t(116) = 7.014$, df $= 116$, $p < .001$), positive
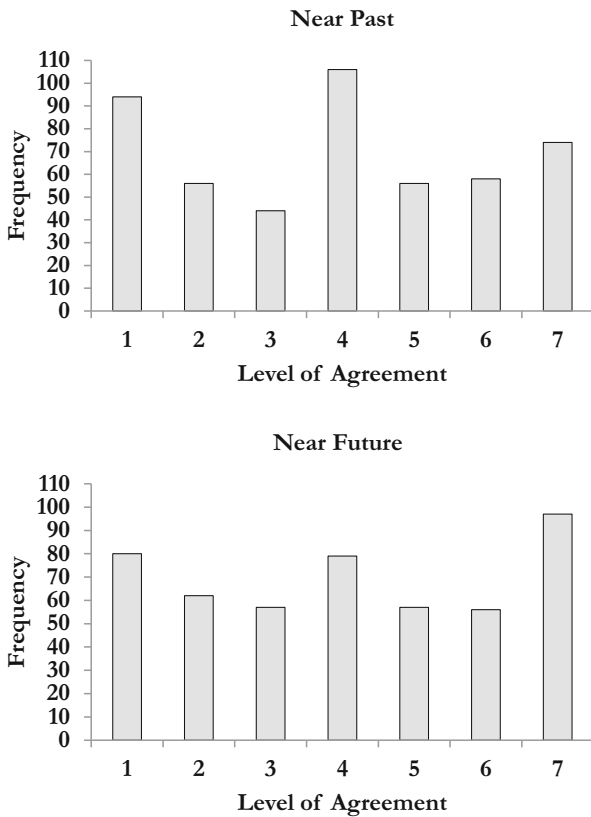
Near Past

Near Future

Fig. 1 Level of agreement Judgments for past (top) and future (bottom) conditions, collapsed across hedonic and non-hedonic events and positive and negative valence. "1" is strongly disagree, "7" strongly agree with a statement in the direction that indicates a near preference

hedonic $r = 0.394$ (t(121) = 4.709, $p < .001$), and positive non-hedonic $r = 0.626$ (t(120) = 8.784, $p < 0.001$).

3.2.2 Level of Confidence

The 2x2x2 repeated-measures ANOVA found a main effect of direction $F(1, 484) = 5.447$, $p = .02$ and a two-way interaction between direction and event $F(1, 484) = 4.968$, $p = .026$. No other significant main effects or interaction effects were observed.

The main effect of direction was that confidence was slightly higher for the future conditions ($M = 5.59$, $SD = 1.46$) than for past conditions ($M = 5.437$, $SD = 1.59$).

Simple effects tests using a Bonferroni correction for four comparisons were carried out on the two-way interaction between direction and event. First, for past judgments there was no significant difference in levels of confidence between hedonic events ($M = 5.48$, $SD = 1.57$) and non-hedonic events ($M = 5.40$, $SD = 1.58$; $p = .558$). Second, for future judgments, levels of confidence were significantly higher for hedonic events ($M = 5.78$, $SD = 1.46$) than non-hedonic events ($M = 5.40$, $SD = 1.46$; $p = .005$). Third, for hedonic events, levels of confidence were significantly higher for future judgements than for past judgments ($p = .001$). Fourth, for non-hedonic events there was no
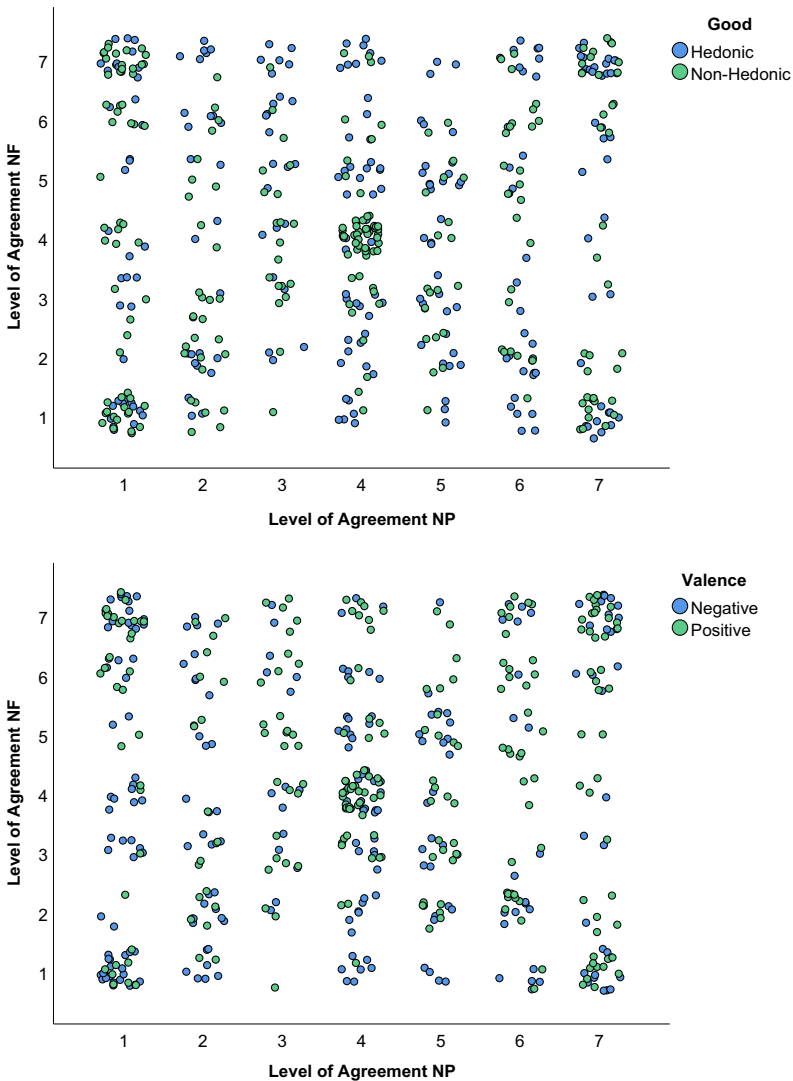
Fig. 2 Individual participant responses. Preference for near past against preference for near future. Top, data is broken down by hedonic (blue) and non-hedonic (green). Bottom, data is broken down by negative valence (blue) and positive valence (green). No association is evident between the near-past and near-future levels of agreement (see text). Points are jittered to avoid complete overlap

significant difference in levels of confidence between past and future judgments ($p = .941$; see Fig. 3).

Participants' level of confidence in their response to their past condition was positively correlated with that of their future condition judgment, $r = .558$, $t(486) = 14.81$, $p < .001$. That is, the more confident someone was in their judgment in one condition, the more confident they were in the other condition. This is much like the magnitude of participants' preferences, which were also correlated (see previous section). In fact it is possible that the confidence correlation is a consequence of the
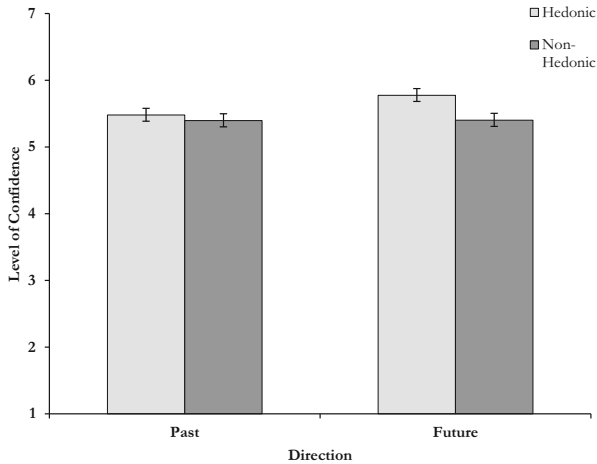
Fig. 3 Levels of confidence, collapsed across valence. The main effect of direction was significant, as was the interaction between direction and event Error bars are one standard error

correlation in preference magnitudes. Suchman (1950), among others, has observed that stronger preferences are correlated with higher certainty.

4 Discussion

Initial examination of our results suggests that the past/future symmetry hypothesis is vindicated: at the population level, we find symmetries between past- and future-directed preferences regardless of whether the events are hedonic or non-hedonic, and regardless of their valence. In this regard, our findings were as we predicted based on the earlier findings of Yi et al. (2006) and Bickel et al. (2008). In particular, we found that, on average, participants showed both future *and* past-directed near bias for hedonic events (positive and negative). Moreover, just as Greene et al. (2020) found decreased levels of *future* bias with respect to non-hedonic events compared to hedonic events, we found decreased levels of *near* bias with respect to non-hedonic events compared to hedonic events.

Nevertheless, and interestingly, although on average participants displayed this pattern of preferences, a large proportion of people did not express any preference, or expressed the opposite preference. Indeed, our results show that participants' preferences were extremely variable, and hence that it may be misleading to interpret the data via averages. Instead, we find some indication of trimodality—that is, peaks of roughly similar height at both extremes and at the indifference point. This variability is large enough that it suggests that there are multiple sub-populations of approximately equal size having very different preferences. One such sub-population appears to display future-directed near-biased preferences; one displays indifference, and one displays future-directed *far*-biased preferences. There appear to be the same three sub-populations when we look to past-directed preferences: those who are past-directed near biased, those who are indifferent, and those who are past-directed *far* biased. It is the existence of these six roughly equal sub-populations that appears to give rise to the population-level symmetry of past/future preferences.

It is important to remember, however, that the past/future symmetry hypothesis is the hypothesis that insofar as *individuals* show certain patterns of future-directed preferences, they will show the *same* pattern of past-directed preferences. Yet we found little to no correlation between individuals' future-directed and past-directed preferences. To put it another way, none of the three sub-populations of individuals who displayed each of the three kinds of future-directed preferences were correlated with any of the three sub-populations who displayed the three kinds of past-directed preferences. This means that we failed to vindicate the past/future symmetry hypothesis, and thus failed to provide support for simple time neutralism. As we argued in Section 2, if simple time neutralism is correct to claim that the anticipatory/retrospectory mechanism is responsible for both future bias and future-directed near bias, then those individuals who exhibit future-directed near bias ought also to exhibit past-directed near bias, which is something that we did not find.

Equally, however, we failed to find evidence in support of temporal metaphysic hybridism. As we discussed in Section 2, temporal metaphysic hybridism claims that there is a deep metaphysical asymmetry between the past and future that justifies future bias but not near bias. Moreover, if our (irrational) future-directed near bias is explained by the nature of our anticipation, we should not expect past-directed near bias since we do not anticipate past events. Thus, temporal metaphysic hybridism predicted that people would display both future bias and future-directed near bias, but not past-directed near bias. As noted above, at population-level we found that on average participants displayed both future-directed near bias *and* past-directed near bias. Further, this population can be broken down into three distinct sub-populations, only one of which displayed future-directed near bias, and only one of which displayed past-directed near bias. There was, however, no correlation between participants' future-directed near bias and past-directed near bias.[12]

This suggests that a much more complicated account of our past-directed, and perhaps also future-directed, preferences, is called for. In particular, it suggests that, as Frederick et al. (2002) and Soman et al. (2005) argue, intertemporal choices are the *joint* product of *conflicting* motives. Many experiments demonstrate that people sometimes prefer to incur a loss immediately rather than delay it.[13] One explanation for this is that delaying an unpleasant experience results in disutility from anticipation (i.e., negative "waiting"). Other experiments suggest that people often prefer improving sequences over declining ones (Loewenstein and Prelec 1991), or to maximize the utility of anticipation by delaying positive events (i.e., positive "waiting") (Loewenstein 1987, 1996). So while there is evidence suggesting that people tend to devalue distant-future events in comparison to their near-future analogues, this devaluation is countered by considerations from the utility of anticipation (positive waiting), the disutility of anticipation (negative waiting), and preferences for improving sequences.

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[12] One might worry that these results are due to using hypothetical scenarios to test participants' preferences. At least in some behavioural economics studies, participants' preferences are tested under non-hypothetical conditions in which, for instance, they gain or miss out on real money. Clearly, the testing of past-directed preferences cannot be done in anything other than a hypothetical manner. Nevertheless, it's worth noting that a number of studies have found very similar results when comparing participants' responses to hypothetical and non-hypothetical scenarios (Lagorio and Madden (2005); Johnson and Bickel (2002)).

[13] See Benzion et al. (1989); Loewenstein (1987); and MacKeigan et al. (1993).

Our results suggest that these different factors regarding future-directed preferences may differently affect individuals, thus explaining the apparent trimodal distribution we found. The fact that we found a similar distribution with regard to past-directed preferences, but *no* correlation between past-directed and future-directed preferences, suggests that there are likely to be a *different* plurality of factors that determine individuals' past-directed preferences, and that individuals are differently sensitive to these factors. That is to say, these results suggest that mechanisms underlying past-directed near bias and future-directed near bias are quite different, and, plausibly, independent of one another.

These results suggest that some version of time neutralism is correct. Our results support the time neutralist contention that there is no sense in which our preferences are tracking, or are the result of, some single, deep, temporal asymmetry, which justifies those preferences. Indeed, temporal metaphysic hybridism seems to be motivated by the idea that there is a set of shared preferences, and that the structure of space-time can justify those preferences. Once we see, however, that there is no such set of shared preferences, then this view becomes much less plausible. Indeed, if true, it will result in us saying that a majority of the population are irrational, since they do not display the preferences that the hybridist takes to be justified.

However, our results do not support simple time neutralism, for we do not see symmetrical future- and past-directed near bias at the individual level. Instead, it seems that there are multiple mechanisms that influence our future-directed preferences, and multiple mechanisms that influence our past-directed preferences, and that these mechanisms differently influence the preferences of individuals. That is why we see a variety of both future-directed and past-directed preferences. We will not attempt, here, to spell out these various mechanisms. Instead, we will introduce an example of the type of mechanism that we believe influences past-directed near biased preferences.

Research shows that most memories fade over time: memories for recent events typically contain more sensorial and contextual detail than those for remote events (Johnson et al. (1988)), while memories of positive experiences often contain more such details than memories of negative experiences (Byrne et al. (2001); D'Argembeau et al. (2003); Destun and Kuiper (1999)). Hence, if one wants to maximise the extent to which one remembers a pleasant event, one may prefer that event to be in the near past, rather than the far past. Likewise, if one wants to minimise the extent to which one remembers an unpleasant event, one may prefer that event to be in the far past, rather than the near past. On the assumption that people generally want to remember pleasant events and forget unpleasant events, it makes sense for people to be past-directed near biased. Thus, those participants for whom memory effects are salient can be expected to display past-directed near bias. The appearance of past-directed far bias, by contrast, will require appeal to a distinct mechanism. Past-directed near neutrality (like future-directed near neutrality) might then be explained by these competing mechanisms 'cancelling one another out.'

To be clear, it is not our contention that these descriptive results prove that (some more sophisticated form of) time neutralism is correct, and that temporal metaphysic hybridism is false. Descriptive results can only go so far in the context of normative theorising. The fact that people display certain preferences cannot show either that they ought to display those preferences, or that they ought not. Nevertheless, we do think that the great amount of diversity in people's preferences that we found in this study undermines a good deal of the motivation for hybrid views, which take themselves to be in the business of vindicating supposedly shared preference patterns. Furthermore,

the most likely predictions that temporal metaphysic hybridism makes about our past-directed preferences have been shown not to obtain. This does not prove that the view is false, but it does suggest that those who have been committed to some form of hybridism have reason to re-evaluate their view.

Similarly, while these results support sophisticated forms of time neutralism, they are equally consistent with the view that there are *no* normative facts about which pattern of preferences people *ought* to have: perhaps there are simply the preferences that people do have, which vary a great deal, and no fact about what preferences they ought to have. We cannot speak to this issue here, but it may be that this data provides some support for adherents of this view.

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