**Moving Ego versus Moving Time: Investigating the Shared Source of Future-Bias and Near-Bias**

**Abstract**

It has been hypothesized that our believing that, or its seeming to us as though, the world is in some way dynamical partially explains (and perhaps rationalizes) future-bias. Recent work has, in turn, found a correlation between future-bias and near-bias, suggesting that there is a common explanation for both. Call the claim that what partially explains our being both future- and near-biased is our believing/it seeming to us as though the world is dynamical, *the dynamical explanation.* We empirically test two versions of the dynamical explanation. The first is *the moving ego explanation*—according to which it is our belief that the ego moves, or our phenomenology as of the ego moving, that jointly (partially) explains future- and near-bias. The second is the *moving time explanation*—according to which it is our belief that time robustly passes, or our phenomenology as of robust passage, which jointly (partially) explain future- and near-bias. We found no evidence in favour of either explanation.

1. **Introduction**

Humans are time-biased—we have preferences for where some events are located in time, and these preferences are sensitive to where in time those events are represented as being. There are a variety of ways in which agents can be time-biased. An agent is said to be *near-biased* if she tends to prefer that positive events are located temporally near to her, and that negative events are located temporally far from her, holding fixed relevant factors.[[1]](#footnote-1) An agent is said to be *future-biased* if she tends to prefer that positive events are located in the future rather than the past, and that negative events are located in the past rather than the future, again holding relevant factors fixed. [[2]](#footnote-2) Though the nature of near-bias and future-bias have both been studied (the former much more extensively than the latter), there has been very little work on the relationship between these biases. This could be because it is largely assumed that near-bias and future-bias have little in common.

While most philosophers take near-bias to be rationally objectionable,[[3]](#footnote-3) they take future-bias to be rationally permissible.[[4]](#footnote-4) On this assumption, it is rationally impermissible to value the utility of temporally nearer selves over the utility of temporally distant selves, but there is nothing rationally amiss about valuing the utility of temporally future selves over the utility of temporally past selves. What could explain this normative asymmetry? According to one plausible explanation, which we call the *independence assumption*, these biases are normatively asymmetrical because they have distinct sources.[[5]](#footnote-5) Perhaps future-bias arises because there is a relevant asymmetry between the past and future, and since the near future and distant future do not have this same kind of asymmetrical relationship, this factor can only explain and (potentially) justify future-bias and not near-bias.

Recent research by Latham, Miller and Norton (ms) places the independence assumption in jeopardy. Latham et al. found a moderately strong association between being future-biased and being near-biased and a significant correlation between the strength of future-biased preferences and near-biased preferences. This suggests that at least one factor partially explains both future-bias and near-bias, and in turn undermines the independence assumption. Latham et al. go on to argue that without the independence assumption, it is unlikely that there could be a normative asymmetry between near and future-bias. We take no stand on this latter issue. Rather, we focus on the prior question of what kind of factor could (partially) explain both near- and future-biased preferences.

Philosophers and psychologists have recently begun to investigate two broad classes of explanation of future-bias: the *practical irrelevance explanation* and the *dynamical explanation.*

According to the practical irrelevance explanation, we are future-biased because we have some degree of causal control over future events, which makes them objects of practical concern, whereas the past is largely causally inaccessible to us, and thus practically irrelevant.[[6]](#footnote-6) Since the practical irrelevance explanation does not seem well suited to explain near-bias (at least insofar as people show this bias even when both events are fairly temporally close, and each appear to be causally accessible) we set this explanation aside.

According to the dynamical explanation,[[7]](#footnote-7) our (likely tacit) beliefs about, or phenomenology of, movement *in or of time* explains our future-biased preferences.[[8]](#footnote-8) According to one version of the dynamical explanation, it is our belief that *time* moves (that is, that time robustly passes,[[9]](#footnote-9) and/or our having a temporal phenomenology as of time moving)[[10]](#footnote-10) which explain our future-biased preferences.

If we believe, or it seems to us as though, future events are ‘coming towards us’ and then receding ever further away from us into the past, then we might expect to prefer that negative events are ‘behind us’ and ‘over and done with’ by having moved past us, (negative future-bias) and that positive events are ‘ahead of us’ and are moving towards us (positive future-bias). This explanation can be expanded to account for near-bias as well. If we believe, or it seems to us as though, future events are ‘coming towards us’ and then receding ever further away from us into the past, then we might expect to prefer to reach positive events sooner rather than later (positive near-bias) and negative events later rather than sooner (negative near-bias). Call the claim that our belief that time moves and/or our phenomenology as of time moving (partially) explains both near- and future-bias, the *moving time hypothesis.*

According to another version of the dynamical explanation, it is not the movement of time that explains our preferences, but rather, our movement relative to time. If we believe, or it seems to us as though, we are ‘moving towards future events’ and ‘moving away from past events’ then we might expect to prefer that we have moved away from negative events (negative future-bias) and that we are moving towards positive events (positive future-bias). Likewise, if we believe, or it seems to us as though, we are ‘moving towards the future and away from the past’, then we might expect to prefer to reach positive events sooner rather than later (positive near-bias) and negative events later rather than sooner (negative near-bias). Call the claim that our belief that the ego moves and/or our phenomenology as of the ego moving (partially) explains both near- and future-bias, the *moving ego hypothesis.*

In this paper, we investigate both the moving time and moving ego hypotheses. If the moving time hypothesis is correct, then we would expect there to be associations between, on the one hand, moving time beliefs and/or moving time phenomenology and future-bias and near-bias. If the moving ego hypothesis is correct, then we would expect there to be associations between, on the one hand, moving ego beliefs and/or moving ego phenomenology and future-bias and near-bias. Our study aims to detect the presence of any such associations. In §2 we outline the extant literature on near-bias and future-bias, and we present our hypotheses. In §3 we describe our methodology and results. In §4 we consider the implications of those results, with respect to both the explanation and the rationality of future-bias and near-bias. We show that there is no support for either the moving time or moving ego hypotheses, and thus conclude against the dynamical explanation in §5.

**2. The Literature to Date**

It is often thought that our world seems to us, either in experience or belief, to be *dynamical*.[[11]](#footnote-11) Often this is captured by the idea that we believe, or it seems to us as though, time robustly passes.[[12]](#footnote-12) By ‘robust temporal passage’, we mean the kind of passage posited by A-theories of time. A-theories of time hold that there is an objective, observer-independent fact about which moment (or set of events) is present, and which moment (or event) this is, changes. Robust temporal passage is just this change in which events are objectively present.[[13]](#footnote-13) (By contrast, B-theories of time hold that moments in time only stand in *earlier than* and *later than* relations to one another, and are not ‘past’, ‘present’, or ‘future’ except from the perspective of particular observers located at particular times. Since there is no objective present, there cannot be robust passage.[[14]](#footnote-14)) The idea that time is dynamical, or that we experience it as such or believe that it is this way, has been suggested to explain why, (and perhaps to render as rational) our being future-biased.[[15]](#footnote-15)

The dynamical explanation has recently been the target of empirical investigation. A number of studies have probed several aspects of the dynamical explanation. That explanation, recall, appeals to the idea that it is people’s beliefs about, and/or phenomenology as of, movement in, or of, time which explains our future- and near-biased preferences. These studies have teased apart several aspects of the dynamical explanation: our *beliefs*, on the one hand, and our *phenomenology*, on the other. Call the claim that it’s our beliefs that partially explain future- and near-bias, the *dynamical belief explanation*, and call the claim it’s our phenomenology that partially explains these biases, the *dynamical* *phenomenology explanation.* While no studies to date have investigated the role of beliefs and/or phenomenology in *jointly* explaining future-bias and near-bias, several have investigated their role in explaining future-bias alone.

Latham, Miller, Tarsney and Tierney (2021) tested the dynamical beliefs explanation. Their study failed, however, to find any association between people’s dynamical beliefs and future-bias. They did, however, find that participants were more future-biased when presented with dynamical vignettes as compared to static vignettes. This was so regardless of whether participants believed that our world is the way it was presented as being in that vignette (i.e., whether they had the dynamical belief or not).

Latham et al. hypothesised that the dynamical description in the vignettes generated, or made salient, a dynamical phenomenology and this, rather than people’s beliefs, is what impacted future-bias. If that were true, it would provide support for the idea that dynamical phenomenology partially explains future-bias.

In a follow up study, Latham, Miller, Tarsney and Tierney (2022) aimed to test the dynamical phenomenology explanation. They presented participants with vignettes that described dynamical phenomenology, and found that participants were not significantly more future-biased when they saw the dynamical phenomenology vignette rather than the static phenomenology vignette. Nor were participants who said that things seem to them as described by the dynamical phenomenology vignette more likely to be future-biased than those who said that things seem to them as described by the static phenomenology vignette. On the face of it, this tends to undermine the idea that it is dynamical phenomenology which explains future-bias. However, the authors hypothesised that perhaps the reason for these results was that the vignettes did not affect future-bias because the language used to describe the experiences (e.g., ‘seems’, ‘feels’, etc.) were phenomenal underminers: they indicated that the phenomenology in question was not veridical. Together, Latham et al. (2021) and Latham et al. (2022) provide some reason to think that when dynamical phenomenology is taken to be veridical, its presence may promote future-bias.

For our purposes, however, previous work on the dynamical explanation, in both its belief and phenomenology guises, have two significant limitations. First, these studies did not aim to test the relationship between near and future-bias. Second, this previous work did not aim to clearly distinguish between different forms of the dynamical explanation. Recall the dynamical explanation:

**Dynamical Explanation:** People’s (perhaps tacit) beliefs about, or phenomenology of, the moving in or of time, (partially) explains both their near-biased and future-biased preferences.[[16]](#footnote-16)

As discussed, there are two forms that this explanation can take. First, there is the *moving ego explanation.* Moving ego metaphors are a suite of expressions which suggest that the ego moves through time. These expressions employ motion verbs such as ‘he is *nearing* his birthday’. Social scientists have found significant use of such metaphors, and hypothesise that they reflect people’s tendency to believe, or for it to seem as though, the self or ego is moving through time.[[17]](#footnote-17) More recently, Latham, Miller and Norton (2020b) reported that for a range of moving ego expressions, a majority of people agreed that things seemed as described by the moving ego expressions, suggesting that people do have a moving ego phenomenology. Thus, according to the moving ego explanation, our (likely tacit) belief that we move away from the past, and towards the future, or its seeming to us, in experience, as though we move away from the past and towards the future explainsour future- and near-biased preferences.

Second, there is the *moving time explanation*.

**Moving Time Explanation:** People’s (perhaps tacit) beliefs about, or phenomenology of, the ego moving (partially) explains both their near-biased and future-biased preferences.

Social scientists have noted that many languages include moving time metaphors.[[18]](#footnote-18) The moving time metaphors are a suite of expressions which suggest that time itself moves. These expressions employ motion verbs such as ‘his birthday is *approaching*’. Latham, Miller and Norton (2020b) found that across various moving time expressions many (in some cases most) people at least weakly agree that things are as described by those expressions. According to this version of the dynamical explanation, our (likely tacit) belief that the future is moving toward us or its seeming to us, in experience, as though the future is moving toward us, explainsour future-biased and near-biased preferences.

Our goal is to empirically investigate both the moving ego and moving time hypotheses. In particular, we aim to investigate both the belief and phenomenology versions of each. We aim to determine whether it is moving ego beliefs and/or moving ego phenomenology that partially explain our future-biased and near-biased preferences. We also aim to determine whether it is moving time beliefs and/or moving time phenomenology that partially explain our future-biased and near-biased preferences. We assume, then, that moving ego beliefs/phenomenology are distinct from moving time beliefs/phenomenology. This may prove not to be the case. Social scientists have noted that many languages include one or both of what are known as moving time or moving ego metaphors. Latham, Miller and Norton (2020b) found a correlation between people agreeing that things seem to them as though time moves and agreeing that it seems to them as though the ego moves. It could be, then, that these are just two different ways of describing the same underlying dynamical beliefs/experiences. However, since we do not know whether or not this is the case, we want to separately test the moving time and moving ego versions of the dynamical explanation.

Previous work on the dynamical explanation has not always clearly differentiated between the two versions of the dynamical explanation introduced above. For instance, while the vignettes used in Latham, Miller, Tarsney and Tierney (2021) are probably best thought of as describing moving time rather than a moving ego, the vignettes used in Latham, Miller, Tarsney and Tierney (2022) do not distinguish between moving time and moving ego phenomenology. So, even if we focus only on the explanation of future-bias, these studies cannot tell us whether, insofar as there is evidence for the dynamical explanation, this is evidence for the moving time explanation, the moving ego explanation, or both. Nor, of course, can these studies tell us whether one or both of these versions of the dynamical explanation partly explain both future- *and* near-bias.

A further limitation on previous work is that the methodology used was entirely vignette based. Previous studies eliminated a high percentage of participants because they failed the comprehension checks, suggesting that many people had difficulties understanding elements of the vignettes. Since the concept of moving time and of the moving ego are ones that lend themselves to fairly simple diagrams and animations that are plausibly easier to comprehend than long descriptive vignettes, in this study we made use of such diagrams in explicating the metaphysically complex notions of moving time and moving ego. We still use vignette-based methodologies to probe people’s preferences, however, since this cannot be achieved via diagrams, and since these vignettes are quite straightforward to understand (and previous studies such as that of Greene, Latham, Miller and Norton (2021a; 2021b) did not generate high rates of comprehension failure).

In experiment 1 we investigate whether there is an association between people believing that, or it’s seeming as though, the ego moves, and people being both near-biased and future-biased, and whether there is an association between people believing that, or it’s seeming as though, time moves, and people being both near-biased and future-biased. To test people’s near/future-biased preferences, we presented them with a modified vignette from Greene, Latham, Miller and Norton (2021a). In order to test their beliefs/phenomenologies we presented participants with several moving pictorial representations and asked them which of these best describes how they believe things are, and which best describes how things seem to them to be. We call one of these a *moving ego depiction*, one a *moving time depiction*, and one a *static depiction*.

If there is a shared explanation for both near- and future-bias (even if partial) we should expect to find an association between people being future-biased and being near-biased. This is the association hypothesis, (H1).

H1: There will be an association between people being future-biased and being near-biased.

If people’s belief that time moves partially explains why they are both future- and near-biased (the moving time belief hypothesis) then we should find that more people who believe that the moving time depiction captures how they think our world is will be future-biased and near-biased compared to those who believe that the static depiction best depicts how they think our world is. This is our second hypothesis, H2.

H2: More people who believe that the moving time depiction captures how they think our world is, will be future-biased and near-biased compared to those who believe that the static depiction best depicts how they think our world is.

If people’s belief that the ego moves partially explains why they are both future- and near-biased (the moving ego belief hypothesis) then we should find that more people who believe that the moving ego depiction captures how they think our world is, will be future-biased and near-biased compared to those who believe that the static depiction best depicts how they think our world is. This is our third hypothesis, H3:

H3: More people who believe that the moving ego depiction captures how they think our world is, will be future-biased and near-biased compared to those who believe that the static depiction best depicts how they think our world is.

If people’s phenomenology as of time moving partially explains why they are both future- and near-biased (the moving time phenomenology hypothesis) then we should find that more people who have this moving time phenomenology will be future-biased and near-biased compared to those who have static phenomenology. This is our fourth hypothesis, H4:

H4: More people who judge that things seem to them to be as presented by the moving time depiction will be future-biased and near-biased compared to those who judge that things seem to them as depicted by the static depiction.

Finally, if moving ego phenomenology partially explains why they are both future- and near-biased (the moving ego phenomenology hypothesis) then we should find that more people who have this moving ego phenomenology will be future-biased and near-biased compared to those who have static phenomenology. This is our fifth hypothesis, H5:

H5: More people who judge that things seem to them to be as depicted by the moving ego depiction will be future-biased and near-biased compared to those who judge that things seem to them as depicted by the static depiction.

More generally, if support is found for H2 or H4, then this in turn will provide support for the moving time explanation. If the moving time explanation is correct, then we would expect there to be an association with either beliefs about, or experiences of, time moving and either near- and future-bias. Similarly, if support is found for H3 or H5, then this will provide support for the moving ego explanation. If the moving ego explanation is correct, then there should be an association between either beliefs about, or experiences of, the ego moving through time and either future- and near-bias.

In experiment 2 we investigate whether we can manipulate the degree to which people exhibit future-bias by priming them with just one of the temporal depictions considered in experiment 1 (moving ego vs. moving time vs. static). We predicted that people who saw one of the dynamical depictions would be more likely to show future-biased preferences than people who saw the static depiction, because seeing a dynamical depiction would tend to make salient, or promote, the relevant beliefs/phenomenology. We hypothesised that:

H6: More people who see the moving ego depiction will be future-biased and near-biased compared to those who see the static depiction.

H7: More people who see the moving time depiction will be future-biased and near-biased compared to those who see the static depiction.

If support is found for H6, then that would provide support for the moving ego explanation in a manner that is analogous to H3/H5. Similarly, if support is found for H7, then that would provide support for the moving time explanation in a manner that is analogous to H2/H4.

These predictions were pre-registered at <https://osf.io/fjx9p/>.[[19]](#footnote-19)

**3. Methodology and Results**

**3.1 Experiment 1 Methodology**

*3.1.1 Participants*

391 people participated in the study. Participants were U.S. residents who were tested online using Amazon Mechanical Turk and compensated $1.25 for their time. 166 participants had to be excluded from the analyses. That is because they failed to answer all the questions (42), failed an attentional check (55) or failed to correctly answer 3 out of 4 comprehension questions (69). The remaining sample was composed of 225 participants (72 female, 4 trans/non-binary; mean age 36.72 (SD = 10.02)). Ethics approval for the study was obtained from the [blanked] Human Research Ethics Committee. Informed consent was obtained from all participants prior to testing. The survey was conducted online using Qualtrics.[[20]](#footnote-20)

*3.1.2* *Materials and Procedure*

Participants were split into two conditions: positive and negative. In the positive condition, participants reported the extent of their future-biased and near-biased preferences in response to a vignette about a positive hedonic event (ingesting a pill that cures disease but causes the side-effect of 3 days of extreme pleasure). In the negative condition, participants reported the extent of their future-biased and near-biased preferences in response to a vignette about a negative hedonic event (ingesting a pill that cures disease but causes the side-effect of 3 days of extreme pain).

The vignettes used are amended versions of Greene et al.’s (2021a) positive and negative hedonic vignettes. They are amended in such a way as to try to control for two factors that might lead people to express merely apparent future-biased or near-biased preferences. These factors are more pronounced for near-bias than for future-bias and controlling for them adds some complexity to the vignettes, which explains why they were not controlled for in Greene et al.’s (2021a) study.

The first factor our vignettes aim to control is the subjective probability of the event occurring (regardless of its temporal location). We controlled for this factor by stipulating that the pill has already been taken, and that it is certain to cause the relevant side-effects. All that is uncertain is *when* those side-effects will occur. The second factor our vignettes aim to control is the intrinsic value of the goods received to the self that receives them. This factor was controlled for by specifying that the pill’s side-effect causes pain/pleasure *to the self that experiences the side-effect.* Since the positive and negative vignettes differ only minimally, we can present them together:

Imagine that 3 months ago you had a genetic test and the results showed that you are very likely to develop a fatal disease in 10 years. Luckily, just after the results of the test came in, the doctor gave you a pill that prevents this disease from developing. You took the pill in his office, and so you will not develop that disease.

The pill is very safe, and is certain to have no long-term side effects. The medication does, however, have one short-term side effect. At some time during the 12 months after you have ingested the pill, it causes the brain to misinterpret certain signals, and as a result causes three consecutive days of intense [pain]/[pleasure] after which these side-effects cease and you return to normal.

You wake up one morning after a restless night, and for a moment cannot remember whether you have already experienced these side effects.

After reading the vignette, participants responded to four comprehension questions.

In this vignette you were asked to imagine that:

(a) 3 months ago you had a genetic test, which shows you are likely to develop a fatal disease in 10 years time.

(b) Having taken the pill, you will avoid developing the fatal disease.

(c) You wake up one morning and remember that you already experienced the pill’s side effects yesterday.

(d) The pill will cause you to experience 3 consecutive days of high fever.

After each question, participants were given the option of (a) True or (b) False. Participants who failed to correctly answer 3 out of 4 comprehension questions correctly were excluded from the study.

Participants then saw two sets of questions: one probing whether, and the extent to which, they have prospective near-biased preferences, and one probing whether, and the extent to which, they have future-biased preferences. The order in which participants saw these questions was randomised. Participants were asked:

Please indicate your preference using one of the following statements:

1. I would prefer to learn I will start to experience the side-effects of the pill tomorrow, and not in 8 months time.
2. I would prefer to learn that I will start to experience the side-effects of the pill in 8 months time and not tomorrow.
3. I have no preference between learning that I will start to experience the side-effects of the pill in 8 months time and learning that I will start experiencing them tomorrow.

Please indicate your preference using one of the following statements:

1. I would prefer to learn that I will start to experience the side-effects of the pill tomorrow, and did not start experiencing them 3 days ago.
2. I would prefer to learn that I started experiencing the side-effects of the pill 3 days ago, and will not start experiencing them tomorrow.
3. I have no preference between learning that I will start to experience the side-effects of the pill tomorrow and learning that I started experiencing them 3 days ago.

Participants were presented with three pictorial representations. One depicts moving time, one depicts a moving ego, and one depicts a static scene. These can be found at <https://osf.io/fjx9p/>. The moving time depiction shows an image of a person, and the event of experiencing the side-effects of the pill. Participants who see the positively valenced version of the vignette see an image that depicts the positive side-effects of the pill, and those who see the negatively valenced version see an image that depicts the negative side-effects of the pill. In those images, the event of experiencing those side-effects comes closer to a stationary person and then recedes into the past. The moving ego depiction depicts the same events, but this time the person moves from a time before the side-effects are experienced, to a time after they are experienced. The static representation simply shows the relative location of the events. We then ask participants the following forced choice question:

Which diagram do you think is most like the way you believe our universe is?

1. Diagram 1
2. Diagram 2
3. Diagram 3

Finally, participants were then told:

We can distinguish between what you *believe* about the way our universe is, and how the universe *seems* to you to be, as you experience it. For instance, sometimes things seem to you to be the way that you believe them to be. Below are two shapes.

A picture containing shape

Description automatically generated

They will probably *seem* to you to be the same size; you probably also *believe* that they are the same size. That's because they are the same size.

Sometimes, though, the way things seem to you can be different from how you believe things to be.

For instance, it can *seem* to you, in your experiences, as though the two lines below are different lengths, even though (if you’ve learned about this illusion before) you don’t believe that they are.

![A picture containing clock, watch

Description automatically generated]()

Participants were then asked the following question:

Bearing this in mind, which diagram do you think is most like the way our universe *seems* to you?

(a) Diagram 1

(b) Diagram 2

(c) Diagram 3

**3.2 Experiment 2 Methodology**

*3.2.1 Participants*

1141 people participated in the study. Participants were U.S. residents who were tested online using Amazon Mechanical Turk and compensated $1 for their time. 449 participants had to be excluded from the analyses. That is because they failed to answer all the questions (156), failed an attentional check (133) or failed to correctly answer 3 out of 4 comprehension questions (160). The remaining sample was composed of 692 participants (281 female, 14 trans/non-binary; mean age 39.21 (SD = 11.65)). Ethics approval for the study was obtained from the [blanked] Human Research Ethics Committee. Informed consent was obtained from all participants prior to testing. The survey was conducted online using Qualtrics.

*3.2.2* *Materials and Procedure*

Participants were split into six conditions, which were every combination of valence (positive vs. negative) and depiction (moving ego, moving time, static). Participants first saw the same vignette (positive or negative) as in experiment 1 and answered the same comprehension questions. Participants who failed to correctly answer 3 out of 4 comprehension questions were excluded from the analyses. Participants in both positive and negative conditions then either saw the moving ego, moving time, or static depiction.

Participants were then asked the same prospective near-bias preference and future-bias preference probe questions as in experiment 1.

*3.3 Results*

We will begin by summarizing our major findings with respect to our hypotheses before reporting the statistics. No support was found for any of our hypotheses. No support was found for the association hypothesis (H1) in either experiment. We did not find evidence of a robust association between people being near-biased and future-biased. No support was found for the moving time belief hypothesis (H2) nor the moving ego belief hypothesis (H3). We did not find evidence that more participants who believe that the moving time or moving ego depiction best captures how our world is, are more near-biased or future-biased relative to those who believe that the static depiction best captures how our world is. No support was found for the moving time phenomenology hypothesis (H4) nor the moving ego phenomenology hypothesis (H5). We did not find evidence that more participants who judged that our world seems as if time moves, or as if the ego moves, are more near-biased or future-biased relative to those who judged that the world seems static. Finally, our results did not support H6 or H7. We did not find evidence that participants who saw either the moving time or moving ego depiction were more near-biased or future-biased relative to those who saw the static depiction.

Experiment 1

Table 1 below summarizes the descriptive data of participants’ responses regarding their near- and far-biased preferences. The ‘NB’ column represents the number of participants who report positive and negative prospective near-biased preferences. The ‘FrB’ column represents the number of participants who report positive and negative prospective far-biased preferences. The ‘NP’ column represents the number of participants who report a time-neutral preference (i.e., people who report having no preference regarding when in time (near future or far future) the side-effects are experienced).

*Table 1. Descriptive data from all conditions of participants’ responses to the near-bias prompt.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Condition** | **NB** | **FrB** | **NP** |
| **Positive** (n = 114) | 53 (46.5%) | 32 (28.1%) | 29 (25.4%) |
| **Negative** (n = 111) | 25 (22.5%) | 62 (55.9%) | 24 (21.6%) |

To check whether there was any association between people’s near-biased preferences and condition (positive or negative) we ran a chi-squared test of homogeneity. This test revealed that there was a significant association between valence and people’s reported preference (𝜒2 (2, *N* = 225) = 20.061, *p* < .001). Post-hoc comparisons with a Bonferroni correction showed that people were more prospectively near-biased (*p* < .001) and less prospectively far-biased (*p* < .001) in positive conditions than in negative conditions. There was no significant association between valence and the numbers of people who reported having no preference.

Table 2 below summarises the descriptive data of participants’ responses regarding their future- and past-biased preferences in experiment 1. The ‘FB’ column represents the proportion of participants who report positive or negative future-biased preferences. The ‘PB’ column represents the proportion of participants who report positive or negative past-biased preferences. The ‘NP’ column represents the proportion of participants who report time-neutral preferences (i.e., people who report having no preference regarding when in time (future or past) the side-effects are experienced).

*Table 2. Descriptive data from all conditions of participants’ responses to the future-bias prompt.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Condition** | **FB** | **PB** | **NP** |
| **Positive** | 55 (48.2%) | 34 (29.8%) | 25 (21.9%) |
| **Negative** | 62 (55.9%) | 31 (27.9%) | 18 (16.2%) |

Once again, to check whether there was any association between people’s future- and past-biased preferences and valence we ran a chi-squared test of homogeneity. The test revealed that there was *no* significant association between valence and people’s reported future-biased preferences (𝜒2 (2, *N* = 225) = 1.657, *p* = .437). That is, there was no evidence of association between the valence of the vignette people were asked to consider and the proportions of people who reported being future-biased, past-biased, and time-neutral.

Next, to test whether there was any association between people’s reported prospective near-biased preferences and future-biased preferences we ran a chi-square test of independence. The results of this test revealed a significant association between prospective near-biased preferences and future-biased preferences (𝜒2 (4, *N* = 225) = 84.950, *p* < .001). However, when we removed the time-neutral responses from the analyses the result became non-significant, (𝜒2 (1, *N* = 225) = .022, *p* = .882). Thus, we found no robust evidence of there being an association between people’s near-biased and future-biased preferences.[[21]](#footnote-21)

Table 3 below summarizes the descriptive data of participants’ beliefs about whether the world is most like the moving time, moving ego, or static time depiction, and whether the world seems to be most like one in which time moves, the ego moves, or time is static, for all conditions.

*Table 3. Descriptive data from all conditions of participants’ beliefs about which depiction is most like our world and which depiction seems most like our world.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Judgment | Condition | Static | Moving Time | Moving Ego |
| Belief | Positive | 27 (23.7%) | 58 (50.9%) | 29 (25.4%) |
|  | Negative | 31 (27.9%) | 53 (47.7%) | 27 (24.3%) |
| Seeming | Positive | 29 (25.4%) | 48 (42.1%) | 37 (32.5%) |
|  | Negative | 31 (27.9%) | 48 (43.2%) | 32 (28.8%) |

To check whether there was any association between, on the one hand, people’s beliefs about which depiction is most like our world, and which depiction seems most like our world, and, on the other hand, valence, we ran separate chi-squared tests of homogeneity. The results of those tests revealed that there was *no* significant association between valence and people’s reported belief (𝜒2 (2, *N* = 225) = .533, *p* = .766) or between valence and people’s reported seeming (𝜒2 (2, *N* = 225) = .389, *p* = .823).

Finally, we ran separate chi-squared tests of independence to test for an association between, on the one hand, people’s beliefs about whether the world is most like the moving time, moving ego, or static time depiction, and whether the world seems to be one in which time moves, the ego moves, or time is static, and, on the other hand, their near-biased and future-biased preferences. There was *no* significant association between participants’ reported beliefs and their near-biased preferences (𝜒2 (4, *N* = 225) = 5.358, *p* = .252) or their future-biased preferences (𝜒2 (4, *N* = 225) = 3.273, *p* = .513). There was also *no* significant association between participants’ reports about how the world seems and their near-biased (𝜒2 (4, *N* = 225) = 3.802, *p* = .434) or their future-biased preferences (𝜒2 (4, *N* = 225) = 6.954, *p* = .138). Thus, we found no evidence in support of the moving time or moving ego belief hypotheses, nor the moving time or moving ego phenomenology hypotheses.[[22]](#footnote-22)

Experiment 2

Table 4 below summarizes the descriptive data of participants’ responses regarding their near- and far-biased preferences across all conditions.

*Table 4. Descriptive data from all conditions of participants’ responses to the near-bias prompt.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Condition** | **NB** | **FrB** | **NP** |
| **Positive** | | | |
| Static (n = 111) | 51 (45.9%) | 24 (21.6%) | 36 (32.4%) |
| Moving Ego (n = 122) | 46 (37.7%) | 36 (29.5%) | 40 (32.8%) |
| Moving Time (n= 112) | 54 (48.2%) | 35 (31.3%) | 23 (20.5%) |
| **Negative** | | | |
| Static(n = 119) | 31 (26.1%) | 68 (57.1%) | 20 (16.8%) |
| Moving Ego (n = 114) | 30 (26.3%) | 58 (50.9%) | 26 (22.8%) |
| Moving Time (n = 114) | 25 (21.9%) | 66 (57.9%) | 23 (20.2%) |

To check whether there was any association between people’s near-biased preferences and valence (positive or negative) we ran a chi-squared test of homogeneity. This test revealed that there was a significant association between valence and people’s reported preference (𝜒2 (2, *N* = 692) = 55.963, *p* < .001). Post-hoc comparisons with a Bonferroni correction showed that people were more likely to be prospectively near-biased (*p* < .001) and less likely to be prospectively far-biased (*p* < .001) in positive conditions than in negative conditions. People were also more likely to report having no preference in positive conditions (*p* = .007).

Next, to test whether there was any association between people’s near-biased preferences and the depiction of time they were asked to consider (static or moving ego or moving time) we ran a chi-squared test of homogeneity. This test revealed that there was *no* significant association between which depiction of time people were presented with and their reported near-biased preference (𝜒2 (4, *N* = 692) = 4.048, *p* = .400).[[23]](#footnote-23)

Table 5 below summarizes the descriptive data of participants’ responses regarding their future- and past-biased preferences across all conditions.

*Table 5. Descriptive data from all conditions of participants’ responses to the future-bias prompt.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Condition** | **FB** | **PB** | **NP** |
| **Positive** | | | |
| Static (n = 111) | 51 (45.9%) | 34 (30.6%) | 26 (23.4%) |
| Moving Ego (n = 122) | 61 (50.0%) | 31 (25.4%) | 30 (24.6%) |
| Moving Time (n= 112) | 47 (42.0%) | 48 (42.9%) | 17 (15.2%) |
| **Negative** | | | |
| Static(n = 119) | 74 (62.6%) | 33 (27.7%) | 12 (10.1%) |
| Moving Ego (n = 114) | 68 (59.6%) | 25 (21.9%) | 21 (18.4%) |
| Moving Time (n = 114) | 65 (57.0%) | 32 (28.1%) | 17 (14.9%) |

Once again, to check whether there was any association between people’s future-biased preferences and valence we ran a chi-squared test of homogeneity. The test revealed that there was a significant association between valence and people’s reported future-biased preferences (𝜒2 (2, *N* = 692) = 13.196, *p* = .001). Post-hoc comparisons with a Bonferroni correction showed that people were more likely to be future-biased in negative conditions than in positive conditions (*p* < .001). There was no significant association between valence and the proportions of people who reported being past-biased and having no preference.

Next, to test whether there was any association between people’s future-biased preferences and the depiction of time they were asked to consider (static or moving ego or moving time) we ran a chi-squared test of homogeneity. This test revealed that there was *no* significant association between which depiction of time people were presented with and their reported near-biased preference (𝜒2 (4, *N* = 692) = 9.175, *p* = .057).[[24]](#footnote-24)

Finally, we were interested in re-testing (H1). To test whether there was any association between people’s reported prospective near-biased preferences and future-biased preferences we ran a chi-square test of independence. The results of this test revealed a significant association between prospective near-biased preferences and future-biased preferences (𝜒2 (4, *N* = 692) = 126.871, *p* < .001). However, once again, when we removed the time-neutral responses from the analyses the result became non-significant, (𝜒2 (1, *N* = 479) = .387, *p* = .534). Thus, as before we found no support for an association between people’s near-biased and future-biased preferences.[[25]](#footnote-25)

*4. Discussion*

Although we found no support for any of our hypotheses, there are several notable aspects of our results. First, our results support the results of earlier work which found that people were significantly more strongly future-biased regarding negative events (Greene et al. 2021a) than positive events (Greene, Latham, Miller and Norton forthcoming). Interestingly, the results of the current study suggest that the opposite is true of near-bias, since we found more near-bias in positive conditions compared to negative ones.

Unlike Latham, Miller and Norton (ms), however, we did not find an association between future-bias and near-bias (at least, once people who had no preference were removed from the sample). This is puzzling given that Latham, Miller and Norton (ms) found a moderately strong association. One potential explanation for this is the difference in the relative proportions of people reporting being future-biased and near-biased across the two studies. Latham, Miller and Norton (ms) found a larger proportion of people reporting both future-biased and near-biased preferences than we did in the current study. The difference in proportions may, in turn, be explicable in terms of the differences between the vignettes that participants saw.

Latham, Miller and Norton used a vignette that was amended from Greene et al. (2021a) in which participants are asked to imagine they are astronauts on a (very safe) 10-year voyage between planets. The ship’s food dispenser usually produces only bland meals, but on one day dispenses either a favourite (positive valence) or most disliked (negative valence) meal. It is also stipulated that the meal is the favourite/most disliked to the self that receives it (in case tastes change) and that the machine is extremely reliable (so the probability of receiving the meal is the same whether it was received in the past, or will be received in the future). By contrast, in the current study we controlled for the probability of the outcomes by stipulating that the pill, which gives rise to the side effects (negative or positive) has already been taken, and that the side effects cause the brain to misfire (producing pain/pleasure for the self who experiences them).

We would have predicted that Latham, Miller and Norton’s study would find *lower* levels of future-bias and near-bias than in the current study. Even though it is stipulated in Latham, Miller and Norton’s study that space travel is very safe and one is certain to receive one’s future meal, it would be reasonable for participants to think that the future meal is less probable than the past meal, and perhaps also that the far-future meal is less probable than the near-future meal (after all, insofar as participants did not accept that space travel was entirely safe, they might reasonably have thought that their probability of surviving for the next 5 years was less than their probability of surviving a few days and hence that they would be more likely to receive their future meal if it were temporally closer rather than further away).

By contrast, in the current study the pill has already been taken, and will lead to the side-effects. The only question is *when* those side effects occur. Moreover, since the side-effects seem to be more potent in the current study (1 or 3 days of pleasure or pain vs. one favourite/most disliked meal) we would, again, have expected to find higher levels of future- and near-bias. That, however, is not what we found.

Two things stand out to us as key differences between the vignettes. First, in the current study participants have discovered that they had a fatal disease, which has been cured, and that the pill that they have already taken is crucial to maintaining that cure. Second, in the Latham, Miller and Norton study, the favourite/most disliked meals are contrasted with 10 years of otherwise bland meals. In the current study, we do not contrast the pain/pleasure with any period of time in which there are having, say, bland experiences. These factors might singly or jointly explain the lower levels of future- and near-bias. It may be that the side-effects of the pill (good or bad) are to some extent overshadowed by the fact that the pill is a necessary component in preventing the fatal genetic disease. Perhaps the relief people feel at having the disease cured via the pill to some extent swamps their emotional reactions to the side-effects of the pill, dampening their tendencies towards near- or future-bias. It may also be that the painful/pleasurable side effects of the pill are also somewhat muted because they occur against the backdrop of having been diagnosed with a potentially fatal disease, and against a backdrop of a life which presumably contains both pains and pleasures. By contrast, in the Latham, Miller and Norton study, the favourite/most disliked meal occurs against a backdrop of 10 years of bland meals, in which the relative benefit of the favourite meal, and disbenefit of the most disliked meal, may be starker.

If something like this is right, then it suggests that the extent to which people manifest these biases may be quite sensitive to, *inter alia,* small differences in the overall affect of the situation on the individual and/or to the difference between the target of the preference and background conditions. Accordingly, time-neutralists—those who argue that both near- and future-bias are rationally impermissible—may be able to use the results of the current study to defend their position. Critics of both near- and future-bias have argued that these preferences are irrational because they are arbitrary, or are sensitive to normatively irrelevant factors.[[26]](#footnote-26) If it could be shown that these preferences are subject to small differences in the overall effect of a particular situation and thus to what seem to be irrelevant factors, then perhaps time-neutralists are right that near- and future-biases are arbitrary, in so far as they are themselves subject to more or less arbitrary differences between cases.

In addition to shedding some light on near- and future-biases, experiment 1 provides an interesting picture of people’s temporal beliefs and temporal phenomenologies.

Consider, first, people’s beliefs. We found that ~50% of people believed that our world was most like the moving time depiction, with ~25% believing that it was most like the moving ego depiction and ~25% believing that it was most like the static depiction. As Latham, Miller and Norton (2019) note, it has been standard in the philosophy of time to claim that dynamical theories of time better accord with how the folk conceptualise and/or experience time. A series of earlier studies including that of Latham, Miller and Norton (2019, 2020a) investigated this contention using written descriptions of dynamical worlds and static worlds.[[27]](#footnote-27) They found, across several studies, that ~70% of people reported that our world was most like a dynamical world (of some sort or other) and ~30% reported that it was most like a static world. The current study is a useful follow up to this work, since it targets people’s beliefs in a way that does not require that people are able to understand fairly metaphysically demanding vignettes (although the current study does not, unlike that of earlier work, allow us to distinguish different dynamical views). Notably, our results show that ~70% of people think our world is most like either the moving time or moving ego depiction, which is very similar indeed to the percentage of people who Latham, Miller and Norton found to believe our world to be dynamical. We take the current work, then, to be a useful partial replication of those earlier studies. Roughly 70% of people do indeed believe that our world is *dynamical in some sense or other.*

That being said, we need to be careful here as it may be a bit quick to take the ~25% of people who judge that the ego moves as evidence for belief in a dynamical picture of reality. It is possible that moving ego depictions are just another way of judging that our world is dynamical. So it may be that the right conclusion to draw is that 70% of people believe that our world is one in which time robustly passes. Equally, however, it might be that participants who judge that our world is most like the moving ego depiction are not best categorised as believing that time robustly passes. Even if as a matter of metaphysical fact there is no difference between time passing and the ego moving (which perhaps is arguable) it could still be that people who represent that time moves, are genuinely representing something different from those who represent that the ego moves.

If the latter possibility is the case it should be of particular interest to B-theorists, who take time to be static. Previous research has shown that people do not believe that time is essentially dynamical (Latham, Miller and Norton 2020b). That is, they do not believe that worlds that lack dynamism do not(?) contain time. This is some comfort to B-theorists who hold that time is not essentially dynamical (and, typically, not actually dynamical either). Still, as already noted, previous work suggests that a majority of people represent our world as containing robust passage. This poses a potential problem for B-theorists, as it seems to provide a body of data that A-theorists can use to support their view (perhaps by using the data to support an argument from experience to the truth of the A-theory). If, however, the ~25% of people who represent that the ego moves do not also represent that time robustly passes, then this suggests that although 70% of people do represent our world to be in some manner dynamical, that 70% may not represent time as strictly speaking robustly passing. Thus, B-theorists might try to argue that the 25% of people who believe that the ego moves have a representation of time that is *as close* to that of a static representation as to a genuinely temporally dynamical representation. And if that were so, then it would not be true that a majority of people represent time as robustly passing, and so it would not obviously be true that most people represent time in a way that is friendlier to the A-theory than to the B-theory.

The results just discussed relate to people’s beliefs about how the world really is. Unsurprisingly, we find very similar results when we look to people’s judgements about how things *seem* to them to be. Of course, it is notoriously difficult to get people to clearly distinguish between how things seem to them to be, experientially, and how they believe them to be.[[28]](#footnote-28) This is why the current study includes prompts that help people understand the difference between these two notions. Still, we expected there to be a high degree of similarity between people’s beliefs about how things are and the way things seem to them to be: after all, you might expect people’s relatively naïve (i.e., philosophically and scientifically untutored) beliefs about time to be largely the product of how things seem to them to be, especially since we know from prior research by Latham Miller and Norton (2019) that people’s knowledge of science has little impact on their beliefs about time.

Temporal phenomenology has been important in theorising about the metaphysics of time. Dynamists have often offered *the argument from temporal phenomenology* (Baron, Cusbert, Farr, Kon and Miller 2015) according to which we have reason to think our world is temporally dynamical because this is how it seems to us to be, in perceptual experience. Recently, some B-theorists have responded to this argument by denying that it does seem this way to us in experience (Hoerl 2014, Prosser 2016, Deng 2013, 2018, Bardon 2013, Miller, Holcombe and Latham 2020, Miller 2019, Miller forthcoming). Defenders of this view are known as deflationists. Some deflationists have noted that even if our world is a B-theoretic world, we would expect it to seem a way that we might describe by saying that we are moving away from the past and towards the future. That is because at later times we gain new memories, and we find that options that were once open, are now closed. A natural way to describe this seeming would be in terms of a moving ego (Deng 2013, Ismael 2012). Previous work in this area suggests that the phenomenology in question might in fact be better conceived of in this manner. For instance, Latham, Miller and Norton (2020b) and Shardlow, Lee, Hoerl McCormack, Burns and Fernandes (2020) presented participants with a range of moving time and moving ego expressions and asked them how much they agreed that things are how they seem. Both studies found that people tended to weakly agree that things seem as described by the moving time expressions, and that they more strongly agree (and more of them do so) that things seem as described by the moving ego expressions. Latham, Miller and Norton (2002b) took this to be evidence against the idea that we have a strong, pervasive, phenomenology as of time robustly passing, and that instead this phenomenology is better described in terms of moving ego locutions. If so, this would be good news for deflationists who, remember, deny that we have a phenomenology as of time robustly passing.

Interestingly, in the current study we found that *more* people judged that things seem as if time moves, than as if the ego moves. It may be, then, that standard, purely vignette-based methods that use certain kinds of movement expressions (which are common in psychology) yield somewhat different results to those which use animated depictions. Perhaps these animated depictions prompt participants to reflect on different aspects of their phenomenology. The results of the present study thus may suggest that there is an aspect of temporal phenomenology that is better described as being one in which it seems as though time, rather than the ego, is moving. That is not such good news for deflationists.

Having said that, it is notable that more people, in total, judged that it seems as though either time is static or the ego moves, than judged that it seems as though time moves. This is an important result. As just noted, many deflationists think that we have a phenomenology that we might be tempted to describe as being one in which the ego moves, and that our having that phenomenology and its being veridical, is entirely consistent with our world being B-theoretic. These B-theorists, then, might point out that if the results of our study are accurate, then more people have a phenomenology on which it does *not* seem as though time robustly passes, than people who do, and that on their view all of these people can be understood as having a veridical phenomenology. In this regard, then, the results are not all bad news for deflationists.

Let us now consider the implications of our research for investigation of near- and future-bias. Recall that we found no evidence in favour of either the moving ego or moving time hypotheses. This result is consistent with earlier work by Latham, Miller, Tarsney and Tierney (2021, 2022). In their 2022 they found no effect of temporal phenomenology on future-bias using vignette-based methods. We replicated this finding with respect to future-bias. Although they go on to hypothesise that the presence of veridical moving time phenomenology *might* tend to promote future-bias, there was no direct evidence of this in their 2021 except for the observed correlation between the vignette people saw (dynamical vs. static) and future-biased preferences. They found no effect of people’s actual beliefs on future-bias. The present study replicates that finding as well. What we might have expected to find, however, in light of their 2021 results, is that priming people with a dynamical depiction would make them more future-biased than those primed with the static depiction. We did not find this. We are unsure what explains this, but perhaps it is the product of the different vignettes used across the two studies. Regardless, when we look at the totality of evidence here across these 6 studies, we think it suggests that neither people’s beliefs about time moving or about the ego moving, nor their relevant phenomenologies, explain (even partially) their being near- or future-biased.

Of course, there are limitations to the second experiment in which people were primed with dynamic and static depictions. It could be that whatever phenomenology people have is unaffected by a relatively quick prime, and hence that such a primer makes no difference to their preferences. If this were so, then we would not expect to see more people being near- or future biased just because they have seen a depiction in which time or the ego moves. Even if that is right however, we would expect to find an association between people reporting that it seems to them as though time or the ego moves, and having near or future-biased preferences, if the latter is partially explained by the former. We did not find this. On that basis, we are inclined to say that people’s representation of time or the ego as moving do not even partially explain why people are near- or future-biased.

This, in turn, has implications for the normative evaluation of these biases, and in particular for the evaluation of future-bias. It has particular impact on the evaluation of future-bias, since the normative status of near-bias has not previously been linked with people’s representations/experiences as of time or the ego moving.

Defenders of future-bias have often appealed to temporal metaphysics to argue that such preferences are rationally permissible, or indeed obligatory (Prior 1959; Schlesinger 1976; Craig 1999; Pearson 2018). Since these authors often acknowledge that near-bias is not rationally permissible, they aim to show that there is some normatively relevant difference between past and future, and hence between the well-being of past and future person-stages, and that our preferences are sensitive to that feature, which both explains and makes rationally permissible our having those preferences. They often do so by arguing that our beliefs about and/or experiences of time are what explain and justify our future-biased preferences. According to these views, our experiences of robust temporal passage are veridical, and the belief that time robustly passes is justified. Moreover, the presence of robust passage justifies future-biased preferences because past events are ‘over and done with’, and receding from the present, while future events are still due to become present. So, we are suitably sensitive to these features of time, and these features render our future-biased preferences permissible. [[29]](#footnote-29)

The results of the present study suggest that our future-biased preferences would not be rendered permissible by there being robust passage. In order for some structure in the world to render rationally permissible some preference it needs to be that the preference is appropriately sensitive to that structure. For instance, the fact that there is a dog in this room is the right kind of thing to justify one’s belief that there is a dog in the room. But it only does so on the assumption that the belief is appropriately connected to there being a dog in the room. If there is no association between one’s having the belief that there is a dog in the room and there being a dog in the room, then the way the world is does not in fact make it rationally permissible for one to believe that there is a dog present because the belief is not appropriately tracking the way the world is. We found no association between people’s beliefs about time or the moving ego, or their experiences thereof, and their preferences. This, in turn, suggests that whether people are future-biased or not is not sensitive to what they believe about time, or the moving ego, or to their experiences regarding whether time, or the ego, moves. So even if the presence of robust passage were the *kind* of thing that would make such preferences rationally permissible or obligatory, even if time did robustly pass, or the ego did move, it’s hard to see how this would in fact render our preferences permissible.

Of course, that does not show that future-bias is not rationally permissible. Its permissibility could be grounded in something else. Our point here is just that one purported account of in what their rationality consists, lacks empirical support.

*5. Conclusion*

The purpose of this study was to examine the dynamical explanation: the claim that both near- and future-bias are to be explained in terms of one’s beliefs about, or phenomenology as of, there being movement of, or in, time. In contrast to previous work, we considered two versions of the dynamical explanation: the moving time and moving ego explanations. The moving time explanation focuses on beliefs about the movement of time itself, and associated phenomenology. The moving ego explanation focuses on beliefs about the movement of an individual through time, and associated phenomenology. We failed to find support for either explanation, and so see no reason to accept the dynamical explanation. Thus, we think, whether or not time or the ego moves, it is not the movement of either that explains why we have the time-biased preferences we do, and hence contra what many philosophers have supposed, this is not what renders these preferences rationally permissible (if indeed they are). Finally, the current study is unique in the way it uses non-vignette-based methodologies to probe beliefs about and/or experiences of time. In this way, the study provides a template for future experimental work on time.

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1. Thaler (1981) showed that people prefer less money given now to more money given later, and Hausman (1979) found that people were willing to buy cheaper air conditioners with higher operating costs down the line. For overviews see Soman et al. (2005), Frederick et al. (2002), Ainslie & Haslam (1992) and Hardisty et al. (2012). In economics and psychology this is sometimes known as temporal discounting, or as having a high time preference (as opposed to having a low time preference). For example, see Fredrick et al. (2002), and, Lawless, Drichoutis, & Nayga Jr (2013). People have been shown to vary both intra and inter-personally when it comes to the rate with which they discount goods/events. See for instance Loewenstein & Elster (1992) and Frederick et al. (2002) for an informative meta-analysis. [↑](#footnote-ref-1)
2. Recent empirical work has found evidence of both positive and negative hedonic future-bias (Caruso, Gilbert & Wilson (2008), Greene, Latham, Miller & Norton (2021a)) and that people continue to show that pattern of preferences even when there is an inequality of utility between the past/future event. That is, Greene, Latham, Miller & Norton (2021a) found that a significant majority of people are negatively hedonically future-biased even when ten negative past events are weighed against a single negative future event. This study did not find that positive future-bias continued when the ratio of positive past events to future events was 10:1. However, recent work by Greene, Latham, Miller and Norton (2022) shows that people still prefer more positive events in the past compared to fewer in the future, when the ration is 2:1. For other work on future-bias see Latham, Miller, Norton & Tarsney (2020) and Lee, Hoerl, Burns, Fernandes, O’Connor & McCormack (2020). [↑](#footnote-ref-2)
3. Economists tend to disagree, arguing that near-bias is only irrational when it leads to dynamical inconsistency (e.g., Strotz 1956, Koopmans 1960, Lancaster 1963, and Fishburn and Rubinstein 1982). [↑](#footnote-ref-3)
4. Although the normative status of future-bias has been the subject of recent controversy (Hare 2007, 2013, Dougherty 2011, 2015, Greene & Sullivan 2015, Sullivan 2018, Dorsey 2018, Brink 2011, Parfit 1984). [↑](#footnote-ref-4)
5. Or because the normatively relevant sources are not shared. [↑](#footnote-ref-5)
6. Defenders of something like this view include Kauppinen (2018) and Horwich (1987, pp. 194-196). It is developed more fully and explicitly by Maclaurin & Dyke (2002) and Suhler & Callender (2012). Latham, Miller, Norton & Tarsney (2020) found that future-bias is mitigated when agents consider cases in which they can causally influence the past, as the practical irrelevance hypothesis predicts, and Greene, Latham, Miller & Norton (2021a) found that when people are brought to think agentively about the location of events in time, they are less inclined to be negatively future-biased, and indeed instead exhibited negative *past*-bias. However, Latham et al. still found residual future-bias, indicating that practical irrelevance is likely only one factor that gives rise to future-bias. [↑](#footnote-ref-6)
7. Greene, Latham, Miller & Norton (2021a), Latham, Miller, Norton & Tarsney (2020) and Latham, Miller, Norton, Tarsney & Tierney (2021, 2022) call this the temporal metaphysics hypothesis. [↑](#footnote-ref-7)
8. Defenders of hypotheses such as these include Prior (1959), Pearson (2018) Schlesinger (1976), and Craig (1999). [↑](#footnote-ref-8)
9. By ‘robust temporal passage’, we mean the kind of passage posited by A-theories of time. A-theories of time hold that there is an objective, observer-independent fact about which moment (or set of events) is present, and which moment (or events) this is changes. Robust temporal passage is just this change in which events are objectively present. [↑](#footnote-ref-9)
10. A ‘phenomenology as of temporal passage’, then, is a phenomenology whose content represents that the world contains robust passage, whether or not the world is in fact the way it is represented to be (hence the *as of).* [↑](#footnote-ref-10)
11. Paul (2010); Dainton (2011, 2012); Le Poidevin (2007), Norton (2010) Schuster (1986). [↑](#footnote-ref-11)
12. Zimmerman, (2008) Smith (1994), Craig (2000) and Schlesinger (1994, 1982), Smith (1993), Gale (1968) Ludlow (1999), Williams, (1998, 2003), McTaggart (1908). [↑](#footnote-ref-12)
13. Sometimes this change consists in the movement of a property of presentness across existing events, which then change from being future, to being present, (when they have the property) to being past (as in a moving spotlight model). Sometimes this change consists simply in the change of a single three-dimensional object with respect to which objects or events exist (as in presentism) and sometimes it consists in the accretion of new moments of time or events, where these new moments/events are present when they come into existence, and then become past as new moments/events come into existence. [↑](#footnote-ref-13)
14. The terminology of ‘A-theory’ and ‘B-theory’ is originally due to McTaggart (1908). For an overview of the debates between A-theorists and B-theorists, see Zimmerman (2005). [↑](#footnote-ref-14)
15. See for instance Prior (1959), Pearson (2018), Schlesinger (1976), and Craig (1999). [↑](#footnote-ref-15)
16. Note that the Latham et al. studies did not test the relationship between near- and future-bias, and so explored a narrower form of the dynamical explanation. However, because we do consider the relationship between near- and future-bias, we have formulated the dynamical explanation in general terms, to include both kinds of bias. [↑](#footnote-ref-16)
17. Sinha & Gardenfors (2014). [↑](#footnote-ref-17)
18. Sinha & Gardenfors (2014). [↑](#footnote-ref-18)
19. The link is disabled while the paper is under blind review. [↑](#footnote-ref-19)
20. 68% of the remaining sample correctly answered all the comprehension questions. [↑](#footnote-ref-20)
21. Given the earlier association between valence and near-biased preferences, some readers might wonder whether there is an association between near-biased and future-biased preferences but that the association differs according to valence. Results of a Breslow-Day test (Breslow & Day, 1980) found *no* evidence that the association between near-biased and future-biased preferences differs across valence conditions (𝜒 2 ­(1, N = 225) = .646, *p* = .421). It is important to note that in order to perform this test, we had to combine far-biased and no-preference responses into a single new category: *non*-*near biased*. We also had to combine past-biased and no-preference responses into a single new category: *non-far biased*. [↑](#footnote-ref-21)
22. Removing time-neutral responses does not change the reported results. Again, some readers may wonder given the association between near-biased preferences and valence, whether there is an association between people’s reported beliefs and seemings, and their near-biased preferences but that it differs according to valence. Results of separate Breslow-Day tests found *no* evidence that the association between beliefs and near-biased preferences (𝜒2 (2, *N* = 225) = 0.892, *p* = .892) and between seeming and near-biased preferences (𝜒2 (2, *N* = 225) = 1.414, *p* = .493) differed across valence conditions. [↑](#footnote-ref-22)
23. Removing time-neutral responses does not change the reported results. And results of a Breslow-Day test revealed *no* evidence that the association between the condition people were asked to consider and near-biased preferences differs across valence conditions (𝜒2 (2, *N* = 692) = 2.710, *p* = .258). [↑](#footnote-ref-23)
24. Again, removing time-neutral responses does not change the reported results. And results of a Breslow-Day test revealed *no* evidence that the association between the condition people were asked to consider and future-biased preferences differs across valence conditions (𝜒2 (2, *N* = 692) = .578, *p* = .749). [↑](#footnote-ref-24)
25. Results of a Breslow-Day test found *no* evidence that the association between near-biased and future-biased preferences differs across valence conditions (𝜒 2 ­(1, N = 692) = 2.310, *p* = .129). [↑](#footnote-ref-25)
26. See, for instance, Sidgwick (1884, chapter 13) and Rawls (1971, 293–294) as well as Parfit (1984), Brink (2010), Dougherty (2011) and Greene & Sullivan (2015). For instance, it has been argued that people exhibit future-biased preferences for hedonic events but not for non-hedonic events (Brink 2011, 378; Hare 2013; Dougherty 2015, 3, fn. 4). It has also been argued that people exhibit future-biased preferences only with respect to their own experiences but not the experiences of others (Parfit 1984, 181; Hare 2008, 2013, 509–10; Brink 2011, 378–9; Greene & Sullivan 2015, 968; Dougherty 2015, 3) and that they exhibit them more strongly for negative than positive events (Greene, Latham, Miller and Norton (2021b). However, these first two predictions have not been empirically supported. See Greene, Latham, Miller and Norton (2021a). [↑](#footnote-ref-26)
27. For a helpful overview of many studies in this area see part I of Baron, Miller and Tallant (2022). [↑](#footnote-ref-27)
28. For work in this area see Sytsma and Machery (2009), Fischer, Engelhard, Horvath & Ohtani (2019) and Arico (2010). [↑](#footnote-ref-28)
29. Contra these authors, it is not clear that even if there *were* robust temporal passage, that this would furnish any reason for caring more about the future than the past. For instance, Yehezkel writes: ‘[T]he 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’ (2013, pp. 6-7). For a similar conclusion see Miller (2021). Discussion of these issues is also to be found in Maclaurin & Dyke (2002) and Suhler & Callender (2012) [↑](#footnote-ref-29)