**Agentive Explanations of Temporal Passage Experiences and Beliefs**

**Abstract**

Several philosophers have suggested that certain aspects of people’s experience of agency partly explains why people tend to report that it seems to them, in perceptual experience, as though time robustly passes. In turn, it has been suggested that people come to believe that time robustly passes on the basis of its seeming to them in experience that it does. We argue that what require explaining is not just that people report that it seems to them as though time robustly passes, and that they believe that it does, but rather, the substantial variation (a) in people’s reports regarding whether it seems as though time robustly passes, and (b) their beliefs about whether time robustly passes. We empirically investigate *the agentive explanation* of (a), according to which variation in people’s agentive experiences explains variation in people’s reports regarding whether it seems to them as though time robustly passes. We also empirically investigate *the experiential seeming explanation of belief*, according to which variation in people’s beliefs about whether time robustly passes is explained by variation in their reports regarding whether it seems in experience as though time robustly passes. We found empirical support for the agentive explanation, but not for the experiential seeming explanation of passage beliefs. We consider the implications of our results for three views about temporal experience and temporal beliefs: dynamism, passage illusionism and deflationism.

**1. Introduction**

Call *dynamists* those who hold that time robustly[[1]](#footnote-1) passes in the manner posited by A-theorists,[[2]](#footnote-2) such that there is some objective fact of the matter as to which events are present, and such that which events those are, changes as time passes. Further, call a world dynamical if the aforementioned correctly describes it. Then there is robust passage in all and only the dynamical worlds. Call someone a *non-dynamist* if they are a temporal realist who denies that there is robust passage.The most prevalent form of non-dynamism is the view that there exist static B-relations of earlier-than, later-than and simultaneous-with, and that past, present, and future have no special metaphysical status but rather are merely relative or perspectival: what is past relative to one event is future relative to another. [[3]](#footnote-3)  Other versions of non-dynamism are ones in which there exist only static C-relations (i.e., betweenness relations) and past, present, and future are entirely perspectival.[[4]](#footnote-4) Call a world *non-dynamical* if either of the aforementioned correctly describes it. Then there is no robust passage in any non-dynamical world.

Many people, including many non-philosophers, believe that time robustly passes. When we say that someone *believes* that time robustly passes, we will mean that the content of their representation of our world is closer to a representation of a dynamical world than a non-dynamical world. So, people’s beliefs about whether time robustly passes may, on our view, be tacit in that they may be unable to describe how they take time to be, and they may never have consciously tokened any thoughts about how they take time to be in this regard. Nevertheless, they are able to use their representations to make judgments about which kind of world, dynamical or non-dynamical, is most like ours. If people judge that a dynamical world is most like our world (compared to a non-dynamical one) then we will say that they believe that time robustly passes.

Given this way of understanding what it is to believe that time robustly passes, there is good evidence that a majority of non-philosophers (henceforth just ‘people’) believe that time robustly passes (Latham, Miller and Norton 2019, 2020a, 2021; Latham, Miller, Tarsney and Tierney 2021; Hodroj, Latham, Lee-Tory and Miller 2023; Baron, Everett, Latham, Miller, Tierney and Oh 2023). Latham Miller and Norton (2019, 2020a, 2021) found that ~70% of people believe that time robustlypasses. More recently, Hodroj, Latham, Lee-Tory and Miller (2023) found that ~65% of people have this belief, while by Baron, Everett, Latham, Miller, Tierney and Oh (2023), probing people’s beliefs using animated diagrams, found that ~75% have this belief.

A further matter about which there is empirical evidence is the extent to which people report that, in experience, it seems to them as though time robustly passes. Here, investigations have found that ~40% of people *strongly* agree that it seems to them as though time robustly passes and that ~60% at least *weakly* agree that it seems this way (Latham, Miller and Norton 2020b, Shardlow, Lee, Hoerl, McCormack, Burns and Fernandes 2020).

Some explanation is required of (i) why people tend to report that it seems to them in experience as though time robustly passes, and of (ii) why they believe that time robustly passes. It is often at least tacitly suggested that an explanation of (i) and (ii) are particularly pressing for non-dynamists (for examples of this tendency see Baron, Cusbert, Farr, Kon and Miller 2015, Latham and Miller 2023, Braddon-Mitchell and Miller 2023, Hodroj, Latham, Lee-Tory and Miller 2022). After all, non-dynamists think that time does not robustly pass. So, it is at least prima facie puzzling why people both report that it seems as though time does robustly pass, and why they believe that it does. Or so the thought presumably goes. By contrast it is often supposed that the dynamist has a fairly straightforward explanation for this data. After all, she holds that time does robustly pass, so she can be expected to hold that we report that it seems to us in experience as though time robustly passes because this is how it seems to us in experience, and it seems that way because we have veridical experiences of time robustly passing. Further, she can hold that on the basis of this experiential seeming we come to believe that time robustly passes.

We think that framing the explanatory challenge in terms of (i) and (ii) is a mistake, or at least that it reflects an overly narrow explanatory focus. Given the empirical evidence we just outlined what is really required is an explanation of why a majority of people weakly agree that it seems to them as though time robustly passes, *and a substantial minority do not even weakly agree that it seems to them this way* and why a majority of people believe that time robustly passes, *and a substantial minority believe that it does not*. To put matters differently, what is required is an explanation of why there is a substantial variation in people’s reports regarding (a) *experiential* *seemings*—particularly their reports regarding whether it seems as though time robustly passes and (b) *beliefs*—particularly their reports regarding whether they believe that time robustly passes.

Henceforth, it is variation in (a) reported experiential seemings and in (b) reported beliefs, that we will suppose requires explaining.

As we see it, everyonefaces the challenge of explaining variation in reports regarding experiential seemings and beliefs. Dynamists and non-dynamists, however, might be expected to find different aspects of this explanation differentially challenging to provide. Consider, first, dynamists.

As noted, since the dynamist holds that there is robust passage it seems natural for her to hold that people experience the robust passage of time, and that is why a majority report that it seems to them as though time robustly passes. Of course, this explanation relies on our being able to detect robust passage if it exists, something that has been contested. [[5]](#footnote-5) On the assumption that this is possible, however, dynamists have a straightforward account of why *some* people report that it seems as though time robustly passes. That, however, does not yet amount to an explanation of (a), since it does not tell us why we find the amount of variation we do in people’s reports about their experiential seemings. If robust passage is pervasive, as dynamists suppose, and if we have evolved mechanisms to detect that passage, as they suppose, then it’s puzzling that so many people report failing to experience time as robustly passing. The dynamist only has two options here. She can say that a substantial minority of people fail to experience the robust passage of time, and that’s why they fail to report experiencing it. Or she can say that almost everyone experiences the robust passage of time, but that some people mistakenly fail to report their experiences correctly, and hence fail to report that they experience time’s robust passage. Which of these is the more plausible view is going to depend on the dynamist’s view about what it is to experience robust passage. Here is why.

It is usually supposed that the experience of, or as of, robust passage is a perceptual or at least quasi-perceptual experience(Paul 2010, Le Poidevin 2007, Dainton 2011, 2012, Miller 2022). Given this assumption the first option strikes us as very implausible. Insofar as there is an evolved perceptual mechanism for tracking the robust passage of time, it is likely a relatively low-level sub-personal mechanism, and hence a mechanism that does not vary very much from person to person. As such, one would not expect to find a large amount of variation in people’s perceptual experiences in this regard. Thus, if the dynamist takes the experience of robust passage to be a perceptual one, we think they should try to explain variation in people’s reported experiential seemings by holding that although almost everyone experiences the robust passage of time, some people fail to properly describe or report those experiences, and hence fail to report that they are experiences as of robust passage. The dynamist could perhaps take a leaf out of the deflationist’s book here, and suggest that some people who do not believe that time robustly passes come to conceptualise or understand their temporal experiences in non-dynamical ways, or to use non-dynamical language to describe those experiences, and hence to fail to report that it seems as though time robustly passes (Miller, Holcombe, and Latham 2020). Or perhaps the dynamist can offer some other explanation of this variation in reported experiential seemings which does not appeal to people’s beliefs about time’s robust passage.

Regardless, one might think that once the dynamist has an explanation for the variation in reported experiential seemings they then have a fairly straightforward explanation for variation in beliefs (unless they have appealed to variation in beliefs to explain variation in reported experiential seemings of course). For the dynamist can argue that people form the belief that time robustly passes on the basis of the experiential seemings that they take themselves to have. Thus, if there is variation in the experiential seemings that people take themselves to have, and hence to report, there will be variation in their beliefs about whether time robustly passes or not. Call the idea that people form their beliefs about whether time robustly passes on the basis of their experiential seemings regarding the robust passage of time (or, better, on the basis of the experiential seemings they take themselves to have) *the experiential seeming explanation of belief.* Since we often form perceptual beliefs on the basis of perceptual states, appealing to the experiential seeming explanation of beliefs is a very straightforward way to explain the variation in reported beliefs about the robust passage of time.

Next, consider non-dynamists. Non-dynamism comes in several varieties when it comes to accounting for temporal experience.

Non-dynamists who think that it seems to us, in experience as though time robustly passes—so-called *passage illusionists*[[6]](#footnote-6) —are in most ways in the same explanatory boat as the dynamist since they both hold that we have experiences as of robust passage. Unlike the dynamist, of course, the passage illusionist has the additional burden of explaining how it can be that people are subject to such a pervasive illusion. If time does not robustly pass, then none of us has ever experienced robust passage; but then, one might wonder, how could it be that we come to have experiences that represents its passing in this manner?[[7]](#footnote-7) Quite generally, what sort of mechanism could explain how people come to have such a pervasive illusory experience?[[8]](#footnote-8). One might wonder whether insofar as the passage illusionist has an explanation for the presence of this illusion, this might put her in a better position to explain the *variation* in reported experiential seemings than that of the dynamist. She just needs to explain why only some people experience this illusion. In fact, we are not so sanguine that she is better placed with regard to this variation. If the illusion is a genuinely perceptual illusion of the kind we find in, for example, the Muller Lyre illusion, then we would expect to find that almost all people are subject to that illusion. If that is right, then the passage illusionist, too, might need to explain variation in reported experiential seemings not in terms of variation in the seemings themselves, but in terms of the reports thereof. Like the dynamist though, if the passage illusionist can explain this variation in reported experiential seemings she can use this to explain variation in reported beliefs by appealing to the experiential seeming explanation of belief.

Finally, consider how things stand for the non-dynamist who rejects the idea that it seems to us, in experience, as though time robustly passes. Those who accept this view are often known as *passage deflationists*.[[9]](#footnote-9) The passage deflationist will have an easy time explaining why some people do *not* report that it seems to them as though time robustly passes: namely that these people do not have such experiences, and so they do not report having them. They will have a more difficult time, however, explaining why people *do* report that it seems to them as though time robustly passes, given that according to the deflationist it does not seem this way to those people. Some explanations for this variation in reported experiential seemings have already been proposed by passage deflationists. These passage deflationists argue that some people *misreport* the content of their own experiences as being as of robust passage because they differentially use passage-friendly language and concepts that leads them to misinterpret their own experiences (Miller Holcombe and Latham 2020). Like the dynamist and the passage illusionist, if the passage deflationist can explain variation in reported experiential seemings she can then explain variation in reported beliefs by appealing to the experiential seeming explanation of belief.

One explanation that has been offered in the literature of why some people report that it seems to them as though time robustly passes is what we will call *the* *agentive explanation*. The agentive explanation has been offered as an explanation of why people report that it seems to them as though time robustly passes. As we see it, though, an explanation of this broad kind could be offered for why we find the variation we do in reported experiential seemings. The idea would be that the greater the degree to which people experience themselves as agents, the more inclined they are to report that it seems as though time robustly passes. So, if people differentially experience agency, they will differentially report time’s seeming to them to robustly pass.

Our aim, in what follows, is to do two things. First, it is to empirically test the agentive explanation. Second, it is to test the experiential seeming explanation of belief.

We begin, in Section 2, by outlining the agentive explanation and the experiential seeming explanation of belief in more detail and developing several hypotheses. In section 3 we outline our methodology and results, and in Section 4 we discuss the implications of those results for theorising about what explains (a) and (b).

**2. The Agentive Explanation**

Let’s begin by considering the agentive explanation in more detail. Why would there be a connection between people’s experience of agency and their reports regarding their experiences as of time’s robust passage? A number of suggestions have been made in this regard.

Young (2022) offers a specific version of the agentive explanation. He argues that part of the reason people report that time seems to them to robustly pass is that people experience themselves as always acting in the present. In order to explain this experience of being causally active, but always in the present, people come to believe that there is something special about the present. Since which moment is the moment in which we are acting, changes, people come to conceptualise and then describe their agentive experiences in terms of a movement in the present moment. They then come to take these agentive experiences to be experiences of robust passage and hence to report that it seems to them as though time robustly passes.

Another idea is that in order to experience ourselves as agents at all it is necessary that we divide the world up into those things that are fixed and are the inputs to decision, and those things that are open, and are things over which we deliberate (Price 2005; Ismael 2012). Following Price (2005) let us say that the alternatives from which a deliberator chooses are her *options*. These are the propositions the agent takes herself to have the option of making true. *Fixtures* picks out all of the matters of fact not in options. Fixtures contains both the *knowns*—those facts the deliberator takes herself to know—and the *knowables*—those matters she regards as at least in principle knowable before any choice is made. Price argues that the knowns and the knowables must be subsets of fixtures because a deliberator cannot treat a matter as something to be decided by the deliberative process whilst at the same time taking it as either known or knowable prior to the deliberative process. So then in order to deliberate at all creatures must carve up the world into fixtures and options. Since agents exist at different times, they need to update their representation of what is in fixtures and what is in options. At later times matters that were in options will have moved to fixtures. The experience of agency, then, involves an experience of matters moving from options to fixtures. Experiencing matters moving from options to fixtures might involve experiencing there being a particular moment, the present, which stands *between* options and fixtures, such that which moment this is *changes* as matters that were in options, becomes fixtures.

We can distinguish three broad versions of the agentive explanation. The *tracking version* says that in experiencing the updating of options and fixtures in this manner we thereby track the robust passage of time: for in fact, as time robustly passes there is a genuine change in which matters are in fixtures, and which in options. The tracking version of the view will be attractive to dynamists. According to this version of the view, it is by having agentive experiences of this kind that (at least in part) we come to track the passage of time. Even if our experiences are tracking the robust passage of time, however, it can still be that the *extent* to which people have such agentive experiences, or the phenomenological potency of these experiences, varies, and hence the extent to which they report that it seems to them that time robustly passes also varies. Thus, the dynamist will be able to explain why people differentially report that it seems to them as though time robustly passes, and they can then use that to explain why people differentially come to believe that time robustly passes.

The *illusion version* of the view is one according to which people’s experiences of agency are themselves illusory, and on which this illusory experience of agency constitutes an illusory experience as of robust passage. We think that the best way to flesh out this view would be to argue that our agentive experiences are experiences as of the past being objectively fixed and the future objectively open, and are experiences as of a change in which events are objectively open and which fixed. If so, then according to the non-dynamist these experiences are illusory, since on this view there is no objective difference between the past and future in this regard: there is merely a *subjective, perspectival, or epistemic* difference. Hence our agentive experiences are illusory. Moreover, in having these experiences we just are having experiences as of robust passage. The illusion version of the view will be attractive to passage illusionists.

The third version of the view is the *cognitive error* version. According to this view, people differentially veridically experience agency, and people who have stronger agentive experiences sometimes report these experiences as being as of robust passage. There are two variants of this view. The first of these is what we will call the *mere mis-description* view. On this view people do not make any mistake about the content of their own experiential seemings; it is simply that when some people come to describe those experiences, they use certain forms of language that mean that they up end *reporting* that their experiences are as of robust passage even though they don’t in fact believe that this is the content of their experiences. The second variant of the view is one on which people in some way *mistake* these agentive experiences for experiences as of robust passage. Call this the *mistaken belief view.* For instance, it might be that a host of beliefs about agency and freedom play a role in our misunderstanding or mis conceptualising our own agentive experiences. Perhaps as people update their representation of what is in options and what is in fixtures as part of their experience of agency, some of them come to *falsely believe* that the present moment is metaphysically special because they come to believe that there is some *genuine* (as opposed to merely perspectival) change in which matters are in options and which in fixtures. On this basis these people come to *misinterpret* their own agentive experiences and take them to be experiences as of robust passage.

What all versions of the agentive explanation share is the core claim that because people differentially report agentive experiences, they therefore differentially report that it seems to them as though time robustly passes. It is this association that this paper empirically investigates. To do so, we aim to determine whether there is a relationship between (i) the extent to which people feel a sense of agency and (ii) the extent to which they report that it seems as though time robustly passes. If some version of the agentive explanation is correct, we should find an association between the strength of people’s agentive experiences and the strength of their reporting that it seems as though time robustly passes. This is our first hypothesis (H1).

We also want to empirically test the experiential seeming explanation of belief. According to this explanation, we find variation amongst people’s beliefs regarding whether time robustly passes, because we find variation amongst their reports about their experiential seemings. More particularly, people come to believe that time robustly passes on the basis of reporting that it seems as though time robustly passes, and they fail to come to believe that time robustly passes if they fail to report that it seems as though time robustly passes.

There are two (not inconsistent) ways in which the experiential seeming explanation of belief might proceed. First, it could be that people differentially have agentive experiences, and that on this basis some of these people tend to form specific beliefs about the world, and in virtue of forming those beliefs those people then come to believe that time robustly passes. Thus, since people have differential agentive experiences, we would expect them to come to differentially believe that time robustly passes.

Call this the *indirect belief* version of the experiential seeming explanation of belief. One example of this view is that because people differentially experience themselves as agents, they come to differentially believe that the past is objectively closed, and the future is objectively open*.* Since at later times people represent *more* states of affairs as closed, and *fewer* states of affairs as open than at earlier times, they come to believe that there is a change in which matters are objectively open and which are objectively closed. In virtue of forming this belief they then form the belief that is a privileged moment that stands ‘between’ the objectively open and the closed, and that which moment that is changes as matters that were open, become closed, and this is just to come to believe that time robustly passes, as which events are objectively open, and which closed genuinely changes. Something like this idea has been suggested by Ismael (2012, 2017); Prosser (2016) and Hodroj, Latham, Lee-Tory and Miller (2022). Several studies have probed whether people who report believing that time robustly passes also tend to be more likely to report that the future is open in one way or another (Hodroj, Latham and Miller ms; Hodroj, Latham, Lee-Tory and Miller 2023; Latham and Miller 2023). These studies found no association between beliefs about the objective openness of the future and beliefs about time robustly passing. This tends to undermine some variants of this view. This still leaves open, however, that there might be other beliefs that are formed as a product of our agentive experiences, and which lead (some) people to form the belief that time robustly passes.

According to the second version of the experiential seeming explanation of belief, people simply directly form the belief that time robustly passes on the basis of reporting that it seems to them as though time robustly passes. Since people differentially report that it seems to them as though time robustly, we would expect to find that people differentially believe that time robustly passes. Call this the *direct belief version* of the experiential seeming explanation of belief.

If any version of the indirect belief version of the experiential seeming explanation of belief is correct, we should find an association between the strength of people’s agentive experiences and the extent to which they believe that time robustly passes. That is because *whatever* exactly the belief is that is formed on the basis of our agentive experiences, and which in turn leads to the belief that time robustly passes, can be expected to be more likely to be formed when people more strongly report having those agentive experiences. That there will be such an association is our second hypothesis, (H2).

Finally, if the direct belief version of the experiential seeming explanation of belief is correct, then we should find an association between people reporting that it seems to them as though time robustly passes, and them believing that time robustly passes. This is our third hypothesis (H3).

Thus, we have the following three key hypotheses:

H1: There will be an association between the strength of people’s agentive experiences and the strength of their reporting that it seems as though time robustly passes.

H2: There will be an association between the strength of people’s agentive experiences and the extent to which they believe that time robustly passes.

H3: There will be an association between people reporting that it seems to them as though time robustly passes, and them believing that time robustly passes.

In order to test these three hypotheses, we use items from the Sense of Agency Scale (Tapal, Oren, Dar and Eitram (2017) to measure the strength of people’s agentive experience. In order to probe people’s beliefs about whether time robustly passes we present participants with two vignettes, one that describes a world with robust passage and one that describes a world without robust passage, and we ask which they think is most like our world. These vignettes are amended from Baron, Latham, and Miller (ms). In order to probe the extent to which people report that it seems to them, in experience, as though time robustly passes, we present people with both moving time and moving ego expressions and ask them how much they agree that this is how things seem to them. These expressions are amended from Lathan, Miller and Norton (2020). We present both moving time and moving ego expressions because prior research has found that people more strongly report that it seems as though the ego moves than that time moves (Lathan, Miller and Norton (2020)) and we want to allow that these might both be ways of reporting that it seems as though time robustly passes. It might be, of course, that these report two different kinds of dynamical seeming. For present purposes, however, in order to be maximally flexible in testing the agentive explanation we want to include both kinds of expression. We can then operationalise our three hypotheses as follows:

H1: There will be an association between higher scores on the SoA scale and higher scores on the moving time and moving ego expressions.

H2: There will be an association between higher scores on the SoA scale and judging that the dynamical world is more like our word, and between lower scores on the SoA and judging that the static world is more like our world.

H3: There will be an association between higher scores on the moving time and moving ego expressions and judging that our world is more like the dynamical world.

**3. Methodology and Results**

**3.1 Method**

*3.1.1 Participants*

820 people participated in the study. Participants were U.S. residents, recruited and tested online using Amazon Mechanical Turk, and compensated $2 for approximately 10 minutes of their time. Participants had a HIT (task) approval rate of at least 95% and had at least 1000 HITs (tasks) approved. This means that all our participants had already successfully completed at least 1000 other task and received at least a 95% approval rating on these tasks. 618 participants had to be excluded for failing to follow task instructions. This means that they failed to answer the questions (518) or failed an attentional check question (100). The remaining sample was composed of 143 participants (aged 21-66; 37 female; 2 trans/non-binary). Mean age 33.63 (SD = 7.84). Ethics approval for this 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.

*3.1.2 Materials and Procedure*

In random order we present participants with 12 items from the Sense of Agency Scale (Tapal, Oren, Dar and Eitram (2017) and they responded to each on a Likert scale from 1-7, completely agree to completely disagree.

|  |
| --- |
| 1. I am in full control of what I do |
| 2. I am just an instrument in the hands of somebody or something else |
| 3. My actions just happen without my intention |
| 4. I am the author of my actions |
| 5. The consequences of my actions feel like they don't logically follow my actions |
| 6. My movements are automatic—my body simply makes them |
| 7. The outcomes of my actions generally surprise me |
| 8. Things I do are subject only to my free will |
| 9. The decision whether and when to act is within my hands |
| 10. Nothing I do is actually voluntary |
| 11. While I am in action, I feel like I am a remote controlled robot |
| 12. My behavior is planned by me from the very beginning to the very end |

We then presented participants with moving ego and moving time expressions drawn from Latham, Miller and Norton (2020). Participants see these (in randomized order) and respond, on a Likert scale from 1 (strongly disagree) to 7 (strongly agree).

**Moving Time Expressions**

1. It feels to me like the present moves.
2. It feels like the events of tomorrow are moving towards me.
3. It feels like the events of yesterday are moving away from me.

**Moving Ego Expressions**

1. It feels like I am moving through time.
2. It feels like I am moving towards the events of tomorrow.
3. It feels like I am moving away from the events of yesterday.

Participants then see two vignettes, one of which describes a dynamical world, and one a static world, and are asked which they think is most like our world.





*3.2 Results*

Table 1 below summarizes the descriptive results for people’s perceived sense of positive agency (PA) and negative agency (NA), and responses to both moving time (MT) and moving ego (ME) statements. The left columns show results for participants who think that our world is more like the dynamical universe and the right show results for participants who think that our world is more like the non-dynamical universe. The %Y columns show the proportion of people who agree with the scale item or statement (5, 6, 7), and the %4/N column is the proportion of people who are indifferent or disagree with the item or statement (1, 2, 3, 4).

*Table 1. Descriptive Results*

|  |  |  |
| --- | --- | --- |
|  | **Dynamical Universe (n = 65)** | **Non-Dynamical Universe (n = 35)** |
|  | **%Y** | **%4/N** | **M** | **SD** | **%Y** | **%4/N** | **M** | **SD** |
| **PA**  | **76.9** | **23.1** | **5.38** | **1.00** | **88.6** | **11.4** | **5.46** | **0.88** |
| PA1 | 78.5 | 21.5 | 5.51 | 1.16 | 80.0 | 20.0 | 5.57 | 1.07 |
| PA2 | 84.6 | 15.4 | 5.68 | 1.20 | 91.4 | 8.6 | 5.80 | 1.11 |
| PA3 | 81.5 | 18.5 | 5.18 | 1.49 | 80.0 | 20.0 | 5.34 | 1.28 |
| PA4 | 72.3 | 27.7 | 5.25 | 1.28 | 91.4 | 8.6 | 5.66 | 0.97 |
| PA5 | 76.9 | 23.1 | 5.31 | 1.30 | 65.7 | 34.3 | 4.91 | 1.31 |
| **NA** | **55.4** | **44.6** | **4.44** | **1.38** | **54.3** | **45.7** | **4.06** | **1.58** |
| NA1 | 56.9 | 43.1 | 4.38 | 1.89 | 45.7 | 54.3 | 3.80 | 1.88 |
| NA2 | 58.5 | 41.5 | 4.32 | 1.73 | 60.0 | 40.0 | 4.26 | 1.93 |
| NA3 | 58.5 | 41.5 | 4.43 | 1.71 | 54.3 | 45.7 | 4.03 | 1.69 |
| NA4 | 66.2 | 33.8 | 4.86 | 1.53 | 57.1 | 42.9 | 4.31 | 1.75 |
| NA5 | 72.3 | 27.7 | 4.95 | 1.60 | 57.1 | 42.9 | 4.54 | 1.93 |
| NA6 | 58.5 | 41.5 | 4.31 | 1.65 | 45.7 | 54.3 | 3.91 | 1.77 |
| NA7 | 40.0 | 60.0 | 3.78 | 1.83 | 37.1 | 62.9 | 3.57 | 1.98 |
| **MT** | **81.5** | **18.5** | **5.17** | **1.13** | **77.1** | **22.9** | **5.06** | **0.84** |
| MT1 | 81.5 | 18.5 | 5.32 | 1.11 | 68.6 | 31.4 | 5.17 | 1.15 |
| MT2 | 73.8 | 26.2 | 5.09 | 1.40 | 77.1 | 22.9 | 5.00 | 1.31 |
| MT3 | 72.3 | 27.7 | 5.09 | 1.52 | 65.7 | 34.3 | 5.00 | 1.03 |
| **ME** | **76.9** | **23.1** | **5.13** | **1.11** | **80.0** | **20.0** | **5.14** | **0.84** |
| ME1 | 73.8 | 26.2 | 5.12 | 1.29 | 71.4 | 28.6 | 5.14 | 1.38 |
| ME2 | 75.4 | 24.6 | 5.31 | 1.35 | 80.0 | 20.0 | 5.14 | 1.19 |
| ME3 | 72.3 | 27.7 | 4.97 | 1.15 | 77.1 | 22.9 | 5.14 | 0.85 |

Our first hypothesis was that there would be an association between higher scores on the sense of agency scale and higher levels of agreement to moving time and moving ego expressions (H1). Spearman’s rank correlations were calculated to assess the relationship between people’s reported sense of positive and negative agency, and responses to both moving time and moving ego statements. There was a moderate to strong positive association between people’s reported sense of positive agency and their responses to both moving time, r(98) = .559, *p* < .001, and moving ego statements, r(98) = .597, *p* < .001. In contrast, there was only a weak positive association between people’s reported sense of negative agency and their responses to moving time, r(98) = .395, *p* < .001, and moving ego statements, r(98) = .378, *p* < .001.

Our second hypothesis was that people who judge that the dynamical world is more like our world would have higher scores on the sense of agency scale than people who judge that the non-dynamical world is more like our world (H2). Separate between-subjects t-tests were conducted to test whether there was a significant difference in peoples reported sense of positive and negative agency between those who judge that the dynamical world is more like our world and those who judge that the non-dynamical world is more like our world. We found no evidence of a difference in either positive agency, *t*(98) = -0.361, *p* = .719, or negative agency, *t*(98) = 1.227, *p* = .223.

Our final hypothesis was that people who judge that the dynamical world is more like our world would have higher levels of agreement to moving time and moving ego expressions than people who judge our world is more like the non-dynamical one (H3). Once again, separate between-subjects t-tests were conducted to test whether there was a significant difference in people’s responses to moving time and moving ego statements between those who judge that the dynamical world is more like our world and those who judge that the non-dynamical world is more like our world. We failed to find any evidence of a difference in moving time statements, *t*(98) = 0.514 = *p* .608, or moving ego statements, *t*(98) = -0.044, *p* = .965.

1. Discussion

There are three notable aspects of our results. First, let’s consider the agentive explanation. As predicted by H1, we found a moderate to strong positive association between people’s reported sense of positive agency and both moving time and moving ego judgments and a weak association between their reported sense of negative agency and both moving time and moving ego judgements. This provides evidence in favour of the agentive explanation. It suggests that the extent to which people report that it seems to them as though time robustly passes is, in part, a function of the extent to which they experience themselves agentively. Since the extent to which people have these agentive experiences varies, we can explain why there is variation in the extent to which people report that it seems to them as though time robustly passes. While to do date there have been various explanations offered by dynamists, passage illusionists, and passage deflationists, of why people report that it seems to them as though time robustly passes, there has been little to no thought given to how to explain the *variation* in people’s reports regarding whether it seems to them as though time robustly passes. Moreover, the accounts that have been offered by dynamists, passage illusionists and passage deflationists, by and large, are not easily extended to explain this variation. Our results, therefore, represent a significant step forward in explaining what - we take it - needs to be explained: this variation.

What our results do not do, however, is tell us which version of the agentive explanation enjoys most empirical support. This is a place in which future empirical work would be useful, at least with respect to some of these competing versions of the view. In order to test the tracking version of the view one could attempt to show that the agentive experiences in question are sensitive to factors that make it unlikely that those experiences track robust passage. So, for instance, if one could manipulate those agentive experiences by manipulating factors that do not plausibly seem to be relevant to, or involved in, the tracking of robust passage, one could attempt to argue that those agentive experiences are not involved in tracking robust passage, even if there is any such passage to track. The real work here would lie in enunciating just which features these would be.

It would also be good to empirically probe whether the illusion or the cognitive error version of the agentive explanation is better supported. Here too, though, there are difficulties. In order to determine this, we would need to determine whether (i) it is part of the content of our agentive experiences that we experience a moving present that sits between an objectively open future and closed past or (ii) it is not part of the content of our agentive experiences that we experience a moving present that sits between an objectively open future and closed past, but people are often inclined to report their experiences as having this content in virtue of the connection of those experiences with other related beliefs and concepts. Since it is very difficult to directly probe the content of experiences, it is not easy to see how to go about ascertaining whether (i) or (ii) is true.

We do, however, think there is scope to make inroads in empirically investigate which version of the cognitive error view enjoys most empirical support. Recall that the mere mis-description view holds that people have veridical agentive experiences and largely true beliefs about the content of those experiences; but when they come to *report* that content they use language that is imbued with dynamical features, and therefore sometimes report that content as being one in which time robustly passes. By contrast, the mistaken belief version of the view holds that people are mistaken about the content of their agentive experiences, insofar as they mistake those experiences for experiences as of robust passage. If the mere mis-description view is correct, then we should find that if we provide with different ways of describing their agentive experiences, and in particular, ways that do not involve dynamical language or concepts, then the extent to which people report that it seems to them as though time robustly passes should diminish. If the mistaken belief view is true, however, providing those communicative resources should make no difference to the extent to which people report that time robustly passes, because the mistake that people are making is not a merely communicative mistake.

We hope that follow up empirical work might take up some of these challenges in determining which version of the agentive explanation is better.

Moving on, let’s consider what our results tell us about the experiential seeming explanation of belief. We tested both the indirect belief and direct belief versions of this view. The indirect belief version, recall, say that some people form specific beliefs, such as for instance beliefs about agency, or the open future and closed past, on the basis of having agentive experiences, and that on the basis of this beliefs they *then* form the belief that time robustly passes. The direct belief view says that people directly form the belief that time robustly passes on the basis of reporting that it seems to them as though time robustly passes. We found no evidence in favour of either of these versions of the experiential seeming explanation of belief. That is because we found no association between people’s reported sense of positive (or negative) agency and their beliefs about whether time is dynamical and no association between people’s beliefs about whether time is dynamical, and their reports about whether it seems to them as though time robustly passes.

This latter result replicates earlier findings by Latham, Miller and Norton (2020) who found no association between people’s beliefs about whether time is dynamical, and their reports about whether it seems as though time robustly passes. Since Latham et al used different vignettes to probe people’s beliefs about the nature of time than we did in this study, our results provide a fairly robust replication of their finding.

Jointly, these results suggests that the experiential seeming explanation of belief is false. The reason that people believe (or not) that time is dynamical is *not* on the basis of their reports (or lack thereof) that it seems to them as though time robustly passes. This is a surprising result. It is very tempting to suppose that insofar as there is variation in people’s belief about whether time robustly passes and variation in their reports about whether it seems to them as though time robustly passes, that variation in one of these explains variation in the other. The experiential seeming explanation of belief takes it that it is variation in the latter that explains variation in the former. If that were so, then given the empirical support we found for the agentive explanation, we would have an explanation for the variation in people’s beliefs about robust passage. In fact, though, our results suggest that we lack an explanation for the variation in people’s beliefs about robust passage even though we have an explanation for their variation in reported experiential seemings.

Moreover, it’s worth noting that in failing to find evidence in favour of the experiential seeming explanation of belief we also failed to find evidence in favour of the converse thesis: *the belief explanation of experiential seemings*. Several passage deflationists have suggested that the explanation of variation in people’s reports regarding whether it seems as though time robustly passes, is to be explained by variation in people’s beliefs about whether time robustly passes. Recall that according to passage deflationists people do not have experiences as of robust passage. Then according to these passage deflationists people who do not believe that time robustly passes tend to correctly describe their experiences, and hence do not describe them as being as of passage, while those who believe that time robustly passes tend to be more inclined to conceptualise and understand their temporal experiences in terms of robust passage, and hence they tend to report that those experiences are as of robust passage (Miller, Holcombe and Latham 2020). This explanation, too, tends to be undermined by our results, which suggest that there is no explanatory connection between people’s belief about robust passage and their reports regarding their own experiential seemings.

If the agentive explanation is correct, and what explains variation in people’s reports regarding their experiential seemings is variation in people’s agentive experiences, then what explains the variation in people’s beliefs about whether time robustly passes if the experiential seeming explanation of belief is false?

One possibility, which we think is worth further exploration, is that time is a sort of functional concept whose content is defined in relation to a large nexus of other concepts (Baron and Miller 2015a, 2015b Latham and Miller 2022, Pan 2023) including concepts of past, present, and future, change, persistence, freedom, agency, and deliberation. The idea is that time is defined as the thing that plays a bunch of roles in our (folk) theories of change, persistence, freedom, agency, deliberation and so on. Since folk theories of change, persistence, freedom, agency and deliberation will likely vary somewhat across individuals, we would expect the resulting account of time to vary across individuals. In turn, we would expect people’s beliefs about various aspects of time to vary, including their beliefs about whether time robustly passes or not. Thus, on this view we can explain variation in people’s beliefs about whether time robustly passes without any appeal to people’s reporting regarding whether it seems to them in experience as though time robustly passes.

Moreover, if this account is right, we can explain why previous studies have failed to find associations between people’s beliefs about whether time robustly passes and any of the following taken singly: (i) people’s beliefs about the alethic openness of the future (Hodroj, Latham, Lee-Tory and Miller 2022). (ii) people’s beliefs about the nomic openness of the future (ii) people’s beliefs about the epistemic openness of the future (Hodroj, Latham, and Miller (forthcoming) (iii) people’s beliefs about the deliberative openness of the future (Hodroj, Latham, Lee-Tory and Miller 2022) (iv) people’s beliefs about freewill (Hodroj, Latham, and Miller (forthcoming)) and (v) people’s beliefs about persistence (Baron, Latham and Miller ms). We might fail to find such associations if time is defined in terms of its role in a bunch of our (folk) theories of change, persistence, freedom, agency and deliberation, then we would not expect to detect any *single* association between beliefs about time and beliefs about any *one* of these other notions. Instead, an individual’s beliefs about time will be a complicated function of the totality of its roles in relation to these other notions. Call this the *cognitive nexus* view.

We think that future empirical work could investigate the cognitive nexus view by looking for associations between people’s beliefs about whether time robustly passes, on the one hand, and entire clusters of *interrelated* folk theories or beliefs about persistence, change, agency, deliberation, and freedom, on the other hand. If such an association can be found, then this would provide some evidence in favour of the cognitive nexus view. Combining the agentive explanation with the cognitive nexus view would, jointly explain both (a) and (b), by providing a satisfying account of why we find the variations we do in people’s reports regarding whether it seems to them as though time robustly passes, and whether they believe that it does.

Conclusion

Our aim in this paper has been to investigate whether one or both of the agentive explanation and the experiential seeming explanation of belief enjoy empirical support. In the first work of its kind, we found evidence of a connection between reported agentive experiences and reported experiences as of time robustly passing. Surprisingly, we did not find any empirical support for the experiential seeming explanation of belief. Building on previous work in this area, we conclude that the explanation for variation in people’s beliefs about whether time robustly passes is likely not a matter of variation in people’s reports about whether it seems to them as though time robustly passes. Instead, we suggested a cognitive nexus explanation for the variation in people’s beliefs about whether time robustly passes. We hope that further empirical work will test this suggestion.

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1. We use the term ‘robust’ to distinguish this kind of temporal passage from what Skow (2015) calls anodyne or anemic passage, which is the kind of temporal passage that some B-theorists endorse, and which consists in (roughly speaking) succession. See Oaklander (2015) Deng (2013) and Leininger (2021) who defend views of this kind. [↑](#footnote-ref-1)
2. A-theorists include, for instance, Bourne (2006); Broad (1923; 1938); Cameron (2015); Craig (2000); Zimmerman (2005); Skow (2015); Smith (1993); Sullivan (2012); Tallant (2012); Tooley (1997). [↑](#footnote-ref-2)
3. See, for example, Oaklander (2012), Mellor (1998); Le Poidevin (2007), Price (1996) and Farr (2012; 2020a, 2020b). [↑](#footnote-ref-3)
4. See for instance Price (1996), Farr (2012, 2020, 2023,) Kajimoto, Norton and Miller (2020), Latham, Miller and Norton (2021). [↑](#footnote-ref-4)
5. To be clear, not everyone accepts that the dynamist has a straightforward explanation here. Prosser (2007, 2016) Price (1996) and Miller (2017) all argue that even if did time robustly pass, we would have no way to detect its passage, and thus we could not come to have experiences of robust passage. [↑](#footnote-ref-5)
6. This view is often known simply as phenomenal illusionism (see Baron, Cusbert, Farr, Kon and Miller (2015) and Miller, Holcombe and Latham (2018)). However, since one can be a phenomenal illusionist about contents other than robust passage, we call this view passage illusionism. Hoerl (2014) refers to this view as an error theory. Le Poidevin (2007), Paul (2010), Dainton (2011, 2012), Hohwy, Paton, and Palmer (2015) are all passage illusionists. It remains unclear whether other non-dynamists such as Norton (2010) and Savitt (1996) are rightly characterized as passage illusionists or not. [↑](#footnote-ref-6)
7. Prosser (2007. 2016), Hoerl (2014) Miller (2022). [↑](#footnote-ref-7)
8. Illusionists have gone some way towards offering such explanations. See Le Poidevin (2007), Paul (2010), Dainton (2011, 2012), Hohwy, Paton, and Palmer (2015) [↑](#footnote-ref-8)
9. Deng (2013), Bardon (2013), Hoerl (2014), Braddon-Mitchell (2013), Ismael (2012), Frischhut (2015), Miller, Holcombe and Latham (2020) Miller (2019) Miller (2022), Latham, Miller and Norton (2020b) all defend versions of deflationism. [↑](#footnote-ref-9)