Noûs

NOÛS

ORIGINAL ARTICLE OPEN ACCESS

Welfare and Felt Duration

Andreas L. Mogensen

Faculty of Philosophy, University of Oxford, Oxford, UK

Correspondence: Andreas L. Mogensen (andreas.mogensen@philosophy.ox.ac.uk)

ABSTRACT

How should we understand the duration of a pleasant or unpleasant sensation, insofar as its duration modulates how good or bad the experience is overall? Given that we seem able to distinguish between subjective and objective duration and that how well or badly someone's life goes is naturally thought of as something to be assessed from her own perspective, it seems intuitive that it is subjective duration that modulates how good or bad an experience is from the perspective of an individual's welfare. However, I argue that we know of no way to make sense of what subjective duration consists in on which this claim turns out to be plausible. Moreover, some plausible theories of what subjective duration consists in strongly suggest that subjective duration is irrelevant in itself.

1 | Introduction

An experience of pain is worse for you the longer it goes on. This much seems obvious. But how should we understand the duration of a pleasant or unpleasant sensation?

The question is worth raising because we seem able to distinguish between *subjective* and *objective duration*.[1] A minute sometimes feels much longer than a minute, and sometimes much shorter. It is possible that different kinds of minds—those of small, high-metabolism animals or of digital persons of the not-too-distant future—might vary dramatically in their experience of time's passage, living through a much greater amount of subjectively experienced time within a given unit of objective time. To them, the experience of pain filling mere seconds or minutes might be more like our experience of a pain that lasts many hours or days.

How well or badly someone's life goes is naturally understood as something to be assessed from her perspective (Railton 1986; Rosati 1996). Therefore, it seems intuitive that a valenced experience that's subjectively experienced as longer makes a greater difference to your welfare, holding fixed its intensity, objective duration, and any other evaluatively significant properties. As Terry Pratchett (1990, 10) writes: "the important thing is not how long your life is, but how long it seems."

I argue against the claim that the subjective duration of a valenced experience is the important thing. More exactly, I argue against the claim that a valenced experience that is subjectively experienced as longer makes a greater difference to your welfare, holding fixed its intensity, objective duration, and any other evaluatively significant properties. I start in Section 2 by clarifying some basic conceptual issues and explaining the importance of getting clear on how, if at all, subjectively experienced duration modulates welfare. In Section 3, I look at two analyses of the nature of subjective time experience in the recent philosophical literature that strike me as especially attractive. I argue that, although each may be plausible as an account of what felt duration consists in, on neither is it plausible that felt duration per se modulates the contribution of valenced experience to individual welfare. In Section 4, I rebut an intuition pump appealing to digital reproductions of conscious experiences that many find persuasive as an argument for measuring the duration of valenced experiences in terms of subjective time for the purposes of welfare assessment. Section 5 provides a brief summary and conclusion.

2 | Preliminaries

This section is designed to help set the terms of the debate and explains why the debate is worth having in the first place.

2.1 | Welfare and Valenced Experience

I will begin by explaining some core assumptions I do and do not make about welfare and valenced experiences. By a "valenced experience," I mean a conscious experience that feels good or bad, pleasant or unpleasant. For simplicity and concreteness, I focus on pain. Most of the discussion is therefore about how subjective duration contributes to pain's badness. Still, I conjecture that what I say about pain generalizes to valenced experiences more generally.

I assume no particular theory of welfare. In particular, I do not assume a hedonistic theory on which welfare supervenes on valenced experience. Among the constituents of welfare recognized by other theories, duration may well also be significant,[2] and so we can ask the same sort of question I am asking about pains. Is it objective duration that matters or subjective duration (or both)? Nonetheless, pains and other valenced experiences seem especially like the sort of things whose contribution to welfare depends on felt duration. After all, they are naturally thought of as good or bad for you in virtue of how they feel.

2.2 | Subjective Duration

What, then, is subjective duration? Since core parts of my argument turn on exploring different answers to this question, a full analysis will not be given here. Instead, I am going to lay out a few basic concepts I think it is useful to have on the table already at this point.

Most importantly, there is the distinction between *judged duration* and *felt duration*. Roughly, this is the distinction between (mere) beliefs about how much time has passed and the conscious experience of time as passing at a certain rate. This distinction seems especially important in the present context (Schukraft 2020). Someone in pain for 6 min might believe before, throughout, and forever after that it never went on for more than five. All else being equal, she is surely no better off for that. Whatever she believes, she had 6 min of pain. Mere beliefs about how much time has passed do not seem capable on their own of making an experience better or worse. Something about the character of the experience itself has to be different. Time needs not merely to be *believed* to have passed at a slower or a faster rate, it needs to have been *felt* as such.

Unfortunately, almost none of the published psychological literature on time perception is about felt duration as distinct from judged duration. Nonetheless, research on reports of durational phenomenology (so-called *passage of time judgments*) supports the view that judged duration and felt duration are psychologically distinct.[3] For example, reported feelings of time as passing more slowly or quickly have been found to be unrelated to verbal estimates of duration for a target auditory stimulus or the time taken in producing a sound to match a target for tones lasting up to half a minute, although a relationship is observed for longer durations (Droit-Volet and Wearden 2016; Droit-Volet et al. 2017).

Unfortunately, research on passage of time judgments has significant limitations of its own. These judgments have to do with experiences of felt duration as abnormally fast or slow. By contrast, we might be especially interested in differences in the way felt duration is normally experienced across individuals. For example, we might want to know whether small, high-metabolism animals or digital minds of the not-too-distant future live through more subjective time in a given day or year than we do. To each mind, perceiving the world the way it normally does, time's passage will surely seem neither fast nor slow, insofar as it seems any way at all. The kind of phenomenology captured by passage of time judgments arguably will not vary between ordinary flesh-and-blood humans, hummingbirds, or digital emulations of human brains run at high clock speeds. So in what sense could there be differences in the way felt duration is normally experienced across individuals like these?

The approach I favor relies on investigating the possibility that there is variation across different kinds of minds in the normal values of those psychological variables whose variation within individuals is experienced as time passing unusually slowly or unusually quickly. That is what I will mean when speaking in terms of the possibility that there are differences in the way felt duration is normally experienced across different kinds of minds.

Note, finally, that there could in principle be different psychological changes experienced as time passing unusually slowly or quickly (compare Prosser 2016, 113–114; Lee 2017, 159). Furthermore, these could differ in whether and to what extent they matter for individual well-being. We should not assume at the outset that felt duration is one thing and one thing only. For reasons that will become clear in Section 3, we have reason to believe that different explanations should in fact be given for what felt duration amounts to when comparing life-threatening emergencies, where people report time as slowing down, and other cases where variation in felt duration is instead evidenced by differences in the temporal acuity of perception (which seem not to include life-threatening emergencies: see Stetson et al. 2007).

2.3 | Importance

At this point, the nature of felt duration ought still to be a mystery to us. We know that mere judgments about how long a pain has gone on do not matter. Something about the way the pain is experienced must be in play. But what exactly? Until we know, it is hard to say whether subjective duration modulates welfare. But why should we care?

On the one hand, it might affect how we think about the relative weight of good and bad experiences. Positive affect is associated with an experience of time as passing quickly, and negative affect with an experience of time as passing slowly (Droit-Volet and Wearden 2016; Droit-Volet et al. 2017). Pain leads to an experience of time's passage as drawn out in both clinical and experimental conditions (Somov 2000; Hellström and Carlsson 1997).

Some philosophers claim that pains are worse for you than pleasures are good, holding fixed their intensity and duration (Moore 1903; Mayerfeld 1999; Hurka 2010). For example, Mayerfeld (1999, 133) claims that if we imagine "an episode of very intense suffering" and "an episode of happiness of equal intensity," then "the intense suffering would not be compensated by an episode of the intense happiness lasting for the same amount of time." Claims of this kind can seem mysterious, in that they appear to posit a kind of brute asymmetry between good and bad feelings. But suppose Mayerfeld has in mind objective duration when he talks about suffering and happiness lasting "the same amount of time." Then, in light of the psychological facts noted above, we have a natural explanation for why the quoted claim comes out as true, assuming that felt duration is the proper measure of valenced experience.

Thinking about how subjective time experience modulates welfare also has the potential to affect the weight we put on the valenced experiences of minds quite unlike our own that run at speeds quite unlike our own. For example, it is possible we underestimate the lifetime welfare of wide classes of nonhuman animals, because we measure the length of their lives in clock time, whereas those animals subjectively live through much more time within a given day or year than we do (Schukraft 2020).

A number of different lines of evidence indicate that some animals sample perceptual information from the environment at much higher rates than we do and so might experience a greater number of subjective moments per unit objective time. For example, some animals are able to act and adjust their behavior in response to stimuli at timescales that seem impossibly fast to us (Prosser 2016, 85–86; Schukraft 2020). Assassin flies have the fastest known photoreceptors, requiring just 6–9 ms for the nervous system to process an image and prepare an action in response, compared to the 30–60 ms for human photoreceptors just to begin signaling the brain. The flies' hunts are over and done in about a quarter of a second and are nearly impossible for the human eye to follow, except when played in slow motion from recordings by high-speed cameras (Yong 2022, 74–75).

Further evidence comes from studies of *critical flicker-fusion frequency* (CFF), the frequency at which a flickering light source is perceived as continuously illuminated (Schukraft 2020; Yong 2022, 75–76). For human beings, that is at around 60 Hz. A small passerine bird known as the pied flycatcher has a CFF of 146 Hz, whereas honeybees, dragonflies, and flies have CFFs in the range of 200–350 Hz. These animals are able to perceive gaps in the flicker of rapidly alternating light sources that we could only detect from slow motion recordings.

As I have also hinted previously, even more dramatic speedups in processing and concomitant slowdowns in subjective time might be realized by nonorganic minds run on digital hardware. That is due to the extraordinary speed advantages of electronic circuitry. Electronic circuit boards can achieve signaling speeds millions of times greater than the speed of interneuronal communication and can modulate their internal states at rates billions of times faster than neuronal reaction times (Hanson 2016, 79–80). As a result, a digital emulation of a human brain could conceivably pack the experience of many lifetimes into mere hours of objective time.

This is one among a number of considerations highlighted by Shulman and Bostrom (2021) in arguing that digital minds we might one day create could exhibit superhuman capacities for welfare and capture the vast majority of total well-being across future time. In doing so, they rely on the intuition that felt duration is the proper measure of valenced experience. It is time I got round to explaining why I think we should demur from that belief.

3 | Against Felt Duration

"Felt duration" is obviously a philosopher's term of art. The phenomenon itself is elusive, especially once we keep in mind that it is supposed to be distinct from judged duration. Cases of mistaken identity may be widespread. Wearden et al. (2014) claim that reports of the experience of time passing quickly are often misleading, in that what people report as "fast time" may involve nothing more than realizing at the end of some event that more clock time had elapsed than they thought. This means "the report is generated on the basis of an inference, often prompted by an external time marker, without any actual 'feel' of fast time during the event" (303). But what exactly does the "feel" of time's passage that Wearden et al. (2014) appeal to consist in? Until we can answer that question, we should be hesitant to draw conclusions about the contribution of felt duration to individual welfare.

I am going to look at two kinds of analyses of the nature of subjective time experience that have appeared in the recent philosophical literature and that strike me as plausible.[4] Very roughly, the first of these can be thought of as appealing primarily to cognitive factors and the second as appealing primarily to aspects of perceptual processing in explaining our experience of time's passage.

For reasons I have already noted, these need not be thought of as rival theories. Each may be successful as an account of why time should sometimes be experienced as passing unusually slowly or quickly. But in neither case should it seem plausible to us that felt duration—as distinct from objective duration—matters for how well someone's life goes. Since I view each of these theories as attractive, I take this to cast doubt on the welfare significance of felt duration.

You might well take a dimmer view of the merits of the theories to be discussed. Sadly, space precludes me from saying all that could be said in providing a thorough-going accounting of their pros and cons. In any case, I know of no other plausible constitutive explanation of durational phenomenology that would make it any more intelligible why felt duration should be assigned intrinsic welfare significance.[5] Still, I have no argument to show that none exists. If you think such a theory is out there, think of me instead as throwing down the gauntlet.

3.1 | The Speed of Thought

If time really were passing more slowly or more quickly, we too would be sped up or slowed down accordingly, and so presumably would not notice. On the other hand, in becoming aware of a mismatch between our own speed and the speed of external

events, it would seem natural to expect a feeling of time as passing unusually quickly or slowly. This in turn gives rise to the idea that our experience of time's rate of passage may depend on our awareness of the speeds at which external events, as registered in perception, unfold relative to the speed of our internal cognitive processes. Call this the *cognitivist theory of felt duration*—or *cognitivism*, for short.

Arstila (2012) and Phillips (2013) both appeal to cognitivism to explain durational phenomenology in moments of life-threatening danger.[6] Dramatic experiences of time slowing down are reliably reported in extreme crisis situations (Noyes and Kletti 1977; Flaherty 1999, 50–56). For example, one student, whose steering gave out while driving at 60 miles per hour, reports: "Time seemed drawn out. It seemed like five minutes before the car came to a stop when, in reality, it was only a matter of a few seconds" (quoted in Noyes and Kletti 1977, 376).

In order to explain why time's passage seems to slow down in moments of life-threatening danger, Arstila and Phillips appeal to the idea that our conscious experience includes not only perceptions of events unfolding in the world, but also conscious thoughts and other cognitive processes unfolding in our minds. Not only that, but we are aware of temporal relationships between them. The subjective experience of time's passage can thus be accounted for in terms of the fact that we are "aware of the durations of environmental events relative to the non-perceptual conscious activity that occurs between their onset and offset" (Phillips 2013, 232).

The experience of time slowing down during moments of life-threatening danger can then be explained in terms of a speed-up in the pace of nonperceptual conscious mental activity. Whereas Phillips seems to appeal to direct awareness of our thoughts in explaining how the speed of mental activity affects conscious experience, Arstila proposes that we become aware of our increased rate of cognitive activity indirectly, as a result of active engagement with the external world: for example, by registering the heightened frequency with which we can shift attention from one stimulus to another, initiate new actions, or react to new stimuli.[7]

A speed-up in mental activity has obvious adaptive value in life-threatening situations (see Phillips 2013, 245–246), and increased speed of thought is reported by a majority of subjects interviewed by Noyes and Kletti (1977).[8] That is no coincidence, according to these authors. As Arstila (2012, 8) puts it: "our feeling that we are somehow faster than usual also amounts to the experience that things in the external world happen slower than usual."[9]

I claim that insofar as variation in the subjective experience of time is explained in terms of the cognitivist theory of felt duration, variation in the subjective duration of a painful sensation should not alter our evaluation of how bad the pain is, all else being equal. In other words, an experience of pain during an interval that feels as if it lasts for many minutes but is measured in mere seconds by the subject's clock is no worse than an otherwise exactly similar experience involving pain of the same intensity that seems to its subject to fill mere seconds, assuming that differences in the experience of time's passage are explained in terms of cognitivism.

Why not? Because, intuitively, a pain is no better or worse for you merely in virtue of the fact that your thoughts, imaginings, and rememberings seem to move more slowly or quickly in relation to external events while you are in pain. In and of itself, the relative speed of nonperceptual conscious mental activity seems simply irrelevant to pain's badness.[10] It is difficult to see any reason why someone would attach importance to this property except for the fact that they might be persuaded that this is what felt duration consists in. Recall, however, that we are seeking a theory of the nature of felt duration precisely because the phenomenon is elusive and one on which we have only a tenuous grasp, absent some analysis of what is meant by the "feel" of time's passage. If our preferred analysis reveals the subjective rate of experience to be something that strikes us as without intrinsic importance, that is good evidence that the haziness of our pretheoretic conception of felt duration has shrouded something unimportant in apparent significance.[11]

It is also important to be clear that I say only that the relative speed of non-perceptual conscious mental activity is irrelevant to pain's badness *in and of itself*. As a matter of contingent fact, changes in the speed of non-perceptual conscious mental activity may bring about changes in pain's subjective disvalue. They might even do so reliably. It is well established that felt pain depends not only on raw input to first-order nociceptive neurons, but on a range of social and psychological factors, including the allocation of attention toward or away from pain sensations, anticipations of increases or decreases in felt intensity, and dispositions toward catastrophizing (Melzack and Wall 1988, 15–34; Ambron 2022, 140–199).

For these reasons, it is important to be clear that I do not mean at all to deny that changes in cognition can modulate pain's badness. All I mean to deny is that the speed of conscious thought might do so in and of itself. To the extent that cognitive factors like those surveyed above affect the badness of pain experience, it is plausible they do so by altering experienced intensity, whereas my concern is with how we should think of the contribution of duration to pain's badness, holding intensity fixed.

Before wrapping up this subsection, it is also worth dwelling on two important limitations of the cognitivist theory of felt duration.

First, Arstila and Phillips explain variation in the experience of time's passage by appealing to variation in the speed of internal cognitive processes that run alongside perception, as opposed to via changes in the character of perceptual processing per se. Therefore, no increase in the temporal resolution of perceptual experience need be expected as a result of experiencing time as slowed down (Arstila 2012, 4–5, 8; Phillips 2013, 230), and, indeed, Stetson et al. (2007) find no evidence of increased temporal acuity for vision during frightening free-fall experiences. However, as a result, cognitivism is not well-placed to account for potential differences in the way felt duration is normally experienced across individuals in cases where our evidence consists of differences in the temporal resolution of perceptual experience, such as evidence of variation in CFFs across the animal kingdom.

Cognitivism has other limitations that become especially apparent when we try to apply it in explaining potential variation in

the subjective experience of time beyond the boundaries of our species. Cognitivists claim that "what subjects are reporting in terms of 'time slowing down' are experiences in which unusually large amounts of nonperceptual mental activity occurs within a certainy objective period" (Phillips 2013, 233). But we are not told what is meant by an *amount* of nonperceptual mental activity, and it is reasonable to worry that there are not any natural units in which to measure the volume of conscious cognitive processing (Lee 2013, 14; Prosser 2016, 98–99).

When dealing with recognizably human minds, we might suppose that the character of cognition is sufficiently similar across individuals that we need not worry too much about this. The more and more different are the minds under comparison, the less certain can we be that there is a meaningful common measure on which to base comparisons of the volume of conscious cognitive processing, and the more we seem to be in the position of someone asked to say whether more charge has flowed through a length of wire than water through a pipe. If combined with the assumption that subjective duration is the proper measure of how long a pleasant or unpleasant sensation lasts for the purposes of welfare assessment, cognitivism therefore threatens to derail the possibility of meaningful interspecies comparisons of welfare.

3.2 | Frame Speed

In a well-known passage in his *Principles of Psychology*, James (1890, 239) describes the character of conscious experience as follows: "It is nothing jointed; it flows. A 'river' or a 'stream' are the metaphor by which it is most naturally described." No doubt it seems that way to us.[12] Nonetheless, a wide range of evidence appears to support the contrary hypothesis that conscious experience actually consists of a succession of discrete experiential frames (VanRullen 2016; Herzog et al. 2016; White 2018; Drissi-Daoudi et al. 2019).[13]

For example, people are found to be able to experience the *wagon wheel illusion* when viewing a spinning disk through their own eyes under conditions of constant illumination (Schouten 1967; Purves et al. 1996). The wagon wheel illusion is familiar from film recordings of wheels that seem to spin backward, owing to the fact that the recording samples information discretely from the environment and can end up successively catching the wheel at moments just short of a full rotation. The fact that normal human vision generates the same illusion suggests that visual experience also relies on discretely generated representations of the external world.

Consider also a recent study by Herzog et al. (2020). They find that two opposite-direction offsets in a stream of vertical lines integrate and cancel out any effects on visual experience if they occur within 450 ms of one another. However, if three offsets are present at 0, 330, and 490 ms, this canceling effect occurs only among the first and second, even though the second and third are much closer together. This suggests that conscious visual information is updated at discrete intervals based on processing windows of around 450 ms, as opposed to being a continuously updated stream derived by integrating information within a sliding window.

Some authors relate the integration of information within discrete perceptual frames to oscillatory cycles in neural activity (VanRullen 2016). For example, the scalp-recorded alpha rhythm (8–12 Hz) has been hypothesized as related to the "frame rate" of perception. Slower alpha rhythms degrade the temporal resolution of perception, an effect hypothesized as due to the greater likelihood that successive stimuli are processed within the same perceptual frame and so cannot be distinguished in time (Samaha and Postle 2015). Strikingly, Mioni et al. (2020) report that by experimentally speeding up or slowing down alpha rhythms using transcranial alternating current stimulation, they were able to increase or decrease judged duration in a time generalization task that required subjects to say whether a probe stimulus was of the same duration as a previously learned target stimulus.

Results of this kind seem to vindicate a hypothesis about time perception originally proposed in the middle of the 19th century by von Baer (1864). He hypothesized that conscious experience consists of a succession of discrete experiential frames and that the speed at which these frames succeed one another provides "the basic standard by which we measure time in observing nature" (von Baer 1864, 258).

Among contemporary philosophers, the clearest defense of a theory of experienced duration based on the assumption that conscious experience consists of a succession of discrete perceptual frames comes from Merino-Rajme (2014). She argues that conscious experience is divided into *quanta*, each presenting a tightly unified and temporally bounded arrangement of experienced qualities, corresponding to the *specious present* (Clay 1882; James 1886; Husserl 1991/1893–1917; Broad 1923; Dainton 2000). In her view, "whatever features are presented in a quantum will be experienced as taking one subjective unit of duration" (Merino-Rajme 2014, 255). The felt duration of an event is then to be understood in terms of the number of quanta experienced as making up one's overall perception of the event. She calls this the *quantum theory of felt duration*.

Before looking at what a theory of felt duration based on frame rate might tell us about the way felt duration modulates welfare, I want to stop and clarify two issues. The first has to do with what it means to say that conscious experience is discrete as opposed to continuous.[14] The second is to do with how the number of frames experienced within a given interval relates to felt duration.

I take the evidence presented by authors like Herzog et al. (2020) to support the hypothesis that normal waking experience involves discontinuous changes in the content of conscious experience. This need not entail that we are not actually having experiences throughout our waking lives and that consciousness instead arises in short-lived bursts, surrounded by periods of unconsciousness. Discontinuities in the content of conscious experience need not entail gaps in consciousness itself. Consciousness might operate on a "sample and hold" principle, like modern liquid crystal display screens, continuously maintaining a given content until it undergoes an instantaneous or near-instantaneous refresh at discrete intervals. Nonetheless, Herzog et al. (2020, 833) write as if their results imply the existence of "gaps in between these conscious percepts." That hypothesis seems to me to be unsupported by their evidence.

On the question of how the number of experiential frames experienced within a given interval relates to felt duration, Merino-Rajme suggests that we form impressions of the approximate number of experiential frames that make up our perception of some event. In her view, "The number of quanta 'counted' while experiencing a long-lived event determines the amount of duration that the long-lived event is experienced as having" (256).

This may be thought implausible. As James (1890, 239) observes, consciousness "does not appear to itself chopped up in bits." Appearances may be misleading, of course. Nonetheless, even if conscious experience in fact consists of a succession of discrete experiential frames, it is natural to think that we are unaware of the frames themselves (but see Torrengo 2024, 81–95). An alternative approach would be to simply rely on how many frames make up your experience over a given length of time, setting aside any awareness of each window of integration succeeding the one before. Recall that according to Merino-Rajme, "whatever features are presented in a quantum will be experienced as taking one subjective unit of duration" (255). Assume that a discrete experience of the specious present corresponds to a window of integration. Since every such window is experienced as one subjective unit of duration, more units of subjective time are experienced in a given interval of proper time for subjects for whom more such windows of integration are processed, regardless of any awareness on the subject's part of how many windows go by.[15]

Still, a challenge remains. If we are not aware of a change in the approximate number of experiential frames that compose our experience over some period of time, how could a change in frame speed give rise to the feeling that time is passing at an unusual rate? Here is one way: such a feeling might arise from our awareness of a change in the temporal resolution of perception, which, as noted, is typically linked to frame speed in theories of discrete perception. What tips us off may be the ability to observe temporal details that ordinarily get blurred out, such as fine adjustments in trajectory made by an assassin fly on the wing, or changes that otherwise unfold too slowly to be directly perceptible, such as the upward thrust of a plant stem as it grows. A commitment to some form of awareness of the frames themselves therefore strikes me as an optional commitment of the quantum theory.

Keeping those points in mind, let us now consider why the number of discrete frames that divide up one's experience over a given objective time interval should be thought to matter to the badness of a pain experienced throughout that time.

It may be thought that no explanation is necessary, assuming the quantum theory to be correct. In particular, it may seem tempting to respond that since a discrete experience as of pain filling the experienced present simply is the fundamental unit of which experiences of pain over time are built, it has to follow that the extensive magnitude of such experiences should be measured by the number of such units they encompass. A discrete experience as of pain filling the specious present functions simply as the fundamental unit of accounting—the atom out of which pain experiences are composed.

I do not find this persuasive. Even if our waking lives are composed of discrete experiential frames, there appears to be nothing in the nature of consciousness itself that requires that kind of discretization. Continuous consciousness seems to be possible, even if in fact our own experiences are discrete. For continuous minds, we seem forced to say either that there is no number of discrete experiences that make up the experience of a minute of pain or that there are uncountably many or that minds like that undergo exactly one discretely demarcated experience during any period of uninterrupted consciousness (compare Tye 2003, 97). But each of these claims yields absurd results when making welfare comparisons across discrete and continuous minds, as well as among the experiences of continuous minds, if we insist that the right way to measure pain's extent is in terms of the number of discrete experiences that comprise an experience of pain. For example, if continuous minds are said to have one discrete experience during any period of uninterrupted consciousness, then it will be no worse for such a mind to have a pain experience that lasts 8 h as opposed to 1 s if both are book-ended by periods of unconsciousness.

For this reason, I think we cannot insist on a discrete experience as of pain filling the specious present as a fundamental unit of accounting in assessing the subjective badness of pain. We need to be able to explain the evaluative significance of the compartmentalization of pain experiences into more or fewer discrete frames.

I can think of two possible explanations of the evaluative significance of the compartmentalization of pain experiences into varying numbers of discrete frames. Nonetheless, each comes with its own unique limitations, and each is based on a bold conjecture about how the mind works.

Here is the first. As noted earlier, theories of discrete perception typically link the frame speed of experience with temporal resolution: the faster we integrate perceptual information within experiential frames, the shorter is the represented interval that fills the specious present, and the better are we at discriminating events in time (see Lockwood 2005, 372–374). It is conceivable that pain experiences that admit of a higher degree of temporal resolution are typically worse because higher temporal resolution in nociceptive perception leads to the experience of fine-grained modulations in pain's intensity that would be averaged out at a lower temporal resolution.

Why should that be worse? Some philosophers believe that the badness of pain is a strictly convex function of intensity (Mayerfeld 1999, 134–135; Hurka 2010).[16] In other words, pain intensity exhibits increasing marginal disvalue. It follows that an experience of a very intense pain followed by a relatively mild pain is worse overall than an experience of pain whose intensity is the average of the two, all else being equal. As a result, the ability to perceive more of the detail of how pain unfolds in time might end up being worse for you insofar as this means you experience fine-grained modulations in pain's intensity that would be averaged out at a lower temporal resolution.

The thing that is pure conjecture here is that pain intensity experienced at a coarser temporal grain is (no greater than) the

(unweighted) average of the pain intensities that would be experienced at a finer temporal grain. A further major limitation is as follows. Consider an experience of pain that does not vary over time in those properties that translate as experienced intensity and so will be experienced as of the same intensity regardless of the temporal grain of experience. Appeal to the badness of pain as a supralinear function of intensity and the modulation of experienced intensity by the frame speed of perception provides no reason to suppose that increases in the temporal resolution of perception should worsen a pain like that. As a result, we have not been given a general case for treating a pain that unfolds across a higher number of discrete subjective moments as worse, all else being equal.

Here is a second way in which we might explain the importance of frame speed for welfare, and one that might be able to achieve the level of generality we found lacking in the first.

As I noted earlier, it is important to be clear on what we mean if we say that conscious experience is discrete as opposed to continuous. In particular, the existence of discontinuous changes in the content of conscious experience does not entail the existence of discontinuities in consciousness itself. Let us suppose, nonetheless, that there are such discontinuities: conscious percepts do not fill our waking lives but instead arise briefly out of extended periods of surrounding unconsciousness. We can then imagine that a pain that feels longer is made up of percepts that are packed more densely in time due to the increased frame rate of conscious experience. If the duration of a percept itself changes little if at all with frame speed, the periods of surrounding unconsciousness that separate conscious percepts become briefer the slower time is felt as passing, as a result of which more time overall is filled with pain experience, as opposed to unconsciousness. That surely must be worse.

For reasons I have already noted, the postulate of unnoticeable intermittent on/off discontinuities in ordinary waking experience is conjectural. However, it is also not as far-fetched as it might initially strike us as being. Just as an experience of a round, red patch is not itself either red or round, so, we might think, an experience of something as continuous and uninterrupted need itself be neither continuous nor uninterrupted. Combined with the hypothesis that experience is *transparent*, in the sense that the properties on which we focus in introspecting an experience are merely the represented properties of the experience's intentional objects, this delivers a picture on which the gappy character of conscious experience is compatible with our ordinary introspective awareness of persistent gapless continuity in the course of ordinary waking life (compare Tye 2003, 95–97).[17] We can imagine, for example, that an experience as of continuous pain arises due to the fact that pain experiences, while discrete and nearly instantaneous in themselves, have as their intentional contents the state of the body in relation to the site of injury throughout overlapping, just-passed intervals of time, in line with the *retentionalist* conception of the specious present (Husserl 1991/1893–1917; Broad 1923; Tye 2003; Paul 2010; Lee 2014) (see Figure 1).

In any case, the postulate of unnoticeable intermittent on/off discontinuities in ordinary waking experience is only the first of the key conjectures we are relying on. Here is the second. Even assuming that the subjective experience of time slowing down involves a higher density of discrete percepts per unit time, I know of no reason to suppose, as we have assumed, that the duration of those percepts remains roughly constant, as opposed to contracting in proportion to their frequency and so filling roughly the same amount of time overall. And whatever doubts we might have about our warrant to suppose that discrete pain percepts have a roughly constant objective duration when dealing with intrapersonal variation in the subjective experience of time should clearly be amplified considerably when we compare across species.

Let me also note two important limitations of the proposed explanation for the importance offrame speed when it comes to pain's badness.

The first is that it imposes a hard limit on how much worse a pain can be made by increasing its subjective duration. If a pain percept ordinarily lasts for x milliseconds and the gaps between percepts are y milliseconds, then the experience of time slowing down during moments of pain at most magnifies the pain by a factor of $(1 + y/x)$. Since we have no idea what values x and y might actually take, it is difficult to say anything concrete about the significance of this observation. Nonetheless, it gives us some reason to be skeptical of the idea that if possible minds of the not-too-distant future that run on digital hardware process experiences at millions or billions of times the speed of gray and white matter, then the badness of a pain of fixed intensity experienced for the same objective time interval by a mind like that is millions or billions of times worse by virtue of stretching out through millions or billions of times the amount of subjective time. For that to be possible on the present model, the time occupied by conscious percepts would have to be mere millionths or billionths of our waking lives.

This leads me to my final point—and the most important limitation of the current proposal. Ultimately, it does not actually constitute an explanation for why felt duration—as distinct from objective duration—matters for how well someone's life goes. Really, it is a story on which objective duration is the proper temporal measure of pain experience. What is bad for you is to have more clock time overall filled with pain experience, as opposed to unconsciousness. It is just that what we ordinarily think of as a pain's objective duration is based on the false assumption that a pain fills out the entire interval between (what we call) its onset and its end.

4 | The Simulation Argument

For many people, the intuition that felt duration matters—and objective duration does not—appears to receive its strongest support from thinking about simulated minds that have the same experiences but run through those same experiences at different objective speeds. In this penultimate section, I want to explain why we should not be drawn in by intuition pumps of that kind.

4.1 | Setting Out the Argument

Let us start by making the key thought experiment fully concrete. Suppose that nanoprobes are scattered throughout Simone's

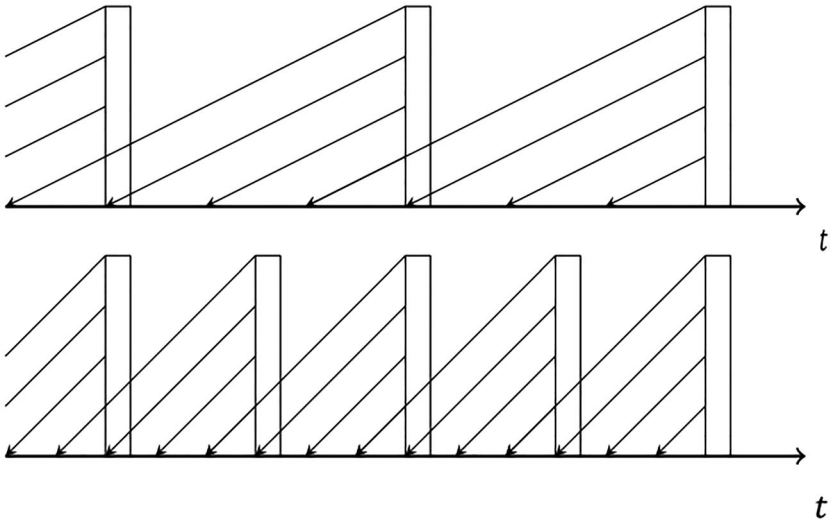

FIGURE 1 | Each vertical bar is a discrete moment of pain experience whose intentional content is the state of the body in relation to the site of injury throughout the time interval marked out by the descending arrows. In the lower panel, time is experienced as passing more slowly in light of a larger number of experienced moments per unit of objective time. The extent of the specious present is represented as contracting, but the duration of each discrete moment of pain experience is imagined as held fixed.

nervous system when she is born. Throughout her life, the probes exhaustively record her neural activity, right down to the molecular level. Nothing is missed. After her death, these recordings allow people to reconstruct a richly detailed digital simulation of Simone's neural activity throughout her life (compare Kurzweil 2005, 198–204).

Assuming for the sake of argument that the physical basis of consciousness is substrate neutral (Chalmers 1996, 247–275) and that the recordings are sufficiently detailed, each simulation of Simone's life may then be expected to generate a new person who undergoes the very same experiences Simone had while alive. Suppose multiple simulations are created and the simulations are run at different speeds by adjusting the clock speed of the simulation hardware. Each time, exactly the same neural processing is simulated via exactly the same computations. Exactly the same experiences occur. Each of these lives feels exactly alike from the inside. However, on some runs, the simulation completes in less than an hour. On others, it runs for decades.

Assume that we can isolate that aspect of a person's lifetime welfare that depends only on her phenomenal states. Call this the *phenomenal component of lifetime welfare*. Thus, the contributions valenced experiences make to lifetime welfare in virtue of how they feel belong to the phenomenal component of lifetime welfare, but need not exhaust it.

In respect of Simone and her simulated copies, many find it extremely natural to think that the speed at which we run the simulation does not affect the phenomenal component of lifetime welfare.

The subject herself cannot tell the difference. It is the same experiences that play out every time, and those experiences feel exactly the same from the inside. Surely, then, lifetime welfare should remain fixed, at least insofar as we have in mind those features of lifetime welfare that supervene on the subject's phenomenal states. Given the assumption that the objective time occupied by the good and bad experiences of the person changes dramatically across the different runs,[18] objective duration cannot be what matters. What counts must instead be the subjective experience of time's passage, which does not vary overall across the different runs, since each feels just like every other.

We can think of the argument as an abductive inference that relies on two central claims: that the phenomenal component of lifetime welfare is the same for Simone and each of her copies; and that this is best explained by the assumption that the durations of pains and pleasures and other valenced experiences are to be equated with their felt duration for the purposes of welfare assessment.

For the sake of argument, I will grant that the second claim is plausible if the first is. However, I do not think we should believe the first claim. I can think of two arguments that may be given in support of that claim. In what follows, I will try to rebut each of them.

4.2 | Subjective Indistinguishability

Here is the first argument that might be used to support the claim that the phenomenal component of lifetime welfare is the same for Simone and each of her copies. The argument appeals to the fact that the experiences of these people are subjectively indistinguishable and the claim that subjectively indistinguishable experiences contribute equally to the phenomenal component of lifetime welfare.[19]

What does it mean to say that two experiences that extend in time are subjectively indistinguishable? In some sense, an experience of 6 min of pain is subjectively indistinguishable from an experience of a minute of pain that comes equipped with false memories of having been in pain for the preceding 5 min also.

But the latter is clearly not as bad. On the other hand, those experiences are only *really* subjectively indistinguishable in their final minute. In their first 5 min, it would probably be easy to tell which you are having.

I am therefore going to interpret subjective indistinguishability in terms of what a given subject is in a position to know based on evidence that supervenes on her phenomenal states *at any time* during either experience. More exactly, here is the proposed interpretation of subjective indistinguishability. Suppose that we have two experiences, x and y, had by subjects S_1 and S_2, respectively. These experiences will be said to be subjectively indistinguishable just in case the following conditions are satisfied. At any point in time during S_1's experience of x, based on evidence supervening on her phenomenal states at that time, S_1 is not in a position to know that her experience contemporaneously satisfies any property, F, where F is satisfied by x but not y at the given point in time; and, similarly, at any point in time during S_2's experience of y, based on evidence supervening on her phenomenal states at that time, S_2 is not in a position to know that her experience contemporaneously satisfies any property, G, where G is satisfied by y but not x at the given point in time.

When subjective indistinguishability is interpreted this way, in order to say whether two experiences are subjectively indistinguishable, we need to determine what the subject is in a position to know and what her experience is like at times that we define to be "the same point in time" across the two experiences. We therefore need to rely on some kind of mapping between the temporal parts of each experience.

That is where the problem arises. We need to make a choice about what kind of mapping among temporal parts we are going to rely on in defining indistinguishability. One possible proposal is that a mapping of the relevant sort exists among the sets of times associated with two different experiences just in case those times are identically marked by two identically constructed, synchronized clocks that begin recording the proper time interval at the onset of each experience. That is not going to deliver the result that the experiences of Simone and her copies are subjectively indistinguishable, given that those experiences will often be wildly different at points that are recorded as the same based on clock time in the experiencing subject's frame of reference.

On the other hand, the proposal to rely on a mapping of that kind might seem to beg the question in favor of a view on which objective duration is what really matters. That seems right to me. But that point cuts both ways. To get the result that the experiences of Simone and her copies are subjectively indistinguishable, you seem to need to rely on a mapping among temporal parts based on their location in time as subjectively experienced, which seems to beg the question in favor of views on which subjective duration is the thing that is ethically significant.

Rather than appealing to a privileged mapping among the parts of an experience, in light of which we need to take a stand on whether the mapping represents similarity in objective or subjective time, maybe we should say that two experiences are subjectively indistinguishable just in case there exists *some* bijection relative to which the subject(s) cannot tell apart times mapped to one another. Since we make no prior assumption that the mapping is a mapping in terms of equivalence of subjective time, the charge of the begging the question might look like it has been defeated.

However, it cannot be the case that two experiences are subjectively indistinguishable just in case there is some bijection relative to which the subject(s) cannot tell apart any times mapped to one another and that subjectively indistinguishable experiences contribute equally to the phenomenal component of lifetime welfare. Here is why (compare Lee 2013, 18–19).

Imagine a mind that continuously experiences a pain of a constant intensity throughout a one second time period, measured in terms of the interval [0, 1]. It has no memory outside of an ultra-short-term memory buffer required for its experiences to have a specious present of a few milliseconds as their intentional objects. At every point throughout the 1-s interval, its experience is as of having a pain of the given intensity and of that pain filling the corresponding specious present. The mind begins to exist at the start of the one second interval and ceases to exist abruptly at its end.

Compare the same mind who continuously experiences a pain of the same intensity occupying the same specious present at every point in time throughout a 2-s period, measured in terms of the interval [0, 2]. Because the experience is uniform in character throughout the time it fills and is so across the two cases, the monotone increasing bijection $f\colon [0, 1]\rightarrow[0, 2]$ defined as $f(t) := 2t$ makes the two experiences subjectively indistinguishable on the current proposal. But, intuitively, the second experience has to be worse because it is exactly like the first at every point in time, but twice as long.

4.3 | Computational Equivalence

Here is a second argument for the claim that the phenomenal component of lifetime welfare is the same for Simone and each of her copies.

The argument appeals to the fact that the same computation occurs each time. In addition, it relies on the idea that if what goes on in the head and gives rise to the mind is Turing-style computation, then the phenomenal component of lifetime welfare must be the same whenever the same underlying computational processes are reproduced, regardless of elapsed time. A Turing machine model of computation, after all, has nothing in it corresponding to the flow of time. The machine's computation is defined in terms of the sequence of configurations yielded by the starting configuration. There is nothing in the model corresponding to the amount of time the machine spends in a given configuration or requires when transitioning from one configuration to another. If the mind is essentially Turing machine-style computation, the time the computation needs in order to complete when physically instantiated ought to be irrelevant to the character of mind, and so to the phenomenal component of lifetime welfare.

I think we should reject this argument, because it fetishizes a well-known limitation of abstract computational models of the mind. The observation that Turing machine models of computation

are atemporal is considered an objection to the hypothesis that mental activity is Turing-style computation (see van Gelder 1995; van Gelder and Port 1995; Clark 1998; Eliasmith 2003; Weiskopf 2004; Piccinini 2010). To quote van Gelder and Port (1995, 19): "Since cognitive processes unfold in real time, any framework for description of cognitive processes that hopes to be fully adequate to the nature of the phenomena must be able to describe not merely *what* processes occur but *how* those processes unfold in time."

More controversially, van Gelder and Port (1995, 21) go on to assert that "it is futile to attempt to weld temporal considerations onto an essentially atemporal kind of model." Defenders of the computational theory of mind roundly reject this claim, arguing that computational models can be successfully supplemented with auxiliary assumptions about the time required for the brain to implement a given computational operation in order to bring the model closer to reality (Clark 1998; Weiskopf 2004; Piccinini 2010).

Clearly, conscious experience also unfolds in time, and any fully adequate account of consciousness as an empirical phenomenon needs to be able to account for this. On some views, temporal properties of conscious experience end up playing an essential role in determining the representational content of consciousness, because experience represents temporal properties in the world based on a mirroring principle: an experience of change requires a change in experience, and, more generally, any experience representing any temporal property must itself instantiate the property it represents (Phillips 2014). However, we need not agree with this controversial position in order to recognize the more basic point that atemporal models of the basis of consciousness should be presumed to be incomplete.

5 | Conclusion

Because individual welfare is naturally thought of as relative to a person's own perspective on the world, it feels intuitive that the temporal extent of a valenced experience should be measured according to how long it feels, and not how long it really is, at least for the purposes of reckoning how well someone's life goes.

I do not accept that view. In part, that is because I think we lack a clear intuitive understanding of what we mean by "felt duration." As noted previously, psychologists who study the phenomenon complain that people reliably misunderstand them, substituting reports of judged duration when asked about the feel of time's passage. Since the phenomenon is elusive and difficult to interpret, judgments about the welfare significance of felt duration should be guided by theories capable of telling us what the feeling of time as passing slowly or quickly really consists in. When we turn to such theories, we come up short. It is not that such theories do not allow us to make headway in understanding the nature of felt duration. Rather, it is that, insofar as they do, felt duration seems to turn out to be irrelevant in itself for how well someone's life goes.

It may be, of course, that there is some alternative theory that would dispel my skepticism. I have no proof to the contrary. If you think such a theory might be out there, think of this paper as laying down a challenge, and as shifting the burden of proof onto those who want to maintain that the important thing really is how long your life feels, and not how long it really is.

Acknowledgments

From helpful comments and discussion, I would like to thank Adam Bales, Heather Browning, Hilary Greaves, Harvey Lederman, Brad Saad, Jeff Sebo, Derek Shiller, Teru Thomas, and Hayden Wilkinson. I would also like to thank audiences in Oxford in June 2023, at the University of Bristol in October 2023, and at the University of St Andrews in February 2024, as well as two anonymous referees at this journal.

Endnotes

[1] It may be thought that the theory of special relativity (Einstein 1905) entails that pains have no objective duration, because there is no such thing as objective duration. That is not quite right. The theory entails that observers at motion relative to one another need not agree on the time-separation between events. Nonetheless, we can identify the objective duration of a pain experience with its *proper time interval*. The proper time elapsed along a time-like curve joining two events in spacetime is the arc length of the curve (according to the Minkowski metric). This is the time measured by an idealized clock traveling along that path. Although time-like curves of different arc lengths can connect the same events, proper time along a given curve is invariant. Thus, in respect of pains, all observers will agree on how long the pain lasted according to the sufferer's own idealized clock. Many thanks to Hilary Greaves for help in drafting this footnote. Any remaining mistakes are entirely my own.

[2] For example, among philosophers who defend desire-fulfilment theories of welfare, Dorsey (2013, 162) holds that "longer-held desires are more significant because they affect the welfare value of more times throughout a person's life," and Heathwood (2005, 490) argues that it matters "how long the concurrent desiring and getting last."

[3] Strictly speaking, the psychology of time perception is organized around a tripartite distinction between *prospective timing*, *retrospective timing*, and the aforementioned *passage of time judgments*, with most research focused on prospective timing (Wearden 2016; Jones 2019). In prospective timing, subjects are made aware that they will be required to provide estimates of stimulus duration prior to the onset of the stimulus. In retrospective timing, subjects are not made aware beforehand that they will be asked to provide such estimates. Prospective and retrospective timing recruit different cognitive mechanisms (Wearden 2016, 117–130; Jones 2019, 58–59). Nonetheless, both are concerned with judged duration, as understood here. Passage of time judgments are to do with how quickly or slowly time is felt as passing, and so are intended as concerned with felt duration. In asserting that judged duration and felt duration are found to be psychologically distinct, I have in mind the observation that passage of time judgments are found to be at best weakly related to time estimates elicited in both prospective and retrospective timing paradigms (Wearden 2016, 130–140; Droit-Volet and Wearden 2016).

[4] Other analyses are, of course, available. Lee (2013) considers and rebuts a number of proposals that understand subjective durational experience as determined by the density of information processing. Prosser (2016) proposes an account of subjective time experience based on an enactivist theory of perception, which I discuss briefly in footnote 7, and which is similar in some respect to the views of Arstila (2012) and Phillips (2013), discussed in the next subsection, but distinguished by its singular focus on action. In my view, Prosser's theory is similar enough to the view developed by Arstila and Phillips that the key points I make about their view in the next subsection can be transposed to apply to Prosser's.

[5] See the previous footnote for a brief discussion of some other possible analyses.

[6] Phillips (2012) also applies the theory to explain the psychological effects of attention to time's passage on time perception.

[7] Prosser (2016) offers a different view on which the subjective experience of time's passage is explained in terms of changes in our awareness of the actions available to us. In line with the enactivist theory of perception (Gibson 1979; Noë 2006), Prosser assumes that the intentional contents of perceptual states encode possibilities for action. He therefore interprets variation in the experienced rate of time's passage in terms of the variation in the possibilities for action perceptually encoded in relation to a given interval of time.

[8] For reasons noted by Arstila (2012, 5–6), there is good reason to take reports of increased speed of thought at face value, since increased speed of thought explains the ability of people in these situations to quickly and purposefully complete complex series of actions required to save their lives. Moreover, Arstila (2012, 7–8) highlights lines of experimental evidence that support the hypothesis that people maintain a sense of how quickly they are able to shift their attention and perform similar operations. I am grateful to an anonymous referee for pressing me to address this issue.

[9] In fact, one of the accident victims interviewed by Noyes and Kletti (1977, 378) appeals to just this idea in making sense of their experience: "my thinking processes increased at an incredible rate so that my movements, in relation to them, seemed extremely slow."

[10] It is worth emphasizing here that I am interpreting cognitivism as providing a constitutive explanation of felt duration in terms of our awareness of the relative speed of nonperceptual conscious mental activity. By contrast, Torrengo (2017, 181–185) may be read as entertaining a view on which a speed-up in conscious mental activity merely causes the unusual feeling of time's passage associated with life-threatening situations. In general, for the reasons noted at the start of Section 3 and reiterated later in the paragraph to which this footnote attaches, I focus my discussion on theories that treat felt duration as amenable to constitutive explanation in terms of underlying aspects of conscious experience of which we have a better or clearer grasp. I am grateful to an anonymous referee for pressing me to clarify these points.

[11] Are we not also left cold by a description of pain processing couched entirely in the language of neurobiology? Perhaps. Still, it is obviously controversial whether pain feelings really are nothing over and above neurobiological events. Only about half of philosophers seem to think so (Bourget and Chalmers 2023). Moreover, reductive physicalists really do seem to face a challenge in explaining why we should privilege first-personal assessments of the significance of phenomenal consciousness and its determinates over the apparent insignificance that may seem to attach to the difference between conscious and nonconscious brain activity when viewed from an objective, third-personal perspective, given that, by the physicalist's own lights, only the latter would seem to tell us what consciousness really is (Lee 2019). It may be that reductive physicalists can meet this challenge somehow or other: for example, by appealing to special epistemic properties of introspection, such as certain forms of incorrigibility that remain consistent with their metaphysics of mind (see, e.g., Papineau 2002, 133–138). No similar explanation seems available for why we should give less weight to intuitions about the evaluative significance of felt duration that are based on the cognitivist analysis as opposed to intuitions framed in terms that provide less transparency about the nature of felt duration. After all, the cognitivist analysis is itself framed in terms of concepts grounded in phenomenal introspection. Thanks to an anonymous referee for raising this objection.

[12] If not to Strawson (2009, 234–240) or to certain practitioners of Buddhist meditation techniques (Davis 2018).

[13] To be clear, White provides a critical summary of evidence supporting the hypothesis of discrete experiential frames. He finds the evidence unpersuasive.

[14] For prior discussion of the many different ways this idea may be understood, see Strawson (2009) and Rashbrook (2013).

[15] One might worry that this does not get us all that far, in that it amounts to explaining the felt duration of extended experiences in terms of the felt duration of a discrete experience of the specious present, without explaining what the felt duration of an experience like that consists in. But the natural reply, I take is, is that a discrete experience of the specious present is the basic unit in terms of which we experience the flow of time and occupies one unit of subjective duration for us in just the same sense that the standard meter bar occupies a length of 1 m.

[16] Something like this may also follow in respect of pain's moral disvalue from a particular interpretation of the prioritarian hypothesis that gains in well-being matter more the worse off you are (Parfit 1991; Holtug 2010; Adler 2012). See Mayerfeld (1999, 149–158) and Hurka (2010) for further discussion.

[17] Arguably, we need not here assume *strong transparency*, on which it is *impossible* to attend directly to our experience, but only *weak transparency*, on which it is merely *very difficult* to focus our attention directly on features of our experience in introspection, as opposed to instead attending directly to the represented properties of the intentional objects of experience (Kind 2003). Thus, we can allow that the gappy character of conscious experience might in principle be revealed through carefully practiced introspection of the kind supposedly available to experienced practitioners of certain Buddhist meditation techniques: see Davis (2018).

[18] This assumption might conceivably be rejected if we accept the kind of view discussed at the end of the previous section.

[19] Those who are persuaded by Williamson's *anti-luminosity argument* (Williamson 2000, 93–113) will naturally object to the second assumption, since they think there is virtually nothing—not even pain—such that you are always in principle in a position to distinguish between its presence and absence. For present purposes, I want to set aside the voluminous controversy surrounding that argument (see McGlynn 2014, 145–166) and so will grant the objector that phenomenally individuated facts are luminous. Speaking personally, I am inclined to believe that Williamson's anti-luminosity argument fails, for reasons highlighted by Smithies (2019, 360–367). Whether phenomenally individuated facts really are luminous seems to me an open question. Thanks to an anonymous referee for nudging me to clarify this issue.

References

Adler, M. 2012. *Well-Being and Fair Distribution: Beyond Cost-Benefit Analysis*. Oxford University Press.

Ambron, R. 2022. *The Brain and Pain: Breakthroughs in Neuroscience*. Columbia University Press.

Arstila, V. 2012. "Time Slows Down During Accidents." *Frontiers in Psychology* 3, no. 196. https://doi.org/10.3389/fpsyg.2012.00196.

Bourget, D., and D. J. Chalmers. 2023. "Philosophers on Philosophy: The 2020 PhilPapers Survey." *Philosophers' Imprint* 23: 11. https://doi.org/10.3998/phimp.2109.

Broad, C. D. 1923. *Scientific Thought*. Routledge and Kegan Paul.

Chalmers, D. J. 1996. "The Conscious Mind." In *Search of a Fundamental Theory*. Oxford University Press.

Clark, A. 1998. "Time and Mind." *Journal of Philosophy* 95: 354–376. https://doi.org/10.2307/2564539.

Clay, E. R. 1882. *The Alternative: A Study in Psychology*. Macmillan & Co.

Dainton, B. 2000. *Stream of Consciousness: Unity and Continuity in Conscious Experience*. Routledge.

Davis, J. H. 2018. "Meditation and Consciousness: Can We Experience as Broken?" In *Routledge Handbook of Consciousness*, edited by R. J. Gennaro, 436–438. Routledge.

Dorsey, D. 2013. "Desire-Satisfaction and Welfare as Temporal." *Ethical Theory and Moral Practice* 16: 151–171.

Drissi-Daoudi, L., A. Doerig, and M. Herzog. 2019. "Feature Integration Within Discrete Time Windows." *Nature Communications* 10, no. 10: 4901. https://doi.org/10.1038/s41467-019-12919-7.

Droit-Volet, S., P. Trahanias, and M. Maniadakis. 2017. "Passage of Time Judgments in Everyday Life Are Not Related to Duration Judgments Except for Long Durations of Several Minutes." *Acta Psychologica* 173: 116–121. https://doi.org/10.1016/j.actpsy.2016.12.010.

Droit-Volet, S., and J. A. Wearden. 2016. "Passage of Time Judgments Are Not Duration Judgments: Evidence From a Study Using Experience Sampling Methodology." *Frontiers in Psychology* 7: 176. https://doi.org/10.3389/fpsyg.2016.00176.

Einstein, A. 1905. "Zur Elektrodynamik Bewegter Körper." *Annalen der Physik* 322: 891–921. https://doi.org/10.1002/andp.19053221004.

Eliasmith, C. 2003. "Moving Beyond Metaphors: Understanding the Mind for What It Is." *Journal of Philosophy* 100: 493–520. https://doi.org/10.2307/3655596.

Flaherty, M. G. 1999. *A Watched Pot: How We Experience Time*. New York University Press.

Gibson, J. J. 1979. *The Ecological Approach to Visual Perception*. Houghton Mifflin.

Hanson, R. 2016. *The Age of Em: Work, Love, and Life When Robots Rule the Earth*. Oxford University Press.

Heathwood, C. 2005. "The Problem of Defective Desires." *Australasian Journal of Philosophy* 83: 487–504. https://doi.org/10.1080/00048400500338690.

Hellström, C., and S. G. Carlsson. 1997. "Busy With Pain: Disorganization in Subjective Time in Experimental Pain." *European Journal of Pain* 1: 133–139. https://doi.org/10.1016/s1090-3801(97)90071-9.

Herzog, M. H., L. Drissi-Daoudi, and A. Doerig. 2020. "All in Good Time: Long-Lasting Postdictive Effects Reveal Discrete Perception." *Trends in Cognitive Sciences* 24: 826–837. https://doi.org/10.1016/j.tics.2020.07.001.

Herzog, M. H., T. Kammer, and F. Scharnowski. 2016. "Time Slices: What Is the Duration of a Percept?" *PLoS Biology* 14: 1–12. https://doi.org/10.1371/journal.pbio.1002433.

Holtug, N. 2010. *Persons, Interests, and Justice*. Oxford University Press.

Hurka, T. 2010. "Asymmetries in Value." *Noûs* 44: 199–223. https://doi.org/10.1111/j.1468-0068.2010.00737.x.

Husserl, E. 1991/1893–1917. *On the Phenomenology of the Consciousness of Internal Time*. Edited and translated by J. B. Brough. Kluwer.

James, W. 1886. "The Perception of Time." *Journal of Speculative Philosophy* 20: 374–407.

James, W. 1890. *The Principles of Psychology*. Henry Holt and Company.

Jones, L. A. 2019. "The Perception of Duration and the Judgment of the Passage of Time." In *The Illusions of Time: Philosophical and Psychological Essays on Timing and Time Perception*, edited by A. Bardon, V. Arstila, S. Power, and A. Vatakis, 53–67. Palgrave Macmillan.

Kind, A. 2003. "What's so Transparent About Transparency?" *Philosophical Studies* 115: 225–244. https://doi.org/10.1023/a:1025124607332.

Kurzweil, R. 2005. *The Singularity Is Near: When Humans Transcend Biology*. Viking.

Lee, G. 2013. "Subjective Duration." https://philpapers.org/archive/LEESD.pdf.

Lee, G. 2014. "Temporal Experience and the Temporal Structure of Experience." *Philosophers' Imprint* 14: 1–21.

Lee, G. 2017. "Making Sense of Subjective Time." In *The Routledge Handbook of Philosophy of Temporal Experience*, edited by I. Phillips, 157–168. Routledge.

Lee, G. 2019. "Alien Subjectivity and the Importance of Consciousness." In *Blockheads! Essays on Ned Block's Philosophy of Mind and Consciousness*, edited by A. Pautz and D. Stoljar, 215–242. MIT Press.

Lockwood, M. 2005. *The Labyrinth of Time: Introducing the Universe*. Oxford University Press.

Mayerfeld, J. 1999. *Suffering and Moral Responsibility*. Oxford University Press.

McGlynn, A. 2014. *Knowledge First?* Palgrave Macmillan.

Melzack, R., and P. D. Wall. 1988. *The Challenge of Pain: Updated Second Edition*. Penguin Books.

Merino-Rajme, C. 2014. "A Quantum Theory of Felt Duration." *Analytic Philosophy* 55: 239–275. https://doi.org/10.1111/phib.12047.

Mioni, G., A. Shelp, C. T. Stanfield-Wiswell, K. A. Gladhill, F. Bader, and M. Wiener. 2020. "Modulation of Individual Alpha Frequency With tACS Shifts Time Perception." *Cerebral Cortex Communications* 1: 1–9. https://doi.org/10.1093/texcom/tgaa064.

Moore, G. E. 1903. *Principia Ethica*. Cambridge University Press.

Noë, A. 2006. *Action in Perception*. MIT Press.

Noyes, R., and R. Kletti. 1977. "Depersonalization in Response to Life-Threatening Danger." *Comprehensive Psychiatry* 17: 375–384. https://doi.org/10.1016/0010-440X(77)90010-4.

Papineau, D. 2002. *Thinking About Consciousness*. Oxford University Press.

Parfit, D. 1991. *Equality or Priority?* University of Kansas.

Paul, L. A.. 2010. "Temporal Experience." *Journal of Philosophy* 107: 333–359. https://doi.org/10.5840/jphil2010107727.

Phillips, I. 2012. "Attention to the Passage of Time." *Philosophical Perspectives* 26: 277–308. https://doi.org/10.1111/phpe.12007.

Phillips, I. 2013. "Perceiving the Passing of Time." *Proceedings of the Aristotelian Society* 113: 225–252. https://doi.org/10.1111/j.1467-9264.2013.00353.x.

Phillips, I. 2014. "The Temporal Structure of Experience." In *Subjective Time: The Philosophy, Psychology, and Neuroscience of Temporality*, edited by V. Arstila and D. Lloyd, 139–158. MIT Press.

Piccinini, G. 2010. "The Resilience of Computationalism." *Philosophy of Science* 77: 852–861. https://doi.org/10.1086/656549.

Pratchett, T. 1990. *Truckers: The First Book of the Nomes*. Corgi.

Prosser, S. 2016. *Experiencing Time*. Oxford University Press.

Purves, D., J. Paydarfar, and T. Andrews. 1996. "The Wagon Wheel Illusion in Movies and Reality." *Proceedings of the National Academy of Sciences of the United States of America* 9: 3693–3697. https://doi.org/10.1073/pnas.93.8.3693.

Railton, P. 1986. "Facts and Values." *Philosophical Topics* 14: 5–31. https://doi.org/10.1017/CBO9780511613982.

Rashbrook, O. 2013. "The Continuity of Consciousness." *European Journal of Philosophy* 21: 611–640. https://doi.org/10.1111/j.1468-0378.2011.00465.x.

Rosati, C. S. 1996. "Internalism and the Good for a Person." *Ethics* 106: 297–326. https://doi.org/10.1086/233619.

Samaha, J., and B. R. Postle. 2015. "The Speed of Alpha-Band Oscillations Predicts the Temporal Resolution of Visual Perception." *Current Biology* 25: 2985–2990. https://doi.org/10.1016/j.cub.2015.10.007.

Schouten, J. F. 1967. "Subjective Stroboscopy and a Model of Visual Movement detectors." In *Models for the Perception of Speech and Visual Form*, edited by W. Wathen-Dunn, 44–55. MIT Press.

Schukraft, J. 2020. "The Subjective Experience of Time: Welfare Implications." *Effective Altruism Forum*. https://forum.effectivealtruism.org/posts/qEsDhFL8mQARFw6Fj/thesubjective-experience-of-time-welfare-implications.

Shulman, C., and N. Bostrom. 2021. “Sharing the World With Digital Minds.” In *Rethinking Moral Status*, edited by S. Clarke, H. Zohny, and J. Savulescu, 306–326. Oxford University Press.

Smithies, D. 2019. *The Epistemic Role of Consciousness*. Oxford University Press.

Somov, P. G. 2000. “Time Perception as a Measure of Pain Intensity and Pain Type.” *Journal of Back and Musculoskeletal Rehabilitation* 14: 111–121. https://doi.org/10.3233/BMR-2000-14306.

Stetson, C., M. P. Fiesta, and D. M. Eagleman. 2007. “Does Time Really Slow Down During a Frightening Event?” *PLoS ONE* 2: 1–3. https://doi.org/10.1371/journal.pone.0001295.

Strawson, G. 2009. *Selves: An Essay in Revisionary Metaphysics*. Oxford University Press.

Torrengo, G. 2017. “Feeling the Passing of Time.” *Journal of Philosophy* 114: 165–188. https://doi.org/10.5840/jphil2017114415.

Torrengo, G. 2024. *Temporal Experience: The Atomist Dynamic Model*. Oxford University Press.

Tye, M. 2003. *Consciousness and Persons: Unity and Identity*. MIT Press.

van Gelder, T. 1995. “What Might Cognition Be, If Not Computation?” *Journal of Philosophy* 92, no. 7: 345–381. https://doi.org/10.2307/2941061.

van Gelder, T., and R. F. Port. 1995. “It’s About Time: An Overview of the Dynamical Approach to Cognition.” In *Mind as Motion: Explorations in the Dynamics of Cognition*, edited by T. van Gelder and R. Port, 1–43. MIT Press.

VanRullen, R. 2016. “Perceptual Cycles.” *Trends in Cognitive Sciences* 20: 723–735. https://doi.org/10.1016/j.tics.2016.07.006.

von Baer, K. E. 1864. *Reden Gehalten in Wissenschaftlichen Versammlungen und Kleinere Aufsätze Vermischten Inhalts*. Erster Theil Reden. H. Schmissdorf.

Wearden, J. H. 2016. *The Psychology of Time Perception*. Palgrave Macmillan.

Wearden, J. H., A. O’Donoghue, R. Ogden, and C. Montgomery. 2014. “Subjective Duration in the Laboratory and the World outside.” In *Subjective Time: The Philosophy, Psychology, and Neuroscience of Temporality*, edited by V. Arstila and D. Lloyd, 287–306. MIT Press.

Weiskopf, D. A. 2004. “The Place of Time in Cognition.” *British Journal for the Philosophy of Science* 55: 87–105. https://doi.org/10.1093/bjps/55.1.87.

White, P. A. 2018. “Is Conscious Perception a Series of Discrete Temporal Frames?” *Consciousness and Cognition* 60: 98–126. https://doi.org/10.1016/j.concog.2018.02.012.

Williamson, T. 2000. *Knowledge and Its Limits*. Oxford University Press.

Yong, E. 2022. *An Immense World: How Animal Senses Reveal the Hidden Realms Around Us*. The Bodley Head.