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意識變異狀態中的時間經驗

The Experience of Time in Altered States of
Consciousness

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States of Consciousness

本論文係林傑蝶君（B10104041）在國立臺灣大學哲學學系完成之學士班學生論文，於民國114年4月23日承下列考試委員審查通過及口試及格，特此證明

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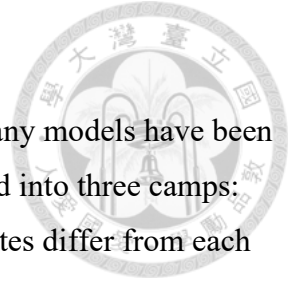
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中文摘要

時間經驗是意識經驗中的一個關鍵因素，為了解釋其結構，當代學者提出了許多模型，並可大致可以分為三個陣營：電影模型(cinematic model)、保留模型(retentional model)和延展模型(extensional model)。這些模型主要差異在於對意識行為和內容的長度持有不同看法。關於這三個模型優劣還存在許多爭議。目前，大多數相關的哲學討論經常忽略了意識變異狀態(Altered States of Consciousness)，但在這些狀態中可看到許多特別的現象經驗，其中時間經驗亦有改變。本文透過引入意識變異狀態中時間經驗的實證研究，來檢視這三類模型的解釋力，並主要集中討論兩個主要特徵：時間經驗速度的改變和看似無時間的經驗。通過分析這些特徵，我們比較了三類模型，以了解它們是否充分地容納和解釋這些特徵，以及這些假設性的解釋是否有相關實證支持。經過分析，似乎所有三類模型都未能完全捕捉到意識變異狀態中的一些改變。未來的研究應該解決這些問題，並嘗試修改出一個能夠更恰當地容納這些改變、並與相關實證發現相銜接的模型，實證研究也可以針對這些現象學模型所提出的假設與解釋做出更多相關討論，以增進對意識變異狀態中時間經驗的了解。

關鍵字：時間體驗；主觀時間；意識變異狀態；時間意識；迷幻藥；精神疾病

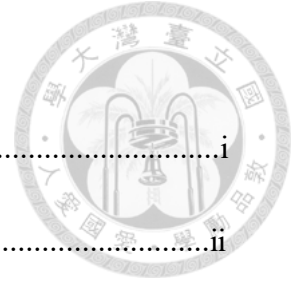
Abstract



The experience of time is a key factor in conscious experience, and many models have been proposed to explain its structure. These models can be roughly grouped into three camps: the cinematic view, retentionalism, and extensionalism. These candidates differ from each other mainly on the length of each act of consciousness and its content. However, most current discussions on them overlook some special states of consciousness, namely the altered states of consciousness (ASC), which present unusual changes in how time is experienced. We investigate empirical studies on the distinctive phenomenological features of these overlooked cases to see the explanatory power of the three groups of models. There are two main characteristics that will be taken into account: alteration in the experience of time's speed and the seemingly timeless experience. By analyzing these features of ASC, we compare the three models of temporal consciousness to see whether they sufficiently accommodate and explain them and if these hypotheses are supported empirically. After the analysis, it seems that all three categories of models fall short of completely capturing some of these alterations. The result suggests a need to revise current models to better account for these cases. Future research should address these problems and work on modifying a model that can more properly accommodate alterations and bridge to relevant empirical findings. We also call for more empirical research corresponding to the possible hypotheses of the experience of time in ASC.

Keywords: The experience of time; Subjective Time; Altered States of Consciousness; Temporal Consciousness; Psychedelics; Mental Disorders

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Chapter 1 Introduction



The experience of time is a key aspect of human consciousness. Conscious experiences stretch within the frame of time. Moreover, it provides a continuous stream, as some philosophers and psychologists suggest that we are only able to construct the narrative self through the experience of time (Berkovich-Ohana, 2017). As important as the experience of time is, however, there remains an ongoing debate on how to describe the structure of it (Prosser 2016, p.117). The main concern of the debate is how to properly describe and explain the experience of temporary extended events such as succession, changes, and movements. The many models proposed that aim to describe it can roughly be categorized into three categories (Dainton, 2010): Cinematic view, Retentional view (or Retentionalism/Retentional approach), and Extensional view (or Extensionalism/Extensional approach). The three provide very different accounts of the structure of temporal experiences.

The three models try to describe the phenomenal features of time experience and answer some relevant mereological questions. Besides the theoretical discussion, in many recent studies of the philosophy of mind, philosophers have started to consider empirical discoveries in their works. Following this line of thought, some researchers have started to incorporate empirical evidence into this discussion, as the empirical evidence helps us better evaluate their models (Dorato & Wittmann, 2019).

While multiple different models of time experience may be sufficient to explain the phenomenal features observed in normal waking states—and may offer some evidence to help determine which model is the better candidate—the altered cases provide distinctive evidence that plays a decisive role. It has been shown that human perception of time can be easily distorted by changes in external stimuli or by changes

in one's mental state (Kanai, 2014). In this paper, we focus on the latter. Some mental states that are very different from normal waking states are labeled "altered states of consciousness (ASCs)". To better investigate the topic of time experience, it is worthy to consider ASCs, as it includes states with severely distorted experiences of time.

Ideally, the model of temporal experience should be able to accommodate and better explain these changes, making it a stronger candidate.

In psychopathology, it is observed that the experience of time in patients with mental disorders can be seriously disturbed, such as in schizophrenia (Giovanni et al, 2016), in bipolar disorder (Northoff et al, 2018), and in depression (Fuchs, 2013). Furthermore, the comeback of research on psychedelics has brought about an up-and-coming field, which is the philosophy of psychedelics (Letheby, 2021). To better explore this field, it is worth investigating how to describe the temporal structure of altered states induced by psychedelics, since an altered sense of time stands as one of their main features.

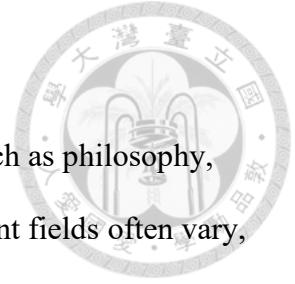
Despite how hard it is to set a rigorous definition of ASC (Dietrich, 2009), many researchers agree that ASC refers to the conscious states with qualitative alteration in the overall pattern of mental functioning. To be more specific and to avoid further confusion, the domain of ASCs in my research includes cases of alteration induced by psychedelics and those psychopathological ones.

There are three aspects that make the questions this research focuses on particularly relevant. First, the long-running debate about the structure of temporal consciousness in humans can be further informed by the phenomena observed in ASC. Second, an accurate picture of time experience contributes to psychopathology by helping us understand the underlying phenomenology of various disorders. Third, beyond psychopathology, it also offers insights into psychedelic research, especially concerning the temporal structure of the bizarre phenomena experienced.

I aim to demonstrate that the experience of time in ASCs remains significantly underexplored. While the trichotomy of models offers useful theoretical frameworks, it still falls short of adequately accounting for the temporal features of ASCs. Moreover, current empirical findings are insufficient to fully support the theoretical hypotheses proposed.

To achieve this, the paper will be structured as follows. In section 2, I outline some methodological distinctions to clarify the scope of this study, given the many possible approaches to the subjective experience of time. I will also introduce the three categories of models as identified by Dainton (2010). Following that, in section 3, I will identify the two most significant experiences in ASC, which are the alteration in the experience of time's speed and the timeless phenomena. In Section 4, I will explore possible explanations for these phenomena from the perspective of each of the three models and look for relevant empirical support to compare them in Section 5, which highlights their shortcomings. Section 6 will briefly respond to some potential objections. I will conclude that the existing three models remain incomplete in their ability to account for the temporal experiences in ASCs and that this underexplored topic deserves more investigation from both theoretical and empirical sides.

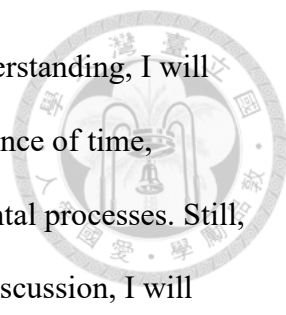
Chapter 2 The Study of the Subjective Time



There are several fields that discuss the topic of subjective time, such as philosophy, psychology, and cognitive science. The terminology used in different fields often vary, which can be confusing for the readers. Hence, I want to begin with clarifying the topic of this research. This paper incorporates both what is commonly referred to as time perception in scientific disciplines and what is known as the experience of time or temporal consciousness in philosophy. I will briefly discuss the fine-grained relationship between these two notions and review some commonly used methods in the scientific study of subjective time, as this research aims to draw on empirical findings to inform our main theoretical discussion. And introduce the trichotomy of models accounting for the experience of time, which is a widely adopted framework in philosophical debates that will serve as the conceptual framework for the investigation in the following sections.

2.1 The Relation Between Perception and Experience of Time

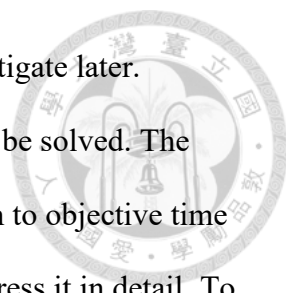
The subjective time can be analyzed from various directions. In psychology, “time perception” and “the perception of time” are used interchangeably. It is a topic that concerns human awareness of the passage of time. Besides perception, some researchers (Matthews et al., 2016) aim to connect time with general human mental processes such as memory, attention, and so on, thus also favoring the term “time cognition.” As for the philosophers, many use the term “temporal consciousness” (Dainton, 2024 SEP entry), which emphasizes the role of consciousness in the experience of time. Some also use the terms “the experience of time” (Le Poidevin, 2019 SEP entry) and “experiencing time” (Prosser, 2016) to broadly refer to the aspect of time in our conscious experiences.



As the switching between terms might cause confusion and misunderstanding, I will use “the experience of time” to generally refer to the human experience of time, regardless of its length, content, or whether it is related to other mental processes. Still, while citing what others have said on this topic or following their discussion, I will preserve their original terminology.

Are all these terms referring to the same phenomenon? While some may use time perception in a broader sense that blurs the distinction between it and the experience of time (Le Poidevin, 2019 SEP entry), some people highlight the distinction between them and emphasize the importance of connecting the various aspects. For example, Northoff et al. (2018) attempt to provide a link between the phenomenological aspect of time (experienced time) and the psychological aspect of time (as often tested through time perception tasks). They suggest that we can take the phenomenological aspects of time as the baseline of a subject’s experience. When we ask them to perform time perception tasks, they use such a baseline to estimate objective time. Thus, those who experience accelerated time have an abnormal baseline, which leads them to underestimate the temporal interval, while those who experience deceleration overestimate time instead. To make this concept more comprehensible, let us consider some examples from daily life. When we feel bored, time seems to go by very slowly (decelerated time), and a 40-minute meeting feels like an hour (overestimation of temporal interval). In contrast, when we are drunk, time appears to pass quickly (accelerated time), and a three-hour gathering feels like two hours (underestimation of temporal interval).

Of course, this link still has its limitations, for there can possibly be cases where the subjective alterations of time do not manifest themselves on psychological tests of subjective time. Also, some subjective alterations are hard to test through the above-

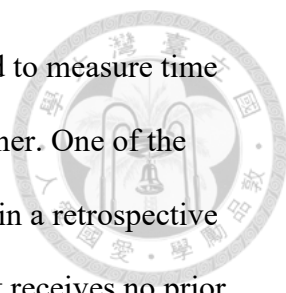


mentioned time tasks, such as the timeless experience we will investigate later. Bridging the different ways to study subjective time still remains to be solved. The discussion on the different aspects of subjective time and its relation to objective time is a rich and widely debated topic. However, this paper will not address it in detail. To maintain our primary focus on the experience of time in altered states of consciousness (ASCs), we will include studies that examine changes in subjective time during ASCs, whether through interviews or first-person reports, or from a third-person perspective. As Berkovich-Ohana et al. (2020) pointed out, the phenomenological investigation can be categorized as thin and thick. According to this view, various methods—such as introspection, interviews, questionnaires, and self-reports—can all be used to investigate first-person experience. These methods fall along a continuous spectrum from thick to thin phenomenology. In this paper, I gather relevant evidence retrieved from many different methods. The minor differences among them do not pose a serious challenge to our main argument, as they are just different ways to characterize the same phenomenal experience.

2.2 Empirical Methods to Study the Experience of Time

Qualitative research on ASCs is often seen in the field of psychedelic-assisted psychotherapy, which involves professionally supervised use of psychedelics such as ketamine, MDMA, psilocybin, and LSD (Schenberg, 2018). Although most of this research primarily focuses on the therapeutic effects of psychedelics in patient recovery, it also contributes to our understanding of human experiences in psychedelic-induced ASCs and highlights its close connection with the altered states observed in psychopathology.

On the other hand, quantitative methods are commonly employed in the study of

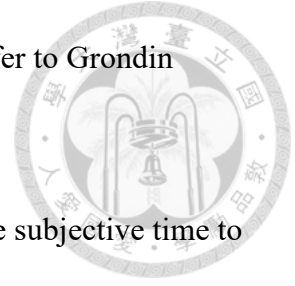


subjective time. A variety of widely used tasks have been developed to measure time perception by evaluating participants' behavior in an objective manner. One of the main distinctions between these methods is whether it is conducted in a retrospective or prospective way (Grondin, 2010). The former is when the subject receives no prior warning before the interval; since it is more related to memory, most of the studies that adopt this method focus on a longer period of time. The latter is when the subject is informed to make time-related judgments before the task starts, focusing more on the shorter period of time.

Since this paper focuses on shorter timescales, most of the research that will be discussed adopts the prospective method of shorter time periods. I list some of the common tasks below for reference.

1. Time reproduction task: In a time reproduction task, participants are usually first presented with a sample duration and are then required to produce a motor action (e.g., to press a button) to reproduce the previously presented duration. the length of a certain duration by asking them to produce a temporal interval equivalent to a duration that was previously indicated.
2. Time bisection task: The temporal bisection procedure is used to study temporal discrimination. Initially, the subject learns to choose between two response alternatives, R1 and R2, according to the (short = S1 or long = S2) duration of a sample stimulus: After S1, choose R1, and after S2, choose R2. Next, the experimenter introduces samples with new, untrained durations, and for each one, records the proportion of R2 (or “long”) choices. The psychophysical function relating the proportion of “long” choices to sample duration t reveals key properties of temporal discrimination.

(For more information on common time perception tasks, please refer to Grondin (2010).)



These methods are effective in quantifying the discrepancy from the subjective time to the clock time. They also allow for comparisons of performance both within and between subjects. I acknowledge that there are more confounds in the performance of doing these tasks than just the experience of time itself. So, in this paper, these time perception tasks will serve only as supporting evidence rather than conclusive proof.

2.3 The Trichotomy of Time Experience

Let us now turn to a more traditional philosophical discussion on the experience of time. In the philosophy of time, philosophers base their framework on two possible series (McTaggart, 1908): the A series (past-present-future) and the B series (earlier-later). However, the experience of time can be another story. Conscious experience exists in time. Temporal consciousness is essential for our brain to process information, form a sense of self, and enable many important phenomenal features of consciousness or functions (Wittmann, 2009). However, many mysteries remain. It seems obvious that we experience the flow of time, variations in speed, changes in rhythm, movements, and duration, among other temporally extended phenomena. The perceived successions (or motions) of time are a main phenomenal feature of the experience of time (Prosser 2016, p.117). For example, it seems clear that we can perceive airplanes passing by, the volume of music gradually increasing, and rain pouring down from the sky. These experiences all occupy extended periods of time. But how exactly do we do so? Can we directly perceive these changes? Is our temporal consciousness limited to a moment or an extended interval?

There are many models that aim to explain these questions. Among the proposed

theories that seek to explain the phenomenal experience of time, a major division concerns whether we can directly perceive temporally extended phenomena. Phenomeno-temporal realists posit that change, succession, duration, and persistence can be directly perceived, whereas anti-realists deny this viewpoint (Chuard, 2011). This leads to distinct attitudes about what principles should be held to explain the nature of the experience of time.

Given these various points of view, Dainton (2008) suggested to categorize these viewpoints into three groups: the cinematic view, the retentional view, and the extensional view. Based on the well-accepted state(vehicle)-content distinction, we can roughly categorize each view through whether they hold the content of the experience and the experience itself to be extended. Thus, the cinematic view holds neither; the retentional view holds that content can be extended but not the experience, and the extensional view holds both. Dorato & Wittmann (2019) suggest the logical possibility of a fourth position, which holds the experience to be extended but not the content; they call it “anti-retentional,” which lacks supporters and thus would not be considered here.

In the following section, we will discuss the three views regarding the phenomenon-temporal consciousness and their arguments. Please note that these three views are roughly categorized, and variations exist within each view. For example, Arstila (2023) argues that we should distinguish the “snapshot model” from other cinematic models, because although the “snapshot model” also agrees that experiential contents are confined to very short-lived instantaneity, they do not reject realism. However, what is relevant to our discussion is whether the main viewpoints of the three categories hold sufficient explanatory power for the empirical evidence in ASCs. Further research can adjust the inner theoretical structure to better accommodate and

connect to empirical findings.

Ultimately, our goal is to evaluate whether these theoretical frameworks can comprehensively account for the temporal distortions observed in ASCs. The three views differ in several aspects, but they are all somewhat convincing, and each faces internal theoretical problems or external problems concerning the empirical investigations of the experiences that need to be addressed. In this paper, I will focus on the latter, and try to provide some empirical evidence to support or criticize them in ASCs. This evaluation will not only clarify the strengths and limitations of each approach but also highlight potential needs for theoretical integration or revision.



Chapter 3 Overview of the Distorted Experience of Time in Altered States of Consciousness



In altered states of consciousness, we can observe robust changes in the experience of time, which is very different from the normal state. Such differences can be the key for us to understand the structure of time experience. Furthermore, we expect a proper model of time experience to hold explanatory power to account for ASC cases. In this paper, we would group the main characteristics in ASCs into two categories: (1) alteration in the experience of time's speed and (2) the seemingly timeless experience. The first category includes both qualitative research that reports such experience as well as quantitative research that shows differences in the performance of time perception tasks. The second category would mostly focus on qualitative research, as there is not yet much quantitative or physiological research done on such rare situations.

Before we start investigating the distinguishing characteristics of the experience of time in ASC, let's briefly discuss the general phenomenon of the experience of time first. It is widely accepted that the temporal experience seems continuous. Thus, the conscious experience is sometimes called "the stream of consciousness" to show its continuity, a term that can be dated back to William James (1895). For example, when we view the motion of an object, or when we move our viewpoint, the change of view does not seem discrete. Or while we stare at a stable item, it remains the same throughout the duration of observation.

The second general phenomenon is the ability to differentiate between simultaneous and non-simultaneous events. In conscious experience, one can usually distinguish between events that are separated temporally while recognizing some events as

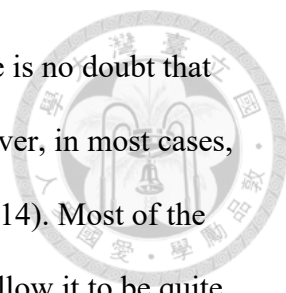
happening at the same time. We would say that we concurrently experience several things, whether being perceived by the same modality or not, while claiming that other things are experienced separately. It is worth noting that the ability to differentiate between the perception of temporal separateness (of non-simultaneity) and the perception of temporal order are not the same thing, since the former does not imply the latter. It is possible that one cannot tell the order of two non-simultaneous perceptions. Also, events that are seen as simultaneous might not indeed happen simultaneously in objective time.

The third general phenomenon is that we seem to be able to experience short-term succession and duration. For example, when the second hand of a clock moves, we perceive its motion as continuously moving. However, when the hour hand moves, the movement does not seem continuous. Like what we have briefly mentioned, the realists hold that the perception of extended phenomena is direct, while the anti-realists try to explain it in indirect ways. Regardless, the experienced succession and lack of succession is to be explained.

These three basic aspects of temporal experience can be altered in ASCs to some degrees. Certain phenomena may change in terms of degree, while others may be entirely absent or transformed into qualitatively different experiences. With this in mind, let us now turn to a closer examination of the two cases in ASCs.

3.1 Case 1: Alteration in the Experience of Time's Speed

The alteration in the experience of time's speed is often found in ASCs. To be fair, humans overestimate or underestimate the length of time often. We often say that "Good times go by quickly" or "Time drags when you're bored." Whether it is due to emotional changes, environmental constraints, or periodically fluctuating changes



across the circadian or the menstrual cycle, just to name a few, there is no doubt that our perceptions of temporal durations vary for many reasons. However, in most cases, the error would not be too troubling (Noreika, Falter, & Wagner, 2014). Most of the time, the factors that make up our estimation of time calibrate and allow it to be quite accurate. Even when they are not, to overestimate a two-second interval as 2.3 seconds may not reflect a severe change in the subjective experience of time. But if one estimates a two-second interval as a 5 seconds, we may seriously suspect that they have a severe change in their phenomenal experience.

As we have discussed in Section 2, the altered experience of time may reflect itself on the performance of tasks that involve time perception, as well as the change in first-person experience. We can reasonably expect that when one is experiencing the acceleration of time, they underestimate the length of time. For example, during the break between classes, students may feel like time has been passing by faster, such that ten minutes pass so quickly it seems like 5 minutes only. Thus they underestimate the length. On the other hand, the deceleration of temporal experience can reflect on the overestimation of the length of time. Please note that we are not to say that any change in the subjective experience of a change in the time's speed is necessary for inaccurate performance in time perception tasks or vice versa. Instead, our following discussion will include cases of alteration in the experience of time's speed, whether it is reflected in time perception tasks, self-reports, or both.

The slowed experience of time is one of the most distinguishing features of depression. The patients who suffer from depression report a feeling of slowed experienced time (overestimation of time), which might be due to the fact that their internal speed does not match the speed of the social environment (Fuchs, 2013). Besides the subjective report, they also show impaired ability in timing tasks such as bisection tasks, and

while conducting timing tasks, overestimation is more significant in short intervals (Liu et al., 2022).

Similar affectedness in timing ability is also found in LSD microdosing subjects (Yanakieva 2019). They found that even if the subjects do not experience significant changes in conscious states, LSD still leads to over-reproduction of temporal intervals. Also, in standardized questionnaires for altered states of consciousness, many take the altered sense of time as a factor. For example, 5D-ASC (Dittrich, 1998) is one of them. It contains various questions that are categorized into 11 groups, including “oceanic boundlessness” (OB), “anxious ego dissolution” (AED), and more. Each question can be rated from 0-100 by the subjects. There are abundant such questionnaires (Carbonaro et al., 2018), like the States of Consciousness Questionnaire (SOCQ) and the Pharmacological Class Questionnaire, just to name a few. In these scales, there are always questions directly or indirectly relating to “altered sense of time and space”, “transcendence of time and space”, and so on. We can thus confidently say that the altered sense of time is a key feature of ASCs.

We can briefly overview what such alteration in the experience of time’s speed is like. Letheby collected and discussed a lot of self-reports of ASCs induced by psychedelics in his 2021 book. Letheby describes the experience of time in ASCs as “subjects of mystical experience report a sense that time had slowed dramatically or stopped completely.” While the opposite can be found in cocaine or Ecstasy (MDMA), which lead the subject to feel the “racing” of time. After using such substances, people can even “dance the night away,” as vividly described by Marc Wittmann in his 2018 book. We will leave the complete timeless experience to the later section. Here, it’s clear to see that the experience of time’s speed can have dramatically changes under a short period of time, such as right after using psychedelic drugs. In mental disorders,

such change can be more permanent and profound in longer lengths of time.

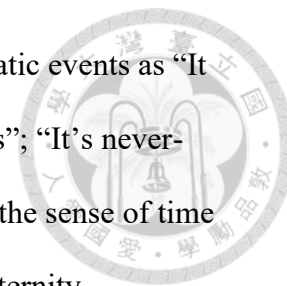
What is the decelerated or accelerated temporal experience itself like? We need to explain what changes in one's consciousness cause such phenomena. Also, what happens when one's experience of time slows down or speeds up? The proper model for the experience of time will have to consider these questions.

3.2 Case 2: The Seemingly Timeless Experience

In ASCs, the continuity of consciousness may not only change its speed of passing, but even seem to stop. The so-called timeless or time expansion experience is a common feature of the ASCs in psychedelics induced states (Taylor, 2022). In the case of psilocybin (which is a naturally occurring psychedelic), it is shown that the dose of it influences the ability to produce time reproduction tasks, where the subjects are required to count or feel a temporal duration that is equivalent to a previously experienced temporal duration (Wackermann et al., 2008). When maximum intensity reaches about 60–90 min after the intake of the drug, the group that took higher doses of psilocybin produces intervals that are longer than the lower and placebo groups. The research suggests that this can be related to the “time standing still” phenomenon reported in many qualitative studies.

So far, some people may see the “time standing still” or timeless experiences as a more intense version of the overestimation of time. For example, I may feel like the time is not passing when my experience of 1 minute clock time feels like 1 hour to me. I may wonder why there has only been such a short amount of time passed when I feel like it has been long. But further, there are cases where time passes so slowly that it seems to not be passing at all. In some extreme situations, such as traumatic events, subjects report a total loss sense of time, which is replaced with a sense of eternity. Ataria

(2015) interviewed several PTSD sufferers who describe the traumatic events as “It seemed to me like forever”; “Eternity...without any time constraints”; “It’s never-ending”. They found that most of the interviewees did not feel that the sense of time slowed down, but rather that the duration of the event was like an eternity.



The subjective reports of the phenomenal experience demonstrate that the slowed time and timelessness are likely two different phenomena. Timeless experience is more robust in ASC such as meditative states. Droit-Volet & Dambrun (2019) review some studies related to the altered sense of self and time with testimonies from expert meditators. These meditators report many special experiences of time during deep meditative state, such as “It(time) stops, it does not pass. It is totally absent.”, “It stops. Time = 0. No feeling of time” and so on. They also conduct an experiment testing time perception (“judgment of interval durations” in their words) and experience of time’s speed (“passage of time” in their words). They found that the underestimation of time, which is likely due to experiencing accelerated speed of time, is surprisingly correlated with the idea that time flies during meditation as if time no longer existed. (Droit-Volet, Chaulet, & Dambrun, 2018) This suggests that timeless experience is independent of time’s speed—in PTSD patients, they experience slowed time in traumatic events, while in meditators, they experience accelerated time. Still, both claim that timelessness is a feature of their experience.

Let us acknowledge that the “timeless”, “eternal” experiences of time we are focusing on here are different from the mere alteration in the speed of time that we have discussed in section 3.1. In 3.1, the subjects still experience time passage, just that the speed of passage changes greatly. But in a timeless experience, the subject does not even feel like their experience still unfolds within the scale of time.

How can we explain the experience of timelessness? We must admit that factually, such an experience is still unfolding within the framework of time, as there is a consensus that conscious experience is extended in time (Kent & Wittmann 2021), just that the framework of the experience has to accommodate how the experience itself can be heavily twisted, to a point that it can be suggested that in these cases time does not seem linear like usual.

Chapter 4 Theoretical Explanations of the Experience of Time in Altered States of Consciousness



4.1 Cinematic View

4.1.1 The Basic Framework of the Cinematic View

One of the most popular views of anti-realism is the so-called “cinematic view.” They state that the experience of time itself is not continuous but formed by discrete states of experience. Similar to how film and cartoon works, the film itself need not be an actual “continuous” stream. With an appropriate frame rate, viewers are led to perceive a seamless connection between each frame, forming the illusion of uninterrupted motion. Cinematic model supporters suggest that we are unable to directly perceive the stream of time. Instead, we perceive only a series of “snapshots” that are momentary and static.

The model consists of a continuum of momentary (or very brief) phases . These phases are so brief that they do not hold any succession or duration themselves. Still, we humans are able to perceive succession, though not in a direct way in the realist sense. The phases are densely packed together, one by one, and rapidly presented in our ray-like awareness, which causes our sense of duration. Both the content and the act of conscious time are momentary, not extended.

However, many attack them based on a favored and well-accepted slogan from William James (1890), who states a distinction between “the experience of succession” and “the succession of experience”. A lot of philosophers accept such distinctions. They doubt that the cinematic view blurs the two cases and reduces the former to the latter.

Despite such attacks from the realists, there are still some advocates who support the cinematic view. One of the most active philosophers, Chuard (2017) suggests that the cinematic view, or “the snapshot view” in his words, holds equal if not higher explanatory power, and its mereological structure is simpler. We cannot encompass a detailed discussion here. The key feature of the cinematic view is that they don’t take the phenomenal experience of time at face value like the realists and aim to reduce the continuous stream of consciousness to discrete, momentary events, each containing content that is as momentary.

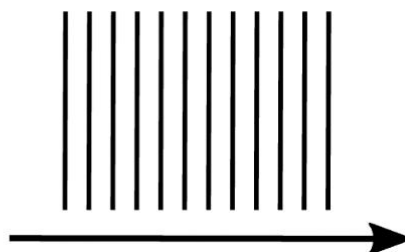
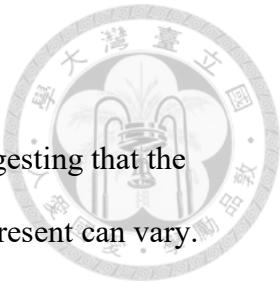


Figure 1. Cinematic Model (adapted from Dainton, 2024 SEP entry)

4.1.2 Cinematic View’s Explanation for Case 1

The cinematic model claims that the experience of time is not itself continuous but only appears so, as many temporary moments occur one after another. If anything is to be altered, it can either be (1) the content of the unextended present or (2) the gap between each instantaneous act of consciousness, since the length of the unextended present cannot be changed. ASC is known for subjective experiences involving hallucinatory content. The cinematic model can explain the altered speed of time by changes in the content of each instantaneous moment. However, there are clearly cases where the amount of content remains unchanged despite a change in the experienced speed of time—such as in psychopathology. People with depression, for instance, experience decelerated time without also experiencing hallucinations or other unusual

content.



The cinematic model can also adopt the second possible option, suggesting that the length of the gap between each instantaneous consciousness of the present can vary.

This leads to the problem raised by Dorato and Wittmann (2019): whether such a gap would cause the subject to miss events too frequently. If there is, say, a 200-ms gap between each unextended present, everything that occurs during that 200 ms would not be perceived by the subject. In that case, we would miss quite a lot of what happens in the world. Interestingly, Dorato and Wittmann criticize the cinematic model on the basis of the stability of the gap’s length. If the gap remains constant, we would consistently fail to perceive events that fall within its duration. Yet, the cinematic model might as well bite the bullet, as Chuard (2017) suggests that the gap is normally small enough for us to experience successive events without any apparent discontinuity.

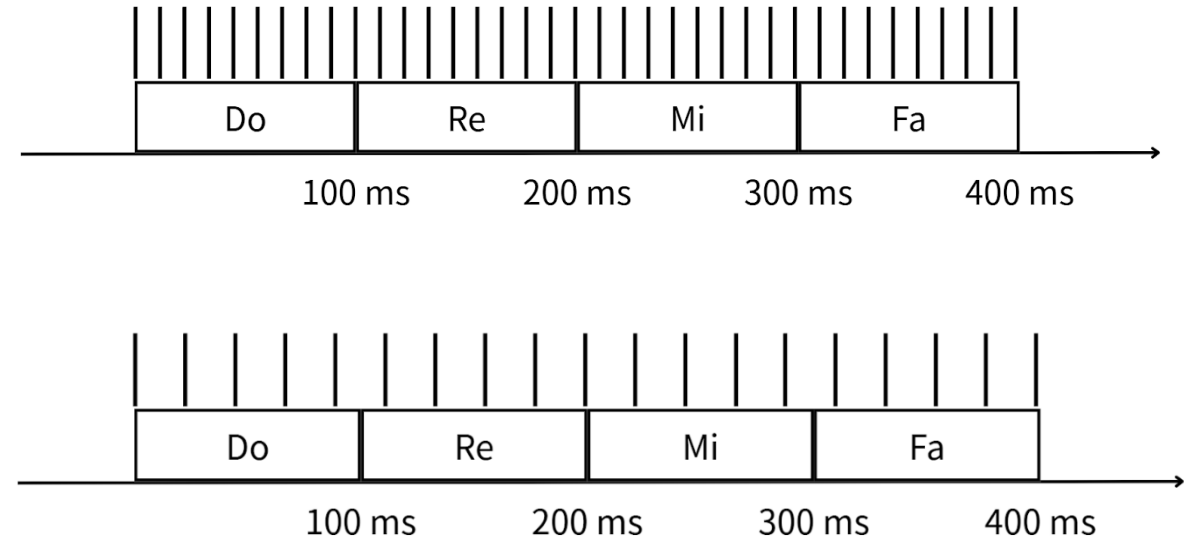


Figure 2. The enlarged gaps.

If the cinematic model accommodates the possibility of varying interval lengths between each instantaneous act of consciousness, can it capture the experience of accelerated and decelerated time? If we understand each unextended act of consciousness as the moment when stimuli are perceived, the variation of gap length would lead to stimuli being missed at an unstable frequency. For example, an enlarged gap makes events within it unperceivable. When a significant amount of content goes unperceived, people may underestimate the passage of time.

Here is the possible explanation from the cinematic point of view. Imagine you are listening to the sequence “Do-Re-Mi,” but in an altered state of consciousness (ASC), the “Re” falls within a gap, so you only experience “Do-Mi.” You might wonder why it seems to jump so quickly from “Do” to “Mi.” This reflects a deceleration of subjective time, as you are perceiving too little and missing too much. It is also possible that perception, and the lack of it, occurs at a shorter, unconscious level.

Consider the movement of a handwave. In ASCs, it may feel like the hand is waving faster or slower than usual, and varying the gap lengths means that subjects either fail to perceive some locations of the hand during the movement or perceive more fine-grained changes in the hand's location. Skipping locations, such as when left-middle-right becomes left-right, may make the subject feel like the hand moves faster from left to right or appears to “jump” from left to right. However, this hypothesis takes extra steps to get to the speed phenomenon—they use the unexpectedness of the discontinuity to explain the speed alterations.

In conclusion, the cinematic view requires a necessary link between the quality and/or amount of content and speed to properly explain the latter. They have to say that the speed changes are due to perceiving special content, or missing/increased content during a certain period of time.

4.1.3 Cinematic View's Explanation for Case 2



The cinematic view suggests an anti-realism model in that it seeks to reduce the seemingly continuous experience of time to discrete snapshots. To reject taking the experience “at face value,” the anti-realists have two possible ways to explain the timeless experience: (1) They can argue that the basic structure remains the same regardless of the apparent alteration; (2) They can reconsider whether timelessness can be reduced to another structure upon which it supervenes, while it may fall out of the basic rules of their view. For the focus of our discussion here, it is not clear if following reductionism while changing the proposed structure is still a cinematic point of view or represents yet another possibility of anti-realism. This possibility can be further explored, but as we want to focus on the explanatory power of the standard views, let us focus on (1). Although the timeless experience seems profoundly different from the normal state, and even from ASC case 1, the cinematic may still try that such timeless cases can still be reduced to their simplified model. We will still maintain the basic structure of the cinematic model.

Considering the experiential content itself, Chuard (2017) states that the cinematic view stresses that the similarities between the content of each instantaneous snapshot lead to a feeling of continuity. If you look at your hands, then look down at your feet, and then turn left to look out the window, you will feel that this series of experiences, despite occurring within a short period of time, is not as continuous as, for example, looking at a leaf slowly falling from the tree. Thus, they can say that if one fails to find the similarities between perceived content, one will experience the discontinuity and feel as if they are stuck in a present that lasts forever.

Also, based on our previous discussion, we suggested that widened gaps lead to

missing content, which is related to diachronic discontinuity, and that this discontinuity may help explain changes in the perceived speed of experience. Supporters of the cinematic view can argue that the experience of timeless phenomena also arises from variations in the duration between each instantaneous act of consciousness—

particularly when these variations become more pronounced. Perhaps when the gaps are more significantly enlarged, a timeless experience occurs. We can understand this kind of discontinuity as being stuck in each “snapshot”—that is, because the gap between each discrete experience in the sequence is too large, the subject feels as if a single snapshot lasts forever. This matches what we have seen in case 2, where subjects report that time feels never-ending or eternal.

For example, imagine a pianist playing the notes “do-re-mi” in sequence. Just as they are about to play “fa,” a loud “boom” suddenly erupts as something crashes onto the stage. Even though the pianist is professional enough to remain at the same pace and keep playing “so-la-ti-do-re-mi,” etc., I was so stunned by the loud boom that the gap between the experience of “boom” and the next experience became so big that the next thing I experienced was already “mi.” I did not perceive “so-la-ti-do-re.” Therefore, I feel like the “boom” exceeds the normal stream of time because I am stuck there, and when I snap back to reality, I feel like the “boom” experience is not continuous with the “mi” I then experienced.

The problem is, even if we set aside whether such mechanisms properly capture the phenomenal experience of case 2, they still use mechanisms that are very similar to those they have used in explaining case 1. This is where the simplicity of the cinematic view becomes a double-edged sword. It seems that the cinematic view suggests that the timeless phenomenon is just a more severe distortion of time’s speed. However, when we describe case 2 in section 3, we find that for those who feel like they are

living in eternity and time stops passing, it is not just a more severe case of slowed or accelerated time.



4.2 Retentional View

4.2.1 The Basic Framework of the Retentional View

In contrast with the cinematic view, many argue that the present of experience is not the same as the present in clock time; therefore, they refer to the former as the “specious present.” Many models embrace the concept of the specious present, though each offers its own variation. The focus here—the retentional view—is based on Husserl’s idea. It includes the momentary now as well as the retentions (or “primary memories”). After each experience that takes place the momentary now, it slips into the past. But before they fully become part of the past, they still survive as “retentions” for a while. The retentions are not just memories of the past events. They are experienced “as past”. The protentions, on the other hand, are a counterpart of the retentions. Dainton (2024 SEP entry) described protentions as “openness to the future, an expectation that something will come.”

So, the retentional view consists of three elements: primal impressions (now), retentions, and protentions. How do they form the specious present? Chuard (2022) lists the three principles that the retentionalists hold. R1: extended temporal contents, which states that the representational contents of a perceptual experience can be an extended event, temporal relation, and such. R2: backward-looking contents, which states the contents of a temporal extended event need not be represented as simultaneous, but the early part of it is represented as occurring before the later part. R3: unextended experiences: the conscious experience itself need not be extended as its content.

In figure 3, the horizontal axis shows the continuous flow of primal impressions. On it, there are points C, D, E, F, and G that are perceived at different moments. The vertical axes show a selection of retentions, and G* is an example of protention. So at the moment when E is perceived, D* and C** are also retained at this specious present, where the * shows the increased level of pastness.

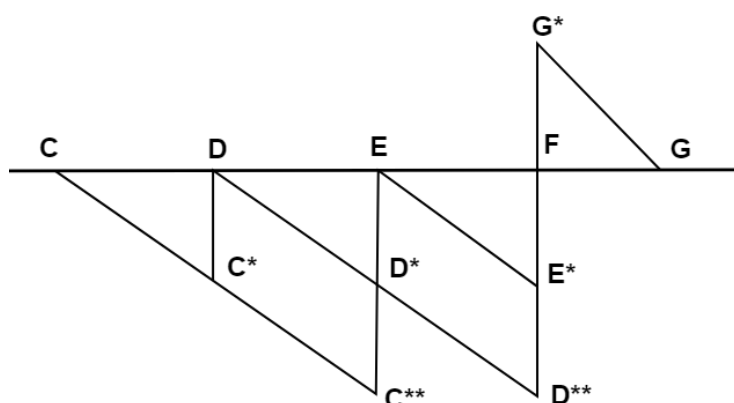


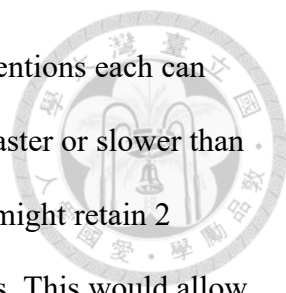
Figure 3. Retentional Model (adapted from Dainton, 2024 SEP entry)

One of the problems that the advocates of the retentional view need to face is that, just like the cinematic view, they also hold that the act of consciousness itself is not extended over time. It needs more explanations on how the content can be extended while the act itself isn't. Also, it's important to show exactly how the retentions play their role.

4.2.2 Retentional View's Explanation for Case 1

The retentional model allows possible changes that the cinematic model did in their structure regarding each discrete act of consciousness. The length of each episode of consciousness is not to be changed due to them being purely unextended. Also, it's possible that the amount of retentions in an instantaneous act of consciousness varies, or that the density of each instantaneous act of consciousness varies.

Let us start from the first possibility. We do not change the amount of act of



consciousness in clock time, but change solely on the amount of retentions each can hold. They can say that the retention under ASC cases fades away faster or slower than in normal states. For example, while a typical act of consciousness might retain 2 seconds of past content, in this altered state it might retain 3 seconds. This would allow us to experience normally non-continuous sequences as connected. We may usually experience Do-Re-Mi as continuous but not “Do-Re-Mi-(pause)-So”. If we are able to hold more retentions, we would feel like “Do-Re-Mi-(pause)-So.” is a continuous experience when we are hearing “So” at clock time. This way, we feel like more things happen almost at the same time, thus we underestimate the length of time (thinking “Do-Re-Mi-(pause)-So.” as the same length of time as normal “Do-Re-Mi”), which relates to the acceleration of the experience of time’s speed.

So we anticipate those who underestimate the length of time and feel the acceleration to keep more retentions at each moment. Theoretically, it already invokes concern since we may also want to suggest that since things are happening faster to a subject, they are indeed unable to sustain content properly. It can actually be the other way around! If the retentions fade faster in the states influenced by LSD, people have a tendency to forget the content that is not too long ago from the present, while this doesn’t happen in normal states since the content would have still been retained. This might lead to the acceleration of the internal clock, and the subject will thus feel like one second ago is already quite distant from now. Thus, the overestimation of time can also occur. These two hypotheses clearly contradict each other, but both are compatible with the retentional view. This highlights a significant weakness of the retentional model: its flexibility allows for contradictory explanations, reducing its explanatory power. We will leave it here for now and look for relevant empirical evidence in section 5 to further discuss this possibility.

The second possibility for the retentionalists is the density of each instantaneous act of consciousness. This is actually quite similar to what we have said on the cinematic model's gap within the same instantaneous act of consciousness. If the gap between each act of consciousness becomes larger, whatever happens within the duration will not be experienced by the subject at all. Thus, we would expect a direct correlation between the amount of missed content and an acceleration of time. Again, this is yet to be supported, as we've previously discussed in the cinematic view section.

4.2.3 Retentional View's Explanation for Case 2

In order to explain timeless experience, the retentional supporter can do the same as the cinematic view may do, which is to use the enlarged gap between each unextended specious present to explain the timelessness. As it has been mentioned, let us turn to the second possibility—that is, the change in the content, the retention.

Theoretically, the retentional view may take timelessness as an extreme case in which the subject (1) fails to keep anything in retention or (2) keeps things in retention for way too long. If the retentionalist takes the process of retention to fail in ASC, their model will collapse into a cinematic model in which there is no temporally extended content. The second route is worth discussing, as it does seem possible that when a large amount of the past events are to be kept as retentions, they will all be seen as “present.” This does match the reports of the timeless experiences, in which everything seems to happen at the same time without the normal passage of time. Moreover, those events that are experienced as timeless seem to be remembered better than the normal ones, like the ones in PTSD cases (Ataria 2015).

4.3 Extensional View

4.3.1 The Basic Framework of the Extensional View

While some realists hold the “Principle of Simultaneous Awareness” (PSA): If one is aware of a succession or duration, one is necessarily aware of it at one moment, thus leaning towards the retentional view; some reject this principle. A lot of the realists who reject PSA favor the extensional view instead. They criticize the view that consciousness can be separated from phenomenal contents (Dainton, 2000, p. 57).

Instead, the subject can be aware of a succession that extended within objective time in a direct manner. Not only is the content of the succession extended, but the awareness of it itself is extended as well, which makes their model different from that of the retentional view’s. The specious present in the retentional view is still confined within a momentary episode, while the extensional view holds that it is itself extended in clock time. Thus, this view supports the so-called “state temporal extension” (Chuard, 2011): To perceive the temporal relation between two non-simultaneous events, x and y , the subject can have a temporally extended experience that begins at t with the representation of x and ends at $t+1$ with the representation of y .

Within these episodes of experiencing, they themselves are able to incorporate change and persistences in a quite straightforward way. These phases compose our stream of consciousness, where overlap across each phase is allowed (Dainton 2024 SEP entry). The reason why they reject PSA is they don’t think that being aware of a succession as a whole requires the awareness of the content to be simultaneous.

Among those rejecting PSA, there are indeed variants of the extensional view.

Dainton, as the main advocate of this view, has mentioned this in various of his works (please refer to Dainton’s SEP entry for a more up-to-date discussion). Some versions of the extensional view suggest an isomorphism between the extendedness of the experience of time and the order of its content. In objective time, event x happens, followed by event y . Accordingly, in our consciousness, we experience them in the

same “x-y” order. Other versions of the extensional view, such as Dainton’s, propose that x and y form a “diachronic unity,” emphasizing the dynamic nature of the phenomenal content and its “immanent flow,” in his words.



Besides the debate on how extended awareness is able to capture diachronic content, there are also critiques regarding the theory of unifying non-simultaneous events. For example, the glue problem concerns what unifies the parts of a perceptual experience (Almäng, 2021). Extensionalists need to address what binds or “glues” together the different temporal fragments of our experience so that they form a unified perception rather than disconnected moments. Since there are several variations of the extensional view, such as holism and atomism, they attempt to tackle this problem in different ways. Although this topic lies beyond the scope of this paper, we acknowledge that there are variations within the extensional view and potentially internal issues within the theory. However, this does not affect our following discussion, which will focus solely on the main claims accepted among these variants of the extensional view—namely, rejecting PSA and embracing temporally extended experience.

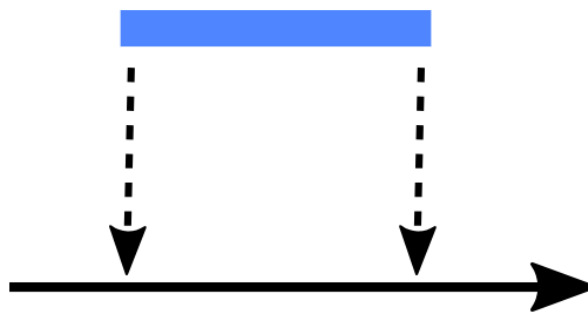
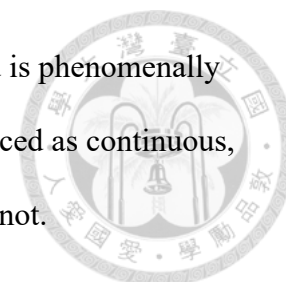


Figure 4. Extensional Model (adapted from Dainton, 2024 SEP entry)

4.3.2 Extensional View’s Explanation for Case 1

The extensional model can suggest that the extended present varies in its exact length. Recall they suggest that within each temporal extension, the subject can directly

perceive its content. All the content within such an extended period is phenomenally experienced as unified. Thus, a handwave, for example, is experienced as continuous, while a second handwave that occurs after a slightly longer time is not.



Let's suppose the extended present becomes longer; say it changes from the ordinary 200 ms to 400 ms. The subject will then take whatever happens within this 400-ms interval to be the specious present. Events that would normally fall within 200 ms to 400 ms and be experienced as not (in a directly perceivable matter) unified would now, in the altered state, be experienced as so. As so much more content occurs in such close succession, clock time will appear to pass much faster than subjective time. Even though the subject may feel it has only been "a moment," in reality, it may have been a few seconds. Consequently, they may underestimate the passage of time. To illustrate, consider the example of psychedelics we discussed in section 3. If those who take MDMA feel like time goes by faster than usual, it might be because the extensions have changed from Figure 5 to Figure 6.

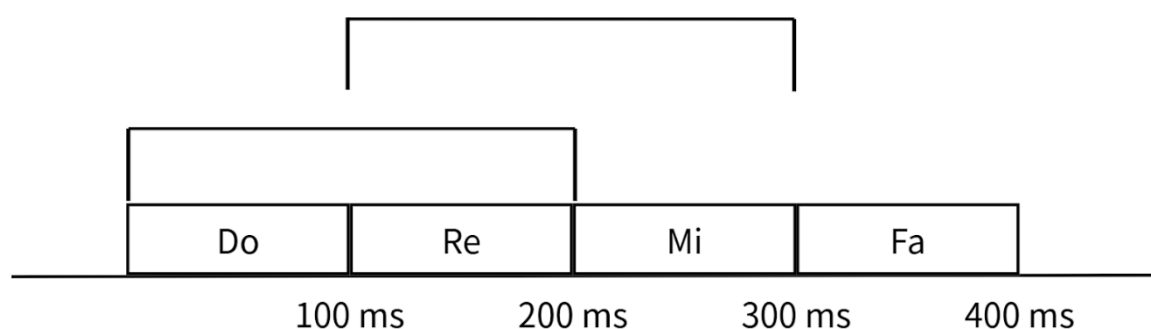


Figure 5. Normal Extensions

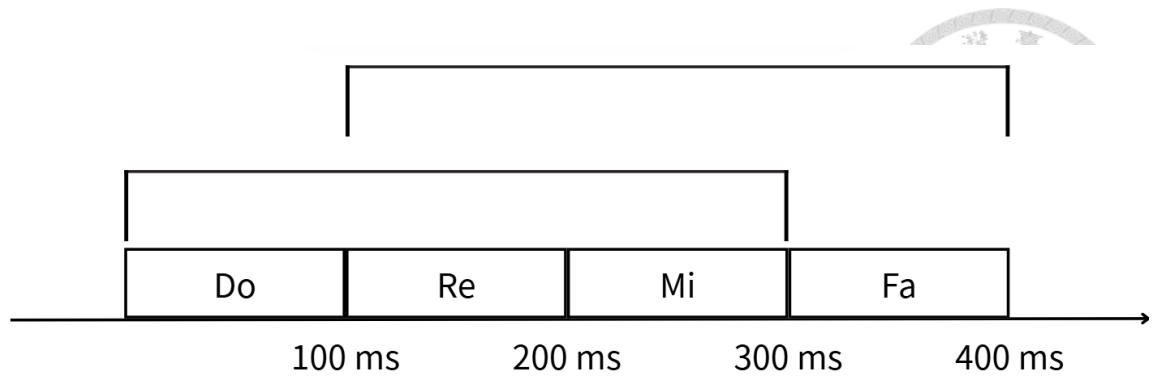


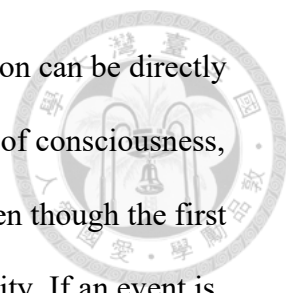
Figure 6. Altered Extensions

Since more content is experienced as unified within the extended present, a longer unfolding of events in clock time will seem to take place within just a moment. For example, the sequence “Do-Re-Mi,” which would normally be perceived as taking a relatively long time, will now feel as if it occurs within a shorter interval.

This explanation seems reasonable. However, it can be questioned from the perspective of normal states of consciousness. While it accounts for the possibility of a change in the speed of time, what about stable speed? If we frequently perceive different amounts of content as continuous, why does our experience of time in a normal state of consciousness still seem to maintain a relatively stable speed?

Sometimes we perceive shorter events (such as seeing a person wave their hand) and sometimes longer events (like seeing a person slowly stand up). Wouldn’t this imply that the first succession is shorter, hence a shorter present, while the latter involves a longer present?

We can accept the version of overlap extensionalism that maintains our experiences appear to be temporally extended and have a duration that matches their apparent duration (Arstila 2016). Moreover, co-consciousness has both synchronic and diachronic forms. We can say that, normally, the act of consciousness is extended in such a way that it encompasses several contents—say, whatever happens within the



200 ms duration. Those diachronic events that fall within this duration can be directly perceived as continuous. Since we continuously have extended acts of consciousness, one event can be connected to the next, and the next to the third, even though the first event is not directly connected to the third one, hence the intransitivity. If an event is so short that it makes up only 100 ms, our act of consciousness may cover the following 100 ms during which the event is absent. While allowing diachronic unity, even if the absence of the event is noticeable enough for us to perceive it as non-simultaneous with the previous event, it does not pose a problem.

Suppose that one hears a melody consisting of Do-Re-Mi. In a normal state, let's suppose Act 1 consists of Do-Re and Act 2 consists of Re-Mi. The overlapping Re is the key to sensible continuity. However, in ASC, the subject may experience Do in Act 1 and Re in Act 2, where the two are almost not experienced in the same act. The advocates of the extensional model can explain the tendency to forget some very recent content by the extended act of consciousness itself, suggesting that in ASC, each extended act of consciousness narrows down to a shorter interval of clock time, which causes the non-continuous feeling of previous experience. Better yet, they can also explain the "seconds turn into minutes" feeling by the speed-up frequency between each overlapping act of consciousness. The narrowed-down extended act in ASC causes more acts of consciousness in the same interval compared to normal states, which accounts for the overestimation.

4.3.3 Extensional View's Explanation for Case 2

What does timelessness mean to the extensionalist? Since unifying extension is the key of their theory, they can say that the extended phases are so long that everything experienced during the ASC falls in the same phase. That way, all that is experienced

seems directly connected to each other. Or, they can say that the binding of the extension fails in ASC, thus there is no experience of continuity in ASC.

The interesting part is whether the extensional view can truly allow the possibilities mentioned above. This relates to their understanding of how a longer period of time is experienced. The overlap model seems to suggest that when extensions are experienced in an overlapping fashion, where they are not completely separate but some are experienced together, the two extensions will form a successive stream.

What's wrong with saying that it's just one extension stretching over a long period?

Sure, the problem is that when the two events are too far apart temporarily, they just would not be seen as happening in succession. In normal circumstances, we know that the hour hand moves continuously, but we don't perceive its movement as continuous. Perhaps, in ASC, they do see the movements that last so long as continuous, or even, everything seems to be connected to each other. This is, indeed, supported by some self-reports in meditation states, in which one feels as if the time passage is absent. If everything stops being separated into different periods of the specious present, the elimination of the passage can happen.

If the extensionalist takes the binding process to fail in ASC, their model will collapse into a retentional or cinematic model in which there is no temporally extended experience. The explanation from these two models has been discussed in the previous section, so we will not elaborate here. Still, it is quite an interesting possibility that ASC cases and normal cases of the experience of time together support a hybrid model overall. Let's set this discussion aside for the overall comparison section.

Chapter 5 Empirical Evidence for the Explanations and Some Overall

Comparisons



To sum up, let us briefly overview the explanatory power of each candidate in all three cases. We categorized models of the experience of time into three categories: cinematic, retentional, and extensional. To simply identify their main characteristics, we understand them through the well-known concept in the philosophy of mind—content/state distinction. The content refers to the experienced content, and the state refers to each “conscious act,” which is the act of consciously perceiving the objects. The cinematic view holds that both content and state of experience are momentary, while the retentional view suggests that the momentary state of experience holds temporally extended content (retentions, protentions). The extensional view claims that we directly experience succession through extended, continuous states with temporally extended content in them.

In the previous section, I listed the possible hypothetical responses from all three models in order to provide explanations for the ASC cases. But are their explanations supported by any existing empirical evidence? There has been more and more discussion about the need to combine empirical evidence with the theoretical discussion on the broad topic of subjective time (Mölder 2014; Dorato & Wittmann 2019; Dainton’s Supplement to Temporal Consciousness on SEP for some relevant discussion). We can reasonably expect that there should be relevant empirical evidence for the explanations of ASCs.

5.1 Empirical Evidence for Cinematic View’s Explanation of ASC

Recall that to explain Case 1—alteration in the experienced speed of time—the cinematic model can appeal to the quality and amount of experiential content. Certain

ASCs, such as psychedelic experiences, are characterized by the special content of hallucinations, which is associated with acceleration. In contrast, cases like depression involve a lack of vividness in memory (Werner-Seidler & Moulds, 2011), which is associated with deceleration. Still, there is currently a lack of sufficient evidence to fully support the claim that it is the quality of experiential content that causes changes in the speed of time.

On the other hand, when the cinematic model appeals to variations in the interval length between each instantaneous act of consciousness to explain changes in the experienced speed of time, perceptual omission becomes inevitable. That is, when a subject feels that time is passing slower or faster than usual, there must be a corresponding increase or decrease in the amount of content they are able to perceive. To support this claim, some relationships between perception and time estimation have indeed been identified. Recent discussions on perceptual gaps in normal states of consciousness (Teichmann et al., 2021) provide relevant insights. The underestimation of eyeblinks is important for us to perceive an object as continuous. This suggests that in order to ignore or miss an event (such as an eyeblink), underestimating its duration is necessary. However, the cinematic view makes the opposite claim—namely, that ignoring some content may lead to the underestimation of its duration. Thus, while the cinematic model provides plausible mechanisms, it remains unclear whether either content-based or gap-based explanations can sufficiently capture the speed changes in the ASCs.

Turn to Case 2—the seemingly timeless experience. The cinematic view can suggest that it is due to more enlarged gaps or discontinuous content. When a timeless experience happens, the altered series of experiences are isolated from the normal ones. The gap becomes larger, and in the isolated altered experience, the content is

highly stressed and vivid. If the subject's implicit memories of this experiential content are stronger, it is likely that the content experienced during the “stuck” snapshot is stressed compared to normal content. Current findings suggest that the priming effect (a type of implicit memory that is characterized by enhanced identification of previously seen stimuli) is stronger in those suffering from PTSD (Sündermann, Hauschild & Ehlers 2013; Yun et al. 2011).

Again, this makes sense as long as the cinematic supporters can allow missing content. Note that everything that falls within the gap will not be perceived by the subject. But in PTSD cases, the subjects report that they witness things happen while standing still (Yochai 2015). It seems the content remains continuous, though the experience itself seems to fall out of the framework of time for the subjects.

As simple as the cinematic model may appear, its explanation of ASC phenomena remains insufficient in fully capturing the phenomenal experience and lacks adequate support.

5.2 Empirical Evidence for Retentional View's Explanation of ASC

Recall that the retentional view allows the amount of retention to change in those states of consciousness in which the speed of time seems to be altered. But we are theoretically unsure whether more retention will lead to the experience of time seeming faster or slower. On the empirical side, there might be some relevant memory research. In patients suffering from bipolar disorder, those who are manic or mixed patients show more deficits in short-term memory (Vrabie et al., 2015). It has also been shown that LSD acutely impairs working memory (Pokorny et al., 2020). These people also often experience an accelerated speed of time. Memory of depression and anxiety patients can be rather complicated due to its co-occurrence with other disorders. Those

who suffer from depression and bipolar patients in depressive episodes feel decelerated time, as shown by Liu et al. (2022). Kizilbash, Vanderploeg, and Curtiss (2002) examined the effects of depression and anxiety on memory performance. They found that retention was unaffected in depression without anxiety, but there is “an adverse effect on immediate recall of new information and the total amount (but not rate) of acquisition.” On the other hand, patients with anxiety only do not suffer from such memory deficits. There was also controversy over whether anxiety patients experience accelerated time, while it has been confirmed by some recent research (Mioni et al., 2016). The relationship between short-term memory and the experience of time's speed remains unclear, with evidence pointing in different directions.

Up until now, we can clearly see that the relation between the experience of time's speed and memory is complicated, which should definitely be further explored. To go back to the previous contradiction, it is possible that the distinction between short-term memory and retention should be emphasized. However, the categorization of memory remains an underexplored issue, as working memory, sensory memory, short-term memory, and other related functions have complex interrelationships. It is crucial to determine where the Husserlian concept of "retention" fits into this discussion to better integrate empirical evidence and use it to support or challenge the retentional view. Some recent discussions such as Dorato & Wittmann (2019) that take retention to be short-term memory or working memory can be unfair. Those contents in short-term memory may not all be seen as present, but the contents in retention can be. Maybe those who experience accelerated time show deficits in short-term memory due to not being able to sustain the large amount of content happening to them so fast, but they still are able to hold more retentions at each act of consciousness so that their “present” becomes longer. It is just that these retentions cannot be properly turned into short-

term memory. On the other hand, those who experience decelerated time do not show deficits in short-term memory, but they hold less retention at each instantaneous act of consciousness, thus their “present” becomes shorter, and time goes by slower to them. The inadequate evidence is compatible with the hypothetical explanation without conclusive support.

When it comes to empirical evidence from short-term memory, there is currently no common agreement on whether those disorders with accelerated experience of time (mania, anxiety) would cause deficits or not. If we choose to claim that retention and short-term memory are distinct, we may find the two being non-correlated; there is no tendency showing whether more retentions at a moment worsen performance of short-term memory or not. The explanation for the timeless phenomenon is the same, as the amount of retention being too large can capture how things all seem to be experienced simultaneously. So far, while the theoretical possibility may hold, there would unfortunately be a lack of empirical evidence regarding how the retentional model explains this case. The retentional view supporters need to further clarify how retention is related to memory functions, such as sensory memory, working memory and so on (Philip 2018).

In conclusion, the retentionalists can use the increased or decreased amount of retentions to account for the experience of altered time’s speed and timelessness. However, empirical research on memory in such cases appears to remain neutral regarding these claims, and the support from it is also debatable, as we are not sure whether retention can be counted as a kind of memory.

5.3 Empirical Evidence for Extensional View’s explanation

The discussion of the extensional view shows their need to account for how the

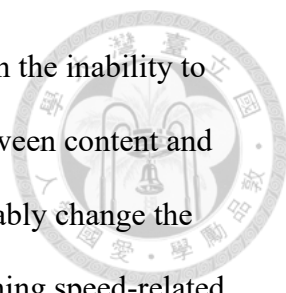
experience can be extended and unified together. Empirical findings on the temporal window of multisensory integration may offer support for the structural basis of this model. Temporal window (or time window) here refers to the temporally extended period in which the perceived distinct stimuli interact to influence perception together with each other. In their 2024 review, Samaha & Romei suggested the hypothesis that human alpha-band frequency in EEG studies correlates with the temporal window, and positive results have been found that support this. These temporal window studies support the extension in the extensional model, as the unifying process can be supported through behavioral and brain imaging results.

However, the question of whether the temporal window of multisensory integration is altered in ASCs remains under-researched, and thus I cannot elaborate further at this stage. We can only conclude that the extensional view provides a theoretically plausible explanation for the experience of speed change in ASCs by positing different lengths of temporal extension. As for the timeless case, it remains unclear whether the extensional view would allow for an extension stretched over a long period—and if so, what kind of experience that would correspond to.

5.4 Overall Comparison and Implications

Recently, altered states of consciousness has become once again a popular topic in the field of consciousness studies (Letheby 2021), in hopes of getting insights of how consciousness works from these different cases.

Our previous discussion demonstrates that the characteristics of each of the three models influence their explanatory power with respect to different cases. Whether due to a lack of empirical support or theoretical issues, none of the models can fully account for cases in ASC. The cinematic view has the advantage of simplicity, but



altering the gap between each momentary experience would result in the inability to perceive anything that falls within the gap due to the direct link between content and state. Any modification to the intervals between states would inevitably change the perceived content, which poses a significant challenge when explaining speed-related alterations, especially since such misperception is not currently supported by the literature.

Retentionalism, on the other hand, can accommodate alterations by employing the concept of retention. They can explain alterations through the amount of retentions in the specious present. What they have yet clarified is how to understand retentions in terms of a specific kind of memory. Since retention is central to the theory, a better understanding of how empirical findings in the field of memory relate to retentionalism could strengthen the model, particularly if a correlation between short-term memory and alterations in time experience in ASC can be established.

The primary issue that extensionalism must address is the operation of the binding process. They can more easily adapt to changes in ASC thanks to the extension. However, is it really feasible for the extension to be very long or to continue changing in length? The explanations of the ASC examples only make sense if these alternatives are permissible within their theoretical constraints and compatible with empirical findings.

Currently, the relation between the experience of time and self-consciousness has started to get more and more attention (Kent & Wittmann 2021; Bellingrath 2023; Berkovich-Ohana & Wittmann 2017). Recent focus on ASC research will benefit from considering the factor of time in it. One of the recently trending topics is “selfless experience”, often found in meditation (Chadha 2023). As self-consciousness is

closely related to time, and the existing support of the correlation between timelessness and selflessness in conscious experience in ASC cases, we can further frame a more complete theory of self that stretches beyond the present.



The other important, but less discussed, topic is the various aspects of time. For better interpretation of the empirical evidence, in section 2 I briefly distinguish between the perception and the experience of time, as well as qualitative and quantitative methods to study subjective time. Despite the conceptual and empirical distinction, many recent discussions still overlook how this can challenge our current theories. Due to the scope of my paper, I separate the cases while being open to evidence from different aspects, as a proper model for the experience of time should be able to explain, integrate, or at least accommodate them. Vogel et al (2020) further distinguish four time-domains, incorporating conscious and unconscious processing of the flow (passage) and structure (past/present/future location) of time. They also use this framework to analyze deviant experiences of time in Autism Spectrum Disorder. This framework can be a good way for us to integrate the results obtained from different methods, and the relationship between the four domains also requires further clarification.

Chapter 6 Possible Objections and Replies



Based on the previous assessments, the three categories of models are all incomplete in explaining the phenomenal experiences in ASC. It is possible for objections that they need not to explain these cases to be raised. Here, I would like to briefly address such concerns and reply to them.

Possible objection 1 (PO1): The three categories of models only aim to explain the experience of time in terms of temporal continuity. The alterations may be solely due to other physiological or psychological mechanisms.

PO1 is a reasonable concern, as the concept of “subjective time” does involve many different mechanisms. Physiological basis such as brain activity, homeostasis, hormonal levels, and so on, can surely contribute to the way we experience things. Psychological functions such as memory, emotion, perception, and so on can also do the same. And all these mechanisms can each have their alterations in ASCs.

The alterations from these perspectives are all very possible. But this will not remove the burden for the phenomenal-temporal models to explain the alterations. They are proposed to explain how we are aware of changes, successions, and the aspect of time in our consciousness in general. There are robust changes in the above-mentioned awareness and consciousness in ASCs. The alteration of speed reflects the amount of things that are experienced as continuous and the experience of such continuities. The timeless experience shows that the continuity, as understood as the key factor of experience, can itself be altered to a point that there seems to be a lack of it. They are exactly the target of the phenomenal-temporal models. The three models focus on the phenomenal experience of time, and while we acknowledge that alterations in ASCs may also stem from other physiological or psychological changes, the phenomenal

experience itself still awaits explanation. If the advocates suggest that the target can be reduced to other physiological or psychological levels, this will contradict their whole framework and thus will not be a valid point.

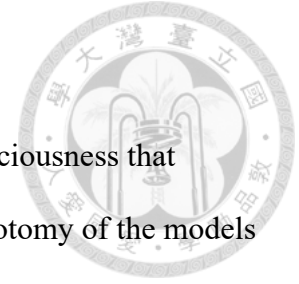


Possible objection 2 (PO2): The three categories of models only need to explain normal states. ASCs are not of their concern, nor should they need to accommodate them.

PO2 is possible to be raised if one wants to remove the theoretical burden for the models to account for ASC phenomena altogether. Again, the original goals of the models is to explain experiences of temporally extended events. While ASCs may feature time as experienced faster, slower, or even standing still, the fundamental question of how these temporally extended experiences are structured remains.

The experiences of them may seem faster, slower, or stand-still in the, but the same question remains in the ASC cases. I can accept that the structure of the model that fits ASC may be different from what would fit normal cases, this does not mean we can ignore the former. If anything, the presence of such altered experiences challenges us to refine or expand our existing models rather than restrict their application.

Chapter 7 Conclusion



After the comparative analysis of the cases of altered states of consciousness that reflect alterations in the experience of time, we found that the trichotomy of the models all fall short of providing a complete picture capable of accounting for the profound changes. This may be stemming from the lack of bridging theoretical discussions and empirical evidence, especially cases of altered states of consciousness. As more philosophers are becoming interested in integrating empirical evidence into their discussions, and given that altered states of consciousness has recently emerged as a popular new topic in the philosophical investigation of consciousness, I believe this paper highlights a less explored perspective on the experience in altered states of consciousness. Throughout our investigation, we also found that the relation between several aspects of the experience of time—psychological, phenomenological, and biological, still remain to be explored. To achieve a more comprehensive theory of consciousness, future research should develop a model that better encompass the experience of time, even in altered states. Additionally, the current discussion on altered states of consciousness can be enriched by explicitly considering the dimension of time.

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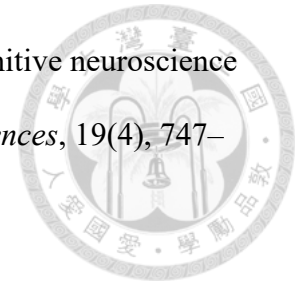
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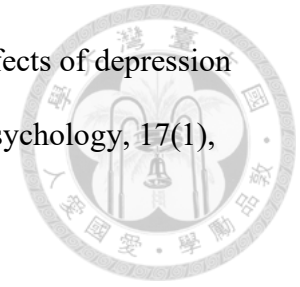
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