

# Thickening Time

How to Stop Your Life from Disappearing

## The Science

by Andrew Mayfield

## The Two-Clock System

The feeling that time is accelerating as we age isn't just a psychological quirk—it's a measurable neurobiological phenomenon with identifiable mechanisms. Recent advances in neuroscience and psychology have revealed that our experience of time operates through multiple independent systems, each governed by distinct neural processes that change predictably across the lifespan.

The foundation of temporal experience rests on what researchers call the two-clock system. Claudia Hammond, in her seminal work on time perception, identified the holiday paradox: while you're absorbed in a new experience, time seems to fly (your prospective clock runs fast), but when you look back, that same period feels substantial and long (your retrospective clock expands). These aren't contradictory experiences—they're evidence that your brain runs two completely separate timing systems.

Prospective time, how duration feels in the moment, is governed primarily by attention. The more you

monitor time's passage, the slower it feels. This explains why a watched pot never boils and why engaging activities make hours vanish. Retrospective time, how long a period feels in memory, operates through an entirely different mechanism: the richness of memory encoding. The more distinct, retrievable memories you form during a period, the longer it feels when you reconstruct it later.

These systems often run in opposite directions, and understanding their independence is crucial for grasping why temporal compression occurs. William Friedman's research at Oberlin College found that when he controlled for time pressure, age-related acceleration effects weakened dramatically. The variable predicting perceived acceleration wasn't chronological age—it was stress. This suggests what we've attributed to aging might actually be a lifestyle effect: people in midlife feel time accelerating because they're operating under chronic cognitive load, not because they've reached a certain birthday.

## **Dopamine and the Aging Clock**

The neural basis of temporal processing involves multiple brain regions working in concert. Warren Meck's Striatal Beat Frequency Model at Duke University demonstrates how dopamine neurons synchronize oscillating neural populations in the cortex, creating beat frequencies that the striatum reads as temporal intervals. More dopamine accelerates this internal clock, making durations feel shorter. Less dopamine slows it, making durations feel longer.

This has profound implications for midlife time perception. Both the nigrostriatal pathway (involved in timing) and the mesolimbic pathway (handling motivation and reward) lose dopamine receptors gradually from the thirties onward. The nigrostriatal decline affects temporal accuracy directly—your clock becomes less precise. The mesolimbic decline affects something equally important: your drive to seek novel experiences. Dopamine in this circuit is what makes novelty rewarding, what generates curiosity and the motivation to explore.

As dopamine availability decreases, so does the appetite for the very experiences that would counteract temporal compression. It's a neurochemical double-bind: the aging brain processes time less precisely and simultaneously loses interest in the novelty that would enrich temporal experience.

## **Memory, Novelty, and the Oddball Effect**

The memory architecture underlying retrospective time operates through what researchers call the oddball effect. When your brain encounters something unexpected—anything that deviates from its predictive model—it triggers heightened processing and richer encoding. A 2024 study showed this effect is measurable: repeated stimuli are literally perceived as shorter than novel ones, even when actual duration is identical. Your brain compresses familiar experience automatically.

This compression serves efficiency but devastates temporal richness. Dean Buonomano at UCLA describes the brain as fundamentally a prediction machine, building models of experience and coasting

when reality matches expectation. The better these models become—through expertise, routine, and repetition—the less neural effort required to process daily experience. Minimal processing means minimal encoding, and minimal encoding creates the thin memories that make years feel like months.

Neural temporal dedifferentiation research published in 2025 revealed that younger brains switch between distinct neural states frequently, creating clear boundaries in the stream of consciousness. Older brains linger longer in each state, producing blurred transitions and compressed temporal experience. This isn't clock slowing—it's resolution coarsening, like the difference between high-definition and pixelated video.

The fresh start effect, documented by Hengchen Dai, Katherine Milkman, and Jason Riis, shows how temporal landmarks create new mental accounting periods. Each landmark—a birthday, job change, or move—opens a fresh chapter in memory. The more chapters a period contains, the longer it feels retrospectively. Life without marked transitions

compresses into undifferentiated blocks because memory lacks retrieval points.

## **The Body's Temporal Machinery**

Perhaps most surprisingly, your heartbeat functions as a literal timekeeper. Cornell University research in 2023 demonstrated that variations in heart rate create "temporal wrinkles"—when a sound follows a shorter heartbeat interval, it's perceived as lasting longer. Marc Wittmann's work in Germany shows that interoception, your brain's monitoring of internal body states, shares neural real estate with time perception in the anterior insular cortex. Higher heart rate variability predicts more accurate temporal processing, while chronic stress produces the rigid cardiac rhythms that accelerate subjective time.

The scarcity research of Sendhil Mullainathan reveals another crucial mechanism. When any resource feels scarce—time, money, attention—cognitive bandwidth narrows through a process called tunneling. Your temporal horizon shrinks to the immediate, preventing the kind of long-term perspective that makes

experience feel coherent and substantial. Time scarcity becomes self-perpetuating: the feeling of having insufficient time narrows your cognitive capacity, leading to decisions that create actual time pressure.

Circadian neuroscience adds another layer. Dan Pink's analysis of chronobiology research shows that time of day explains roughly 20% of human performance variance. Your cognitive peaks and troughs follow predictable daily rhythms, with most people experiencing optimal focus in late morning, a significant dip in early afternoon, and creative recovery in evening. When work is misaligned with these natural cycles, cognitive effort increases while encoding quality decreases—a combination that produces both exhaustion and thin temporal experience.

The role of physical systems in temporal perception extends beyond circadian rhythms. Research published in 2019 found that core body temperature directly affects temporal processing: warmer brains process time faster, creating subjective acceleration

and time pressure. Exercise enhances cerebral blood flow to the prefrontal cortex and temporal regions, literally improving the brain hardware responsible for temporal cognition. After age forty, declining mitochondrial function reduces the cellular energy available for neural processing, contributing to the coarser temporal resolution that characterizes midlife time compression.

## **Attention, Awe, and What Can Be Changed**

Attention fragmentation represents perhaps the most pervasive modern threat to temporal richness. Research published in 2025 shows that sustained attention lapses reduce brain network connectivity in under two minutes. Every notification, interruption, or task switch burns cognitive energy and prevents the deep encoding that creates substantial memories. Knowledge workers lose an average of 2.1 hours daily to distractions and recovery time—more than a quarter of each day spent not fully present in any experience.

The compound effect is brutal: fragmented days feel hurried while you live them, then vanish when

you look back. Both timing systems malfunction simultaneously. Leslie Perlow's Harvard research on "quiet time" protocols demonstrates that structural interventions can reverse this. When interruptions were blocked during specific hours, productivity increased dramatically, but more importantly, the cognitive clarity extended beyond the protected periods.

Awe research by Dacher Keltner at UC Berkeley reveals the most powerful intervention for temporal expansion. Awe—the feeling of encountering something vast that exceeds your mental frameworks—forces neural reorganization, creating exactly the kind of effortful processing that produces rich memories. Participants experiencing brief laboratory awe inductions reported feeling they had more time available and made different choices about how to spend it, preferring experiences over possessions and showing greater willingness to help others.

The neuroscience converges on a clear conclusion: temporal compression isn't inevitable age-related

decline. It's the predictable result of specific neural, physiological, and cognitive changes that can be measured, understood, and in many cases, modified. Your brain's temporal processing operates through identifiable mechanisms—dopaminergic signaling, interoceptive awareness, memory encoding systems, attention networks, and circadian rhythms. Each system responds to different inputs, and their interactions determine whether your experience of time is thick or thin.

The research reveals something profound about the nature of temporal experience: you can't slow time down, but you can increase its density.

The goal isn't deceleration—it's rich encoding, the kind of moment-to-moment processing that leaves substantial memory traces and creates the feeling of a life fully lived. Understanding the machinery makes the difference between accepting temporal compression as inevitable and recognizing it as a set of solvable engineering problems.

This is the evidence. What it can't give you is what to do with it — the specific practices, the personal stories that make the research feel relevant to your own life.

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