The Social Structure of Space and Time: Preliminary Generalizations

ABSTRACT: The most fundamental aspect of our moment-to-moment perception—space and time— has, to this point, been ignored by sociologists. Sociologists have, of course, spent a great deal of time considering the cultural import of time schedules, the periodicity of interactions, life-course and age-related trajectories, the use of public and private spaces, and the traversal of space enabled by transportation technology and electronic media. What they have not done, however, is consider how neurophysiological processes alter and distort *situational perceptions of spatiotemporality* itself. Doing so is important because spatiotemporal perception implicates important aspects of behavioral regulation and impulse control. In this paper, I describe the neurophysiology of spatiotemporal perception, link it to behavioral regulation/impulse control and describe in detail, across 26 testable propositions, how a theory of situational spatiotemporal perception can generate novel predictions in a handful of our most influential sociological theories.

Keywords: Time, Space, Sociological Theory, Perception, Neurosociology, Social Psychology

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…Sociology (which is the term I may be allowed to invent to designate Social Physics)…"
--Auguste Comte, 1858

Put your hand on a hot stove for a minute, and it seems like an hour. Sit with a nice girl for an hour, and it seems like a minute. THAT'S relativity.
--Attributed to Albert Einstein, 1929

The question is not what you look at, but what you see.
--Henry David Thoreau, 1851

Sociology has long been known for its scattered topical subjects, along with the stark absence of any unifying theoretical paradigm(s). Scholars have, of course, debated the litany reasons for our lack of theoretical consensus or progress (Davis, 1994; Campbell, 2019; Lizardo, 2020).

My purpose in this paper is to develop one unifying paradigm, but not only to demonstrate that such a thing might exist. My goal is also, in doing so, to show how such paradigms are likely to be so rooted in our moment-to-moment perception as to be both utterly non-obvious and as obvious as anything could be.

Physicists have long discussed the topics of time and space while sociologists have, for the most part, ignored them. Any sociologist focusing on these questions might, unfairly, be charged with "physics envy." But why? Don't people, of necessity, navigate the world via their perceptions of space and time?

As sociologists, we might ask: *What are the social influences on, and social consequences of, alterations in peoples' perceptions of time and space?*

We know that non-human animals rely on their perceptions of time and space to navigate the world. Perceptions of how time is passing and how space is organized couldn't be more fundamental: without this, animals wouldn't be able to successfully avoid conflicts and predation, or find and recall the locations of resources. This evolutionary inheritance ought not be lost on us: even from infancy, humans are able to track spatiotemporal intervals (Basgol et al., 2021). Kant ([1781]1998) famously insisted that time and space are the predicate categories on which the very *possibility* of experience rest. Without spatiotemporal perception, we'd be unoriented—the focus of our attention and of our understanding could only remain unformed, inconsistent, contradictory, uninterpretable.

The influence of temporal perception is everywhere, such as in verbal communication, as when we distinguish between similar sounding words (depending on one's local dialect)—like "sheep" and "ship"—on account of the duration of a syllable. Similarly, a retail worker might infer a customer's level of interest in a product based on the length of the customer's gaze at an item (Cai and Eagleman, 2015). Spatial perception is equally influential, as when a person at a concert or a wedding feels the area to be expansive or intimately small (irrespective of objective square footage). All of us have been on good dates with new romantic interests where time seems to speed by and the environment around us seems bigger than life. Equally, perhaps, we've been on terrible dates (or job interviews) where time slows to a crawl and space seems so narrow that it might be closing in on us.

Theorizing Spatiotemporal Perception

The French philosopher Henri-Louis Bergson was one of the first modern academics to make a principled distinction between our subjective experience of time and space and the objective, mathematical, measurement of time and space (see Zerubavel, 1987).

But, even before this, Marx ([1867] 1992; [1885] 1993; [1894] 1993) was busy linking the emergence of mechanical timekeeping and transportation with the emergence of capitalist economies (e.g., Martineau, 2015). Modern timekeeping, we are told, "stood at the heart of [Marx's] theory of communism," (Booth, 1991, pg. 8). People had their time calendarized, atomized, counted and kept for purposes of accounting, while space was traversed increasingly more rapidly so that people could get to the city and work long hours. In these early days of theory, it was as if what mattered most about spatiotemporal perception was its association with capitalism.

The sociologist Henri Hubert would later describe time and space as an "object of collective representations," ([1905] 1999, pg. 19) and deigned to show how these collective representations might manifest in religious

rituals. Emile Durkheim ([1912]1965) would build on this and develop the distinction between subjective time/space and objective time/space into a theory of “sacred” and “profane” experiences. Straightforwardly, Durkheim conceptualized time as fundamentally “religious”—that is, marking emotionally salient symbolic places, events, traditions. “The [experience of] days, months, seasons and even years are fixed by the rhythm of collective life,” (Sorokin and Merton, 1937, pg. 619).

Slowly, and ever-so-subtly, a focus on *temporal* perception, in lieu of *spatial* perception, became the norm.

Sorokin and Merton (1937; Sorokin, 1964) would again distinguish between local, qualitative, culturally-variable “social” time and quantitative, uniform, divisible “astronomical/clock” time. For Sorokin and Merton, the growth and globalization of societies put pressure on individuals to more carefully construct a common notion of time, given that people around the world experienced different hours of daylight and different daily routines. They point to the 1887 invention of “time Esperanto”—a supposedly neutral, auxiliary, language—as a means of standardizing communication about time across societies.

Norbert Elias (1992) would shortly come along and insist that the outsized influence of “social time” was relatively recent and varied by era. In forager, and especially early horticultural and agrarian societies, time was more strictly tied to the day/night cycle, to seasonal fluctuation, to the brute physical distance between locations, to the needs of livestock and so on. Time became socially organized and arranged only later in particularly large empires, by a full-time priestly class, he argued. The emergence of large cities requires a level of organization and structure that is relatively less dependent on seasonality or even day/night cycling, and relatively more dependent on the decisions of a managerial bureaucracy. Though foragers’ conceptualization of time was indeed often religious and socially-constructed, as Durkheim would have insisted, Elias argued that the import of “social time” became even more significant in later and larger societies, because it depended on an administrative bureaucracy motivated to regulate the organization of large cities and markets.

Eviatar Zerubavel (1976; 1979;1982;1987) pioneered the exploration of “hidden rhythms” of temporality, or how institutions and organizations standardize and canalize peoples’ use of time. Psychiatrists’ schedules determine when feuding married couples work on themselves, schools determine the schedule of classes and extra-curriculars, and hospitals move appointments around for different doctors on different days. This rhythm is often hidden from us in its taken-for-grantedness, despite being an important influence on our perception of time and its passing. Zerubavel also pointed out that social situations, themselves, have temporal

dimensions *sui generis*. Situations in our lives (1) often reveal a sequential ordering (sequence), (2) take place for varying or standardized periods of time (duration), (3) occur at times of the day or night (timing), and (4) occur more or less frequently (tempo).

Between the years 1940 and 2000 a new set of focuses emerged, albeit more empirical than theoretical, on how time relates to *age*, *generation*, *life cycle* and *life course* (Cicchelli et al., 2006). Time in relation to age involved describing differentiated stages of development; childhood vs. adolescence, for example, or describing how different organizations might cater to different age groups. Time in relation to generations involved describing how, depending on the year they are born, people experience different traumatic or formative national/cultural events. Time in relation to life cycles involved describing, for example, family life cycles involving birth, rearing, and departure during adulthood; such cycles were thought to produce patterns of "normativity" in society. Finally, time in relation to life course involved describing cultural trajectories where they existed, for example, people in mid-century America tending to finish school before entering the workforce and marrying before having kids.

Despite these developments, even by the 1970s, the *theoretical* study of "social" time was all but dead, with Zerubavel's (1976) passionate plea for more theory falling flat. The serious theoretical study of spatial perception had died long before.

Certainly, contemporary sociologists have here and there discussed temporal perception (much more rarely spatial perception) as a *descriptive* component of both social structure and processes. Some provide descriptive accounts of the social impact of clocks, or of how schedules influence the flow (or disruption) of business and other institutional interactions (Hassard, 2017), some focus more on how time scheduling influences how parents raise their children (Lareau, 2000), and others simply categorize how past theorists have used "temporality" metaphorically, as a description of how directed, undirected or teleological processes of social change are (as in the works of Marx or Polanyi, see Hirschman, 2021).Other work focuses on temporality's role in social science research methodology (for example, as it relates to determining causality, see Abbott, 2001). Still others attempt to discuss temporality (again, not *spatio*temporality) as broadly as possible—from sociology to anthropology to philosophy to history to astronomy—which, while interesting, has no specific substantive focus (e.g., Šubrt, 2021).

In sum, existing modern work in this area focuses primarily on temporality, not spatiality. And of the work that exists, most deal with metaphorical notions of time, or the literal scheduling of our daily lives, or on categories that analysts are applying to the world (see Bergmann, 1992), *not*

spatiotemporal perceptual interpretations generated by the brain-in-situation. Our existing theory, therefore, remains for the most part a "plurality of [concepts of] social [time]" (Nowotny, 1992, pg. 428).

Why Does Time Slow and Space Shrink? Why Does Time Accelerate and Space Expand?

A neuroscience of spatiotemporal processing is still in its formative stages (Northoff et al., 2020) but the insular cortex and the hippocampus/entorhinal cortex system are often mentioned as regions typically engaged in processing spatiotemporal perception (Wittman, 2015; Buzsáki and Llinás, 2017). Other work suggests that variation in time (and possibly space) perception results from dopaminergic and GABAergic networks, suggesting that spatiotemporal processing might be closely linked to anxiety and vigilance—that is, to physiological arousal and attentional allocation (Tonelli et al., 2022).

Regardless of the specific physiological structures and networks involved in spatiotemporal perception, current theory in cognitive psychology presumes a central role for Bayesian predictive processing (Fountas et al., 2022).

This processing involves the brain continuously updating its internal model of the world by relying on sensory inputs from the environment. Each updated iteration of the brain's internal model is then compared against new incoming sensory signals which, invariably, produce prediction errors (because situational stimuli changes—often unpredictably— from moment to moment or from context to context). These prediction errors, depending on the magnitude of error and the complexity of incoming stimuli, are then assessed at higher hierarchical levels of cognition (up to and including conscious cortical reflection). Prediction errors—or the absence of such errors— in turn, produce alterations in spatiotemporal perception.

Edmund Husserl ([1893-1917] 1991) was among the first to appreciate that perceptual stimuli required a stable form of neurological organization in order for an organism to navigate its environment successfully, that is, in a way consistent with the stimuli being perceived. Husserl referred to this form of organization as "retention" (stimuli from the recent past; what researchers now call episodic working memory), "impression" (stimuli in the moment, say, hundreds of milliseconds to a couple of seconds; what researchers now call interference control) and "protention" (expectations about what stimuli will be perceived next; what researchers today call a preparatory set) (Kent and Wittmann, 2021).

A point worth underscoring, and one seemingly lost on sociological theory to this point, is that *spatial and temporal processing are not (necessarily)*

independent; times have spaces and spaces have times (Weber et al., 2020; Shukla and Bapi, 2021; Cui et al., 2022; Qin et al., 2023; see Xiaoqin, 2020 for a review).

Consider, as just one example, the well-documented "Kappa Effect"—if two or more lights are flashed at a stable distance from an observer, the observer's perception of the time between flashes will increase in accordance with the spatial distance between the lights. Space and time are not merely linked in physics (as a "fabric" that matter can distort) but, also, linked in organismic (e.g., human) perception.

Today, researchers in neuroscience/cognitive psychology refer to four "dominant," and to a significant extent overlapping, theoretical models to explain the proximate mechanisms leading to alterations in spatiotemporal perception (Weber et al., 2020):

- the Pacemaker-Counter Model
- the State-Dependent-Network Model,
- the Generalized Magnitude Model, and
- the Perceptual Classification Model

At the highest level of generality, these models tend to share two underlying assumptions in common:

- Focused perception is a cause and consequence of higher levels of neuronal energy expenditure, and when the brain focuses perception, subjective perceptions of time slow and subjective perceptions of space narrow.
- Symmetrically, defocused perception is a cause and consequence of lower levels of neuronal energy expenditure, leading to a scanning (instead of focusing) orientation to the environment. When the brain orients to a scanning perspective, subjective perceptions of time accelerate and subjective perceptions of space broaden.

Figure 1 below provides an illustration of this dynamic.

<Insert Figure 1 Here>

Consider a simple example. Imagine you are driving a familiar route around your neighborhood, humming along to the music on your radio. The time spent en route to your destination seems to fly by and you are broadly aware of your surroundings as you drive. Suddenly, seemingly out of nowhere, a small child runs into the street directly in front of your car. Your vision becomes tunneled and focused, and time slows or, maybe, seems to stop. You brake in time and the child is swooped up by a trailing parent. You take a moment, and then continue to drive. Your heart rate and breathing

rate steadily return to baseline as you, once again, competently predict the coming surroundings as they move past your line of sight; your perception of time begins to accelerate and your perception of space begins to widen.

This is an extreme example—an emergency circumstance. But these basic processes operate, perhaps often below conscious awareness, from day-to-day and in response to far more mundane fluctuations.

With this general heuristic in mind, let's consider some of the tenets of each theoretical model of spatiotemporal perception.

A. The Pacemaker-Counter Model

The basic claim of the Pacemaker-Counter Model is that spatiotemporal perceptions emerge as an outcome of an "internal pacemaker" or "biological clock" tracking neuronal energy expenditures—greater expenditure speeds up this internal clock (Eagleman, 2008; Cai and Eagleman 2015). This model is supported by research indicating that when people are instructed to pay attention to the passage of time, or when their flow of perception is disrupted by rare or unexpected stimuli, their perception of time dilates, that is, they over-estimate the amount of time that has passed (Wittman, 2015; Matthews and Gheorghiu, 2016).

The model specifies three steps. First, an "internal clock," is modulated by attentional allocation and physiological arousal, second, spatiotemporal inferences are stored in working memory based on increases or decreases in the rate of this "internal clock," and, third, these inferences are used to motivate individuals to form a decision about, or respond to, subsequent incoming stimuli (Cui et al., 2022).

A problem with the Pacemaker-Counter Model, quite independent of its overfocus on temporality as opposed to *spatio*temporality, is that no singular "pacemaker" is known to exist in the human body. Cells metabolize according to regular schedules, yes, but there is no evidence that cellular metabolism, per se, is influential to our situational subjective perception of time or space. Daily circadian rhythms are also a form of internal timekeeping, but they refer to a diffuse physiological coordination of internal systems—these rhythms interact with infradian rhythms (periods longer than a single day) and ultradian rhythms (periods shorter than a single day)—no one of which is clearly responsible for situational alterations in spatiotemporal perception (Zhou et al., 2014).

I do not deny the *possible* existence of a centralized pacemaker in the body which generates subjective time (and space) perceptions. But, as it stands, there is little evidence for such a thing beyond, perhaps, perceptions of time

in the range of milliseconds (Roseboom et al., 2019). Still, this model of time/space perception has been influential and thus merits mention.

B. The State-Dependent-Network Model

Called the "leading alternative" to the Pacemaker-Counter Model, the State-Dependent-Network Model nevertheless holds in common with the pacemaker-counter model that dynamic energy expenditures across neural networks influences spatiotemporal perception. However, here, the existence of a centralized internal pacemaker is regarded as unnecessary. Instead of proposing the existence of a centralized internal clock, proponents of the State-Dependent-Network Model argue that spatiotemporal perception is responsive to changes in the (1) variation, (2) complexity, (3) rate of change and (4) emotional valence of environmental stimuli (Droit-Volet and Gil, 2009; Roseboom et al., 2019).

Expectation effects play a central role in this model. For example, even if an individual expects a large change in the subsequent variation, complexity, rate of change or valence of salient situational stimuli, dynamic increases in neural expenditure will be *lessened* if objective stimuli change is *consistent* with these expectations (as opposed to inconsistent). As well, if peoples' expectation for stimuli alteration is low, even a small increase in stimuli alteration will result in greater neural responsiveness (Roseboom et al., 2019). In this approach, expectations in situations drive alterations in spatiotemporal perception.

The main distinction, then, between the Pacemaker-Counter Model and the State-Dependent-Network Model is that stimuli content—its variation, complexity, rate of change or valence—may change situationally, and that the processing of this alteration influences perception to the degree that such alteration is anticipated/expected. No internal clock necessary; all that's necessary is the ability of the brain to generate expectations (in Bayesian fashion) and then track changes in perceptual content.

As with the Pacemaker-Counter Model, the State-Dependent-Network Model has thus far largely been used to predict subjective perceptions of time, instead of space-time per se. Theoretically, however, increases in neural responsiveness would initiate a relative perceptional shift to one of focusing (vs. scanning).

C. The Generalized Magnitude Model

Cognitive neuroscientist Vincent Walsh published a landmark article in 2003 introducing a novel and parsimonious theory of *spatio*temporal perception, which he called "a theory of magnitude" (Walsh, 2003).

Walsh's premise was that alterations in subjective spatiotemporality were responsive to sensory perceptions of greater *stimulus magnitudes*, with subsequent work speculating that magnitude judgments occur primarily in the inferior parietal cortex (see Basgol et al., 2021). Thus, any situational stimuli that is larger, more numerous, more luminous, louder, heavier, faster, more frequent, or more complex will all focus spatiotemporal perception, that is dilate time perception and constrict spatial perception (Eagleman, 2008; Zhang et al., 2019). Even experimental exposure to longer (relative to shorter) lines and squares with a larger area (relative to those with a smaller area) have been found to slightly slow down peoples' perception of time and crowd their perception of space (Cui et al., 2022).

The connection between spatiotemporal perception and stimulus magnitude is straightforward: the more numerous, faster, luminous, etc., something in one's environment is perceived to be, the more physical space the stimuli will appear to occupy and the more objective time it will take our attentional and sensory systems to process (Shukla and Bapi, 2021). As a result, our subjective perception of space shrinks and our subjective perception of time dilates/lengthens.

The Generalized Magnitude Model is distinct from the Pacemaker-Counter Model and from the State-Dependent-Network Model in that no internal pacemaker is required and because expectation effects are regarded as relatively less important than magnitude changes in stimuli per se. These magnitude effects are nevertheless expected to be (1) influenced by our expectations, (2) more intense when self-referential, and (3) context-dependent (Zhang et al., 2019).

With regard to expectations, the Generalized Magnitude Model predicts that when we expect smaller magnitudes and encounter larger ones, spatiotemporal processing will be more substantially affected (compared to mere exposure to larger stimuli magnitudes). Also, it is worth noting that, on a State-Dependent-Network Model account, a simple violation of expectation may also influence spatiotemporal perception absent any increase in magnitude. In other words, when we expect larger stimulus magnitudes *but* encounter smaller ones, spatiotemporal processing should also become more focused (i.e., dilated time perception and constricted space perception). In this way, State-Dependent-Network models predict focused spatiotemporal perception even in the absence of increased stimuli magnitude so long as expectations are violated.

With regard to self-referentiality, stimuli magnitudes will most affect spatiotemporal perception when they are deemed relevant to self, that is, when they are perceived to have direct implications for future self-related behavior. This self-referentiality is especially influential on spatiotemporal perception when subsequent behaviors are presumed to risk eliciting

negative consequences (Zhang et al., 2019). There is, then, a valence to the self-referentiality of stimulus magnitude: numerous, faster, more luminous, etc., stimuli that is perceived to be relevant for subsequent action will especially dilate perception of time and constrict perception of space to the extent that subsequent action may lead to negative or threatening self-related outcomes.

Finally, with regard to context, research suggests that stimuli magnitudes influence spatiotemporal perception to the degree that they appear to increase "perceptual clarity and ease of information-extraction," (Matthews and Meck, 2016, pg. 876). Put differently: stimuli magnitudes appear to influence spatiotemporal perception not only when they are self-referential, but also when they appear informative. To the degree that numerous, faster, more luminous, etc., stimuli are informative—that is, suggestive of the meaning or purpose of a situation or context—they more substantially influence spatiotemporal perception (i.e., dilate time and constrict space further relative to less informative magnitude increases).

D. The Perceptual Classification Model

The final model of spatiotemporal perception I'll discuss here is the Perceptual Classification Model, and it shares important assumptions with the above models. What distinguishes this model, by degree is the importance placed on *ex-situ* reflection on past situational expectations. This model, then, is the most trans-situational of the models discussed.

According to the Perceptual Classification Model, our spatiotemporal perceptions rely on a constant feedback loop involving (1) prospective expectations about how an upcoming situation will transpire and (2) retrospective judgments—based on episodic memory formation—of how the situation did transpire (Matthews and Gheorghiu, 2016; Fountas et al., 2022).

The Perceptual Classification Model acknowledges the role of stimulus magnitude, and of neural excitation, but places relatively greater emphasis on peoples' expectation states and stocks of knowledge regarding how situations experienced in the past are likely to be similar to those in the future. It is also not just the violation of any one expectation *per se* but the *rate of violated expectations* which increases their emotional/nervous system salience and, thus, impacts our spatiotemporal perception going into subsequent context-similar situations.

The Perceptual Classification Model also often relies on what is called the "coding efficiency framework," or "repetition effect," which simply specifies that repeated stimuli blunt our responsiveness—the more often a particular iteration of a stimuli is encountered, the more efficiently it is encoded

neurologically (Matthews and Gheorghiu, 2016). On this account, greater situational novelty is neurologically encoded less efficiently, leading to a larger neural response. Consistently met expectations, then, regardless of stimuli magnitude or valence, will blunt neural responsiveness, and thus reduce the degree of alterations in spatiotemporal perception. However, Matthews and Gheorghiu (2016, pg. 114) point out that stimuli repetition does not inevitably blunt responsiveness. If the repeated stimuli is "degraded or masked" in some significant way, or when the stimuli repetition itself occurs inconsistently or unpredictably, this would count as an expectation-violating circumstance and would produce alterations in our spatiotemporal perception.

E. In Summation

Each of these models overlaps with the others in interesting ways that allow us to form some preliminary generalizations about the abstract situational dynamics that alter spatiotemporal perception.

> Proposition 1: Individuals encounter inter-situational and intra-situational variation in social stimuli.
>
> Proposition 2: This variation in social stimuli can relate to stimuli magnitude, complexity, rate change, and/or emotional valence.
>
> Proposition 3: Individuals form cross-situational expectations related to the complexity, rate change or emotional valence of social stimuli.
>
> Proposition 4: Increases in the magnitude of stimuli complexity, rate change or valence will slow temporal perception and narrow spatial perception.
>
> Proposition 5: Some situations are more unpredictable, unstable or violative of expectations than are other situations. Situations that are more unpredictable, unstable or violative of expectations will be associated with slower temporal perception and more narrowed spatial perception.
>
> Proposition 6: The situational rate of violated expectations influences the degree to which temporal perception slows and spatial perception narrows.
>
> Proposition 7: Self-referential stimuli—particularly violated expectations regarding self—will slow temporal perception and narrow spatial perception.

Proposition 8: Situations perceived to be informative, or to ease information-extraction, will slow temporal perception and narrow spatial perception.

Proposition 9: Situations perceived to contain the potential for negative/threatening consequences will slow temporal perception and narrow spatial perception.

Proposition 10: Regardless of stimuli magnitude, complexity, rate change, and/or emotional valence, repeated exposure will reduce the intensity of alterations to spatiotemporal perception. However, this holds only if repeated exposure is high in clarity/perceptibility and if repeated exposure is consistent in form across situations.

Known Social-Psychological Correlates of Spatiotemporal Perception

Figure 2 depicts some of the variables that have been consistently associated in past work with each pole of spatiotemporal perception. Below I offer a general discussion of these variables as each relates to spatiotemporal perception. I do so as a means to steadily increase the social psychological and sociological focus of my analysis. We must now begin our segue from brute physiological and abstract stimuli models of spatiotemporal perception to the social world.

<Insert Figure 2 Here>

Relative perceptual scanning (wherein the passage of time appears to move relatively more quickly, and space is perceived to be relatively more expansive) is, generally speaking, more likely to emerge when individuals are distracted by positive (or, at least, not negative) stimuli and/or when they are engaged with stimuli perceived to be familiar or predictable. Distraction influences spatiotemporal perception because it can lower one's self-awareness, and it is this relative decline in self-awareness that can shift perception to become more oriented towards scanning (vs. focusing). Familiar or predictable stimuli influence spatiotemporal perception because they will tend to recruit less attentional regulation (and, thus reveal lower levels of neuronal energy expenditure).

There are, however, many ways to be distracted and many familiar or predictable targets and situations.

Perhaps an individual or group is engaged in activities perceived to be interesting, rewarding or entertaining. Or, perhaps an individuals or group is daydreaming or brainstorming. Or, perhaps an individual or group is engaged in an activity deemed intrinsically beneficial, that is, good or helpful in itself. Or, perhaps an individual or group is engaged with friends

or family or enjoying a situation that feels comfortable and predictable. Thus, even if positively-valenced distraction and familiarity/predictability are the primary fulcrums moving individuals and groups toward a more scanning style of perception, there are many situational and sociocultural ways to be distracted or to feel comfortable.

On the other hand, relative perceptual focusing (wherein the passage of time appears to move relatively more slowly, and space is perceived to be relatively more constricted), is generally associated with a greater attentional allocation towards self, greater physiological arousal and expectation violations. Self-awareness, arousal and expectation violation influence spatiotemporal perception because each motivates individuals to identify the reason for this self-focus, arousal or expectation violation; that is, the source(s) of disruption. Perception of time thus slows and perception of space becomes narrowed and directed in order to identify the source(s).

There are also many reasons why an individual or group might allocate greater attention to themselves and/or experience elevated levels of physiological arousal. Under-stimulation, or boredom, for example, has been associated with both greater self-awareness and time dilation (Wittman, 2015). As well, overstimulation and/or negative mood states can make it difficult to maintain attentional allocations, thus leading to boredom and, again, time dilation (Rafaelli et al., 2018). Or, consider the litany of possible situations that might substantially increase an individual or group's physiological arousal or negative affect (not all drivers of physiological arousal will be negatively valenced). Or, consider all of the ways in which an individual or group might experience novel stimuli, or have their expectations violated.

Our spatiotemporal perception is constantly vulnerable to our situational context, ecology, and socio-cultural expectations. As heuristic guides, though, we can say that—again, generally speaking—our perception shifts toward the scanning pole when we are distracted, experiencing positively valenced stimuli, or stimuli that it is interpreted as familiar or predictable. Alternatively, and again generally speaking, we can say that our perception shifts toward the focusing pole when we are thinking about ourselves, experiencing negatively valenced stimuli, when our physiologies are aroused and/or when our expectations are violated.

Spatiotemporal Perception Influences Behavioral Regulation/Impulse Control

Behavior (including emotion) regulation is a variable of central importance to peoples' ability to navigate and/or contribute to their social environments. Thus, to the extent that variations in spatiotemporal

perception differentially implicate impulse control, we should regard changes in such perception as potentially significant to any social scientific theory.

I must make an absolutely critical point: impulse control failure is an important correlate of spatio-temporal perception because of its role in *both* enabling socially or normatively unacceptable behaviors (e.g., outbursts, addictions, violence) as well as socially or normatively valued behaviors (e.g., creativity, novelty, inspiration). Though he is focused on the macro-level of entire cities, West (2018), for example, finds that social disorder (e.g., crime rates) scales along with creativity (number of unique business sectors or patents filed). This is not because crime causes creativity. It is because there is a dual nature to complexity and disorder, leading to potentially negative *and* positive consequences.

So, when I am discussing "self regulation failure" I am not making any theoretical commitment to negative outcomes. Too often, impulse control is discussed in only positive terms. But this is mistaken. High levels of self-regulation can potentially lock us into rote habits, or into redundantly conformist behaviors and ideas. It can be hard to remind oneself that impulse control—per se—is neither good nor bad, but we *must* do this in order for the theory I am building here to be successfully comprehended.

*A. Behavioral Regulation as a Cause and Outcome of Subjective **Temporal** Perception*

With regard to variations in time perception, experiencing what's called an "extended now," (Vohs and Schmeichel, 2003; Vohs, 2010) appears to be associated with reductions in impulse control. Experiencing an "extended now" is to feel "stuck in the present"; the future is (relatively) discounted and controlling our impulses in the moment feels more effortful.

But why is this?

Self-regulation has two components: (1) the initiation of a regulatory response and (2) the continuance or maintenance of that regulatory response (Vohs and Schmeichel, 2003). It is the latter component, maintenance of self-control, which appears to be most influenced by subjective estimates of time's duration. The slower time feels—i.e., the longer time seems to be stretching on—the more it seems long stretches of time have already been spent on or with something.

Consider a day at the office when there is really nothing to do other than boring busy work. Time seems to stretch on. So, you distract yourself with videos on the internet. Yet, despite watching several distracting videos, you are disheartened to learn that *only* 20 minutes has passed. You still have

hours to kill! Because time feels so long, each effort at distraction feels exaggerated in length, leading to impulse control failure as we ultimately decide to leave work early (though we know we shouldn't). But leaving work early, or indeed quitting any obligation (from work life to family life, to personal commitments), frees us to enter other situations that are potentially more stimulating or novel: maybe going to a new restaurant to meet some friends, thus speeding time up.

A slowed perception of time, simply put, magnifies our perception of the amount of time spent on any given behavior, and the more time *it feels* we have spent on something in a situation, the more attention we begin paying to the passage of time and to the effortfulness of our attempt to regulate ourselves. When our attention is narrowed in this way to an "extended now," that is, to the present context, we by definition focus relatively less on our future selves, future goals or future plans. This principle, first articulated and empirically documented by Kathleen Vohs and Brandon Schmeichel (2003), presumes situational variation in our *temporal horizon*, with attention allocated sometimes locally and internally and at other times distally and externally.

The proposed process is something of a paradox. If we find ourselves at either pole of boredom or heightened arousal, we will begin attending relatively more to the present situation, likely as a means to discern and interpret the source of boredom or arousal. However, this attention to the present moment can produce a dilation of time, an "extended now," which raises our cognitive load (Fudenberg and Levine, 2006), rendering fewer neurological resources available for the maintenance of regulatory inhibition.

Another way to think about it: people can engage in self-regulation in response to specific situational stimuli (self-regulation as a behavioral "state"), but we can also have a tendency to be more or less self-regulating across various situations (self-regulatory ability as a "trait").

Regarding self-control as a state: if something in a specific situation (for example, a norm) causes us to self-regulate in some way, our attention will track features of the situation more closely (including the passage of time itself) and our perception of the passage of time will begin to slow. Regarding self-control as a trait: if we tend to self-regulate more often across various situations, our perception of the passage of time will tend to be slower relative to others who self-regulate less, and we will, therefore, have a relatively harder time controlling our impulses in any given situation. This dynamic is, of course, bidirectional: perceiving relatively dilated time makes self-regulation more difficult and self-regulation increases the perceived dilation of time.

Proposition 11: Attempts at self-regulation dilate/slow temporal perception via increases in neuronal energy expenditure and directed attention to self.

Proposition 12: Dilated/slowed temporal perception increases the perceived effortfulness of self-regulation, leading to a higher rate of regulation failure.

*B. Behavioral Regulation as a Cause and Outcome of Subjective **Spatial** Perception*

With regard to variations in spatial perception and impulse control, we should make a brief but important distinction between personal space or physical confinement/crowding and subjective perception of our visual field.

First, consider the concept of "peri-personal space," or the periphery of personal space (usually, about arm's length) that people expect to maintain in different situations (Rizzolatti et al., 1997; Serrno, 2019; Pianzola et al., 2021). The relevant findings here are that people tend to expand their sense of (and monitoring of) personal space when uncomfortable or anxious (Spaccasassi and Maravita 2020). We can understand the basic principle here intuitively: around friends or family, hugging is normal and physical closeness is expected; but, around strangers or in uncomfortable situations, we wish to regulate our personal boundaries and maintain our distance. Preferences for personal space, of course, vary culturally (Sorokowska et al., 2021).

A second way to conceptualize spatial perception is in terms of physical confinement and/or social crowding (Longoria, 1995). Research finds that peoples' sense of physical confinement (e.g., room size) is associated with anxiety and negative mood states along with poorer performance on small tasks. Feeling socially crowded with others in a new or uncertain environment, on the other hand, appears to reduce peoples' sense of control over the situation (Longoria, 1995).

However, there is a third way to think about "spatial perception," that is related to the above conceptualizations, but more fundamental. The above conceptualizations are both based on a sense of what other people or objects are doing to our perception—violating our physical personal space or confining or crowding us—as opposed to *distortions or alterations to our visual field per se*.

The reason why a focus on the visual field, per se, is important is because our field of vision can narrow ("tunnel") irrespective of the size of the room we are in and irrespective of the density of other people around us. So, yes,

a small room or a dense social setting can lead to a limiting of our visual field, but more social-psychologically, so too can stress, fatigue or uncertainty lead to a narrowing of our visual field (Pooladvand and Hasanzadeh, 2023).

My line of reasoning here is also consistent with the well-validated "broaden and build" theory of emotion and perception in social psychology (Fredrickson, 2004; 2013). The basic premise of this theory is that the experience of positive emotions—from contentment to joy to love—motivate particular behaviors, including play, exploration and general curiosity. These behaviors are, themselves, associated with a broadened visual field of perception (via increased neurological encoding of peripheral visual information, see Vanlessen et al., 2014).

This works symmetrically with regard to negative stimuli and is consistent with a "focusing" (vs. scanning) perceptual orientation. *Anticipating* negative stimuli broadens the focus of our visual perception, while subsequently *encountering* that negative stimuli narrows it (Sadowski et al., 2020). Our visual attention and perceptual field initially broadens to "scan" for the anticipated threat, and when this negative stimulus arises materially, our perception narrows to focus on it (plausibly for purposes of understand it or mobilizing a response to it).

Cortisol, adrenaline and other hormones trigger our sympathetic nervous system's stress response, one of which is for our pupils to dilate so as to let more light into our eyes, thus (slightly) increasing the range of our peripheral vision (Preuschoff et al., 2011). This can be thought of as a component of a visual "search function" to locate and understand the source of the sympathetic nervous system stressor. As sociologists, we can think of "stressors" broadly, as, for example, when salient expectations or norms in a situation are not met (e.g., Heise, 1979) but I will have more to say about this shortly.

Situational cues that increase arousal and stimulate the production of adrenaline, then, narrow perception producing what is colloquially known as "tunnel vision." This can be thought of as a visual focusing function, narrowing attention toward the presumed source of arousal/expectation violation. Tunnel vision occurs when people are highly stressed, afraid or otherwise cognitively overloaded; for a visceral example, consider navigating, *in situ,* a natural disaster (Tsurushima, 2022). Police officers, for another example, have long been found to frequently report a tunneling of their visual field during shootings (Artwohl, 2002).

But the narrowing of our visual field happens not only in these extreme cases of life-or-death circumstance but also more subtly, more gradually: *relative* increases in stress, fear or overstimulation lead to a *relative*

narrowing of the visual field. The gradual tunneling of vision is not likely to be a rare event even if the extreme phenomenon of totally narrowed, pinpoint, perception is rare. We can think of it this way: when aroused or alarmed or on-guard, our visual field narrows, but, when mortified or terrified, it tunnels.

This is where past work comes into play as regards peri-personal space and perceptions of confinement or crowding. The narrowing of the visual field, I suggest, is the fundamental perceptual mechanism underlying perceptions of peri-personal space (when it is violated) and feelings of confinement or crowding. Thus, we can derive the following propositions:

Proposition 13: Narrowed spatial perception is a cause and consequence of anxiety, discomfort and a sense of lost situational control.

Proposition 14: Anxiety, discomfort and/or a sense of lost situational control are associated with a higher rate self-regulation failure.

The Sociology of Identities, Situations, Exchanges and Networks

From the standpoint of theoretical sociology, people enter situations expecting others to verify (1) their identities and (2) the enculturated meaning of situations, with violation of these expectations being associated with negative emotion and discomfort (Stryker and Burke, 2000; Burke and Stets, 2022; Heise, 1979, 1987; Smith-Lovin and Heise, 2016). The expectations that people bring to situations, and which they monitor for verification, often also relate to who in the situation is considered higher status and, thus, to whom attention/deference should be directed (Berger et al., 1986; Ridgeway, 2006).

In addition, people, generally, have meanings related to the goodness-badness, powerfulness-weakness and activity-inactivity of the those involved in social situations, and disruptions in these meanings influences peoples' emotional state (Heise, 1979). People also operate in the context of social networks and exchange with one another in often stable and predictable ways (Lawler et al., 2001; Lawler et al., 2021).

These are foundational notions in sociological theory, supported by decades of quantitative and qualitative research.

Below, I review the central components of each of these theoretical perspectives.

Then, in the sections that follow, I will apply the above theory of spatiotemporal perception to this voluminous body of work and derive novel

and testable propositions that might advance sociological theory in heretofore unacknowledged directions.

A. Identities and Situations

> *"If [people] define situations as real, they are real in their consequences," (Thomas and Thomas, 1928, pg. 572).*

Identity Theory focuses on the meanings that comprise peoples' various identities (i.e., their role, social and person identities), while Affect Control Theory focuses on the cultural meanings people hold about situations, specifically, the people (e.g., "maintenance worker," "celebrity," "teacher," "doctor," "cashier," "driver"), objects (e.g., "phone," "uniform," "podium," "professional attire," "credentials," "car,") and behaviors (e.g., "sell," "cry," "help," "yell at," "touch") that exist or arise in a given situation.

From an Identity Theory perspective (Stryker and Burke, 2000; Burke and Stets, 2022), people develop identities throughout their lives, each of which contain a set of meanings. Identities might be role identities (implicating a responsibility to someone else, like teacher, parent, or employee), social identities (implicating a group affiliation, like Christian, Democrat or Lakers fan) or person identities (implicating an aspect of the individual, like trustworthiness, honesty, humor or riskiness).

Identities, and the meanings comprising identities, may vary culturally and sub-culturally. The identity of "student" (a role identity), for example, might not exist in a formal institutional sense in a small horticultural village (though, of course, learning and practicing do). However, even within a large and differentiated society with formal schooling, the identity of "student" will contain different meanings depending on the social location of the individual in question. For example, a student at a very competitive school with frequent testing might have meanings like "driven," "conscientious" or "rule-following" composing their student identity, whereas a student in a more open-ended and self-directed school might have meanings like "creative," "open-minded," or "spontaneous," composing their student identity.

Salient identities are those identities which are frequently active across situations in our lives, while *prominent* identities are those sharing meanings with many other identities. How committed we become to any given identity is a function of how embedded it is in *mutual verification* contexts (Burke, 2023). Mutual verification contexts are situations where people consistently, and successfully, verify one another's identity meanings; good examples might be close friendships, healthy marriages or successful working relationships.

As mentioned above, Affect Control Theory defines situations as composed of other people, behaviors, and objects, all of which we come to define according to social learning processes across our life (see Robinson, 2006). When our understanding of the cultural definition of another person, behavior or object in a situation goes unverified (perhaps a person in the situation behaves differently than we expected, or an object is used differently than we expected it to be used) we register an error ("deflection") which is represented to us as a mild to severe negative emotional experience.

Moreover, from an Affect Control Theory perspective (Heise, 1979), actors, behaviors and objects in situations are perceived along (at least) three basic dimensions, and these dimensions have been mathematically modeled and empirically measured in diverse countries around the world[1] (Heise, 2010; Smith-Lovin and Heise, 2016).

These dimensions are: (1) evaluation (how good or bad something is, along a continuum), (2) potency (how powerful or powerless something is, along a continuum), and (3) activity (how lively or quiet something is, along a continuum). These dimensions come from Osgood's (1964; Osgood et al., 1975) semantic differential studies and are regarded as universal human dimensions of cultural meaning. Evaluation, potency and activity are dimensions of affective meaning in that peoples' expectations are tied to their emotional state (with positive emotions flowing from verified situational expectations, and negative emotions flowing from unverified situational expectations).

But how do these dimensions work out in real situations?

Below is a (hopefully) helpful, edited, example from Heise, a founder of the theory:

> "Suppose [a doctor is interacting with a patient]. In U.S.A. culture, [the general] definition of the situation leads [the doctor] to feel … fundamentally quite good and powerful and neither lively nor still, and the patient [to feel they are] fundamentally neither good nor bad, quite weak, and slightly quiet.
>
> Now what behavior should the doctor perform to best confirm the fundamental [cultural] meanings of both individuals in the situation?
>
> [They] might perform a behavior that is neutral in goodness, powerfulness, and liveliness (like study or evaluate), and such a behavior is not too bad a

[1] https://affectcontroltheory.org/resources-for-researchers/data-sets-for-simulation/

> choice…[but], such a behavior makes a doctor seem less good and potent than [they are generally perceived to be].
>
> So, the doctor increases the niceness of [their] behavior to quite good to get around that problem. A behavior that is quite good and neutral on potency and activity--like talk to, or understand-- confirms the meanings [likely held by the patient] and it almost perfectly confirms the evaluation and activity aspects of a doctor's fundamental cultural meaning.
>
> This behavior still leaves the doctor seeming not quite as powerful as [they are expected to be], but a more powerful behavior would detract from the goodness [they are] trying to confirm. So, [they] reasonably settle on talking to the patient and understanding the patient's problems. Doing so produces a transient meaning of the doctor as quite good, slightly powerful, and neither lively nor still.
>
> But this emergent meaning is less powerful than a doctor should be, so [their] next action has to be somewhat more potent to avoid straying too far from the fundamental meaning of "doctor." [They need] to perform a behavior that is quite good, slightly powerful, and neutral on activity--like console, or soothe.
>
> Consoling and soothing the patient leaves the doctor's emergent meaning still lacking the ideal level of potency, and meanwhile, the patient begins to seem excessively indulged. In fact, the doctor's consideration of the patient, creating an excessively high evaluation of the patient, provides a context in which the doctor now can be more domineering. Now the doctor can employ behaviors that are only slightly nice, more powerful, and slightly quiet--like direct, or counsel.
>
> These emergent meanings of doctor and patient combine with [common cultural] sentiments about doctors and patients to produce [the situational context]," (Heise, 2002, pgs. 24-25)

Finally, we must introduce a third theoretical perspective: Expectation States Theory (Berger et al., 1986; Ridgeway, 2006; Kalkhoff et al., 2020). According to this theory, people also hold expectations about the meaning of "status cues" in interactions. Status cues are signals of purported competence. These status cues can vary broadly, but Berger and colleagues (1986) helpfully categorize them as either verbal or nonverbal and they can relate either to tasks or categories.

Let's consider some examples (from Berger et al., 1986, pg. 160). When situations involve a task to be addressed, status cues can be verbalized (expressed in statements like, "I just happen to know how to do this") or displayed with the physical body (e.g., posture, eye contact, speech

loudness). However, categories of persons and groups also constitute important situational status cues and these, too, can be verbalized (e.g., “I have a Harvard PhD,” “I am Chicano,” “As a woman…”) or displayed with the physical body (e.g., language or dialect, skin color, age, sex) and even displayed as objects (e.g., framed diplomas and certifications, a certain style of watch or bracelet).

Of course, not all situations have a task to be addressed and, in these situations, potential cues of status may be less significant. But, even a small, superficial, task (“where should we go eat dinner tonight?”) can arise in which someone reliably asserts (or expect another to assert) influence.

B. Exchanges and Networks

From an Exchange Theory perspective, people exchange material and social resources with others in reliably structured forms, which overlap in practice, and which constitute an important component of the structure of society (Molm, 2003; Lawler et al., 2009; Lawler et al., 2021).

When we do something nice for someone we don’t know—for example, let them borrow our phone so they can call someone to pick them up, or help someone change a flat tire— we do so without any expectation for reciprocation. An even simpler example is holding a door open for someone walking into a building behind you. It simply feels good, and is low cost to us, to help out another person. These are termed *generalized exchanges*, and these tend to have a low frequency and duration of interaction.

Reciprocal exchanges are iterated situations where one person or organization does something favorable for another, with a general expectation for reciprocation at some unspecified point in the future. This might involve, for example, agreeing to watch a neighbor’s pet for them while they leave on a vacation, with the understanding that they will return the favor when you take your own vacation. Or, it could involve giving a sales lead to a colleague so they can get a bonus, with the expectation that they will return the favor at some point if your sales numbers come up short. Though reciprocal exchanges tend to have a low-medium frequency and duration of interaction, their prevalence across a community is a good indicator of collective efficacy (Zeng and Wu, 2022.)

Negotiated exchanges are those where two or more parties to an exchange discuss the terms of an agreement. This might involve two neighbors negotiating over the price of a fence across a shared property line, or, it might involve a married couple agreeing to a household division of labor. Since negotiated exchanges have the potential for conflict—as when terms cannot be agreed to, or when one party doesn’t fulfill their obligation—these

exchanges sometimes contribute to discord and network tie dissolution (Molm et al., 2006). But, plausibly, most negotiated exchanges are at least asymmetrically positive sum, benefiting both individuals to some degree whatever the situation. Excluding transient market exchanges, as with a cashier in a store, the frequency and duration of interaction during negotiated exchanges tends to range from medium to high.

Finally, *productive exchanges* are those where individuals in the situation share a superordinate goal—one that would be unachievable by any one individual but *is* achievable with enough group effort across situations. Productive exchanges can be found everywhere from task groups at a job, to community groups organizing in support of a policy initiative, to a soccer team practicing for an upcoming game. Generally speaking, the rate and duration of interactions between individuals is high in productive exchanges.

Next, we turn to consider a general sociological network theory perspective.

Some social network characteristics are quantitative, like the absolute number of people one's network (network size), the number of one's network members that know one another (network density), or the frequency and duration of interaction with one's network members (network time).

Other characteristics of networks are more qualitative. Some network ties are more emotionally intense than others and some of our ties are culturally similar and familiar to us (known as strong ties or bonding ties) while other ties are different from us in important ways (known as weak ties or bridging ties) (Granovetter, 1973; 1983; Putnam, 2000; Fine, 2021, pg. 75). The "strength" of a tie tends to be correlated with how much interaction takes place, and the consequent information "bandwidth" that emerges between the two individuals (Aral and Van Alstyne, 2011). And, while information bandwidth is highest between strong ties in a network—and therefore more information in total tends to be transmitted between strong ties—weak ties tend to generate a higher rate of unique information on account of greater social and cultural distance (Aral and Dhillon, 2023).

Diverse social networks, then, (comprised primarily of weak, bridging ties) are expected to be lower in their information bandwidth but higher in the rate of delivery of unique/novel information (i.e., unique/novel from the standpoint of any given piece of information transmitted by other nodes in the network). Homogenous social networks, on the other hand, (comprised primarily of strong, bonding ties) are expected to be higher in information bandwidth and, consequently, information range (i.e., number of topics discussed), but lower in the amount of unique/novel information transmitted.

These quantitative and qualitative aspects of networks have proven to be important with regard to a variety of social outcomes of interest to theorists. For example, knowing the characteristics of a person's social network can help predict their health outcomes (Smith and Christakis, 2008), their exposure to new ideas and creativity (McPherson et al., 2001; Aral and Dhillon, 2023), and their economic circumstances (Blau, 1964; Letki and Mieriņa, 2015).

The Social Structure of Spatiotemporal Perception

There is something fundamental occurring underneath these descriptions of identity-situation and exchange-network dynamics. The dynamics today described by sociologists and social scientists are being influenced by, driven by, far more basic perceptual mechanisms than have been considered or studied to this point in the discipline's history.

Identity-situation dynamics, forms of exchange, and network characteristics, from a spatiotemporal perspective, all represent contexts revealing (1) larger or smaller magnitudes, (2) higher or lower probabilities of exposure to novelty (3) positive or negative emotional valences and (4) higher or lower probabilities for met expectations. And, (1)-(4) are known to influence spatiotemporal perception which, in turn, influence behavior and impulse control.

This is where we now turn.

Recall that on several theoretical accounts of spatiotemporal perception—most notably the Theory of Magnitude (Walsh, 2003)—larger perceived magnitudes are associated with dilated time perception and narrowed spatial perception. Recall, also, that across a variety of studies, threat/fear/anxiety are associated with dilated time perception and narrowed spatial perception (Wittman, 2015). Finally, violations of expectation also tend to dilate time and narrow perception, as suggested by both generalized magnitude and perceptual classification models (Roseboom et al., 2019).

Recall, also, that under conditions of dilated time perception (relative slowing of time) people tend to feel greater subjective effort with regard to impulse control and reveal more impulse control failures (Vohs and Schmeichel, 2003). As well, under conditions of narrowed perception people tend to feel more anxious, uncomfortable, or concerned about their control over a situation which, in turn, can lead to risky behavior and impulse control failures (Pooladvand and Hasanzadeh, 2023).

A. Spatiotemporal Perception as a Function of Identities and Situations

Most simply, as described above, people expect to be able to verify the meanings comprising their identities and they will feel negatively when meanings within identities go unverified by others in situations (Burke and Stets, 2022).

It is conceivable that, under certain conditions, individuals might *expect* their identities to go unverified (for example, in abusive relationships or hostile work environments), but, in general and all else equal, Identity Theory stipulates that people expect to have their identities verified by others in interactions (following the "cognitive consistency principle").

Identity non-verification—on account of the negative emotion and arousal it produces—is thus expected to dilate time and focus spatial perception which, in turn, will render self-regulation more difficult as the situation unfolds. This impairment in self-regulation in response to identity nonverification might, in principle, lead to many impulsive and regretted behaviors which harm peoples' personal and professional relationships. Or, it might lead to forms of self-expression that would otherwise be overly-controlled, producing long-term improvements to our social relationships.

Particularly "salient" identities (those disproportionately likely to be activated across situations in a person's life) and "prominent" identities (those sharing a disproportionate number of meanings with other identities) also structure our situational expectations (Burke, 2023). Theoretically, individuals will feel less negatively when salient and prominent identities go unverified (relative to less salient or less prominent identities) because past, iterated, verifications of the identity meanings have built up a "reservoir" of positive emotions that can be drawn from (see McCall and Simmons, 1978). By contrast, less salient or prominent identities—for example, identities which are newer, less securely held or less often active across situations—will be associated with a greater degree of negative emotion when unverified by others because these identities and meanings have little or no history of repeated verification across situations. We would, then, expect this elevated negative emotion to dilate time perception and focus spatial perception thus rendering impulse control more difficult.

Identity Theory also stipulates that individuals with greater access to resources (e.g., money, social influence) and status (perceived competency) will tend to more easily verify their identity meanings across situations (Burke and Stets, 2022). Individuals perceived as competent and influential can direct peoples' attention as well as conversational topics in a way that increases the likelihood that their particular identity meanings are verified. For example, money might allow individuals to purchase positions or leverage in organizations, or provide funding for other peoples' pursuits or

needs; in either case, verifying one's identity meanings across situations becomes easier because of others' relative financial dependency and their subsequent motivation to placate or ingratiate.

The implication is that individuals with fewer resources and less status in situations will experience relatively more frequent bouts of identity non-verification. As such, we should expect individuals with fewer resources or status in a situation to experience that situation as relatively time dilated and spatially focused, and to experience greater difficulty regulating their behavior (including their emotions).

Some preliminary generalizations follow from this:

Proposition 15: Identity non-verification in situations produces increases in physiological arousal and negative emotion when this non-verification is *expected* and higher levels of negative emotion and arousal when it is *unexpected*.

> Proposition 15a: Slightly to moderately elevated physiological arousal in response to *expected* identity non-verification slows perceptions of time and narrows perceptions of space.
>
> Proposition 15b: Moderately to highly elevated physiological arousal in response to *unexpected* identity non-verification slows perceptions of time and narrows perceptions of space to a greater degree (relative to expected identity non-verification).
>
> Proposition 15c: Slightly to moderately negative emotion in response to *expected* identity non-verification slows perceptions of time and narrows perceptions of space.
>
> Proposition 15d: Moderately to highly negative emotion in response to *unexpected* identity non-verification slows perceptions of time and narrows perceptions of space to a greater degree (relative to expected identity non-verification).
>
> Proposition 15e: A slowed perception of time in response to *expected* identity non-verification slightly to moderately increases the perceived effortfulness of self-regulation, leading to a small to medium increase in the rate of self-regulation failure.
>
> Proposition 15f: A slowed perception of time in response to *unexpected* identity non-verification moderately to severely increases the perceived effortfulness of self-regulation, leading

to a medium to strong increase in the rate of self-regulation failure.

Proposition 15g: A narrowed perception of space in response to *expected* identity non-verification will slightly to moderately increase anxiety and discomfort, leading to a small to medium increase in the rate of self-regulation failure.

Proposition 15h: A narrowed perception of space in response to *unexpected* identity non-verification will moderately to severely increase anxiety and discomfort, leading to a medium to strong increase in the rate of self-regulation failure.

Proposition 16: Less salient identities (i.e., newer identities or those less often activated across situations) and less prominent identities (i.e., those that are less securely held or less integrated with one's general self-concept), will be associated with increases in physiological arousal and negative emotion when nonverification is *expected* in a situation and higher levels of physiological arousal and negative emotion when it is *unexpected.*

Proposition 16a: Slightly to moderately elevated physiological arousal in response to *expected* non-verification of identities lower in salience or prominence will slow perceptions of time and narrow perceptions of space.

Proposition 16b: Moderately to highly elevated physiological arousal in response to *unexpected* non-verification of identities lower in salience or prominence will slow perceptions of time and narrow perceptions of space to a greater degree (relative to expected identity non-verification)

Proposition 16c: Slightly to moderately negative emotion in response to *expected* non-verification of identities lower in salience or prominence will slow perceptions of time and narrow perceptions of space.

Proposition 16d: Moderately to highly negative emotion in response to *unexpected* non-verification of identities lower in salience or prominence will slow perceptions of time and narrow perceptions of space to a greater degree (relative to expected identity non-verification).

Proposition 16e: A slowed perception of time in response to *expected* non-verification of identities lower in salience or prominence will slightly to moderately increase the perceived

effortfulness of self-regulation, leading to a small to medium increase in the rate of self-regulation failure.

Proposition 16f: A slowed perception of time in response to *unexpected* non-verification of identities lower in salience or prominence will moderately to severely increase the perceived effortfulness of self-regulation, leading to a medium to strong increase in the rate of self-regulation failure.

Proposition 16g: A narrowed perception of space in response to *expected* non-verification of identities lower in salience or prominence will slightly to moderately increase anxiety and discomfort, leading to a small to medium increase in the rate of self-regulation failure.

Proposition 16h: A narrowed perception of space in response to *unexpected* non-verification of identities lower in salience or prominence will moderately to severely increase anxiety and discomfort, leading to a medium to strong increase in the rate of self-regulation failure.

Proposition 17: Individuals with greater resources or status will be more successful in eliciting identify verification across situations, and this produces positive emotional experiences.

Proposition 17a: Positive emotions resulting from elicited identity verification accelerates perceptions of time and broadens perceptions of space.

Proposition 17b: Accelerated perceptions of time in response to elicited identity verification will reduce the perceived effortfulness of self-regulation, leading to a greater ability to regulate behavior.

Proposition 17c: Broadened perceptions of space in response to elicited identity verification will be associated with lower levels of anxiety and discomfort, leading to a greater ability to regulate behavior.

Now, let’s consider Affect Control theory, and how meanings in the situation might operate outside of identity. Recall Affect Control Theory’s contention that people monitor and attempt to maintain culturally-learned meanings about the evaluation, potency and activity dimensions of the people, behavior and objects in situations.

Proposition 18: When peoples' enculturated expectations about the evaluation, potency and activity dimensions of the people, behavior and objects in a situation are not verified, people tend to experience elevated physiological arousal and negative emotion.

> Proposition 18a: Elevated physiological arousal in response to unverified situational meanings will slow perceptions of time and narrow perceptions of space.
>
> Proposition 18b: Negative emotion in response to unverified situational meanings will slow perceptions of time and narrow perceptions of space.
>
> Proposition 18c: A slowed perception of time in response to unverified situational meanings will increase the perceived effortfulness of self-regulation, leading to a higher rate of self-regulation failure.
>
> Proposition 18d: A narrowed perception of space in response to unverified situational meanings will increase anxiety and discomfort, leading to a higher rate of self-regulation failure.

Proposition 19: People, behavior or objects in a situation expected to conform to enculturated meanings of "badness" (relative to "goodness") will cue (potentially mild) threat and negative emotions.

> Proposition 19a: Perceptions of threat in response to situational meanings of "badness" (relative to "goodness") will slow perceptions of time and narrow perceptions of space.
>
> Proposition 19b: Negative emotions in response to situational meanings of "badness" (relative to "goodness) will slow perceptions of time and narrow perceptions of space.
>
> Proposition 19c: A slowed perception of time in response to situational meanings of "badness" (relative to "goodness) will increase the perceived effortfulness of self-regulation, leading to a higher rate of self-regulation failure.
>
> Proposition 19d: A narrowed perception of space in response to situational meanings of "badness" (relative to "goodness) will increase anxiety and discomfort, leading to a higher rate of self-regulation failure.

Proposition 20: Larger (relative to smaller) magnitudes of “activity” or “potency” displayed by a person, behavior or object in a situation will lead to elevated levels of physiological arousal when this display is expected, and especially high levels of arousal when it is unexpected.

> Proposition 20a: Physiological arousal in response to *expected* displays of high-magnitude activity or potency in a situation will slow perceptions of time and narrow perceptions of space.
>
> Proposition 20b: More intense levels of physiological arousal in response to *unexpected* displays of high-magnitude activity or potency in a situation will slow perceptions of time and narrow perceptions of space to a greater degree (relative to when these displays are expected).
>
> Proposition 20c: A slowed perception of time in response to *expected* displays of high-magnitude activity or potency in a situation will slightly to moderately increase the perceived effortfulness of self-regulation, leading to a small to medium increase in the rate of self-regulation failure.
>
> Proposition 20d: A slowed perception of time in response to *unexpected* displays of high-magnitude activity or potency in a situation will moderately to severely increase the perceived effortfulness of self-regulation, leading to a medium to strong increase in the rate of self-regulation failure.
>
> Proposition 20e: A narrowed perception of space in response to *expected* displays of high-magnitude activity or potency in a situation will slightly to moderately increase anxiety and discomfort, leading to a small to medium increase in the rate of self-regulation failure.
>
> Proposition 20f: A narrowed perception of space in response to *unexpected* displays of high-magnitude activity or potency in a situation will moderately to severely increase anxiety and discomfort, leading to a medium to strong increase in the rate of self-regulation failure.

B. Spatiotemporal Perception as a Function of Exchanges and Networks

Now, let’s consider exchange and network theories.

Forms of exchange differ according to several characteristics but, most notably, they differ according to their frequency and duration of interaction and their propensity for conflict.

Some preliminary generalizations follow from this:

Proposition 21: Forms of exchange revealing a higher rate and duration of interaction (e.g., productive exchanges) will tend to be associated with a greater rate of met identity- and situation-related expectations.

> Proposition 21a: Met expectations and situational predictability in response to an elevated rate and duration of interaction will accelerate perceptions of time and broaden perceptions of space.
>
> Proposition 21b: Accelerated perceptions of time in response to an elevated rate and duration of interaction will reduce the perceived effortfulness of self-regulation, leading to a greater ability to regulate behavior.
>
> Proposition 21c: Broadened perceptions of space in response to an elevated rate and duration of interaction will be associated with less anxiety and discomfort, leading to a greater ability to regulate behavior.

Proposition 22: Forms of exchange associated with a greater risk of conflict/zero-sum outcome (e.g., negotiated exchanges) will be associated with greater unpredictability and negative emotion.

> Proposition 22a: Situational unpredictability resulting from goal conflict will slow perceptions of time and narrow perceptions of space.
>
> Proposition 22b: Negative emotion resulting from goal conflict will slow perceptions of time and narrow perceptions of space.
>
> Proposition 22c: Slowed perceptions of time resulting from goal conflict will increase the perceived effortfulness of self-regulation, leading to a higher rate of self-regulation failure.
>
> Proposition 22d: Narrowed perceptions of space resulting from goal conflict will be associated with increased anxiety and discomfort, leading to a higher rate of self-regulation failure.

Now, we can consider some preliminary generalizations derived from sociological network theories.

Recall that network theories describe a variety of quantitative and qualitative characteristics which comprise social networks. From the

standpoint of spatiotemporal perception and behavior, however, these characteristics can be understood in terms of whether they represent higher or lower probabilities for met expectations, higher or lower levels of distraction, and whether they represent positive or negative emotional valences.

Some preliminary generalizations follow from this:

Proposition 23: Greater levels of trust amongst individuals in a social network will be associated with positive emotion.

> Proposition 23a: Positive emotion resulting from greater levels of trust in a social network will accelerate perceptions of time and broaden perceptions of space.
>
> Proposition 23b: Accelerated perceptions of time in response to greater levels of trust in a social network will reduce the perceived effortfulness of self-regulation, leading to a greater ability to regulate behavior.
>
> Proposition 23c: Broadened perceptions of space in response to greater levels of trust in a social network will be associated with lower levels of anxiety and discomfort, leading to a greater ability to regulate behavior.

Proposition 24: The greater variance in worldviews, resources or status held by individuals in a network, the more probable are unmet expectations.

> Proposition 24a: Unmet expectations resulting from network diversity slow perceptions of time and narrow perceptions of space.
>
> Proposition 24b: Slowed perceptions of time resulting from unmet expectations in a diverse social network will increase the perceived effortfulness of self-regulation, leading to a higher rate of self-regulation failure.
>
> Proposition 24c: Narrowed perceptions of space resulting from unmet expectations in a diverse social network will be associated with increased anxiety and discomfort, leading to a higher rate of self-regulation failure.

Proposition 25: Relative to the proportion of strong ties, the proportion of weak ties in a social network will be associated with a greater probability of exposure to novel/unpredictable information.

> Proposition 25a: Greater exposure to novel/unpredictable information resulting from weak ties in a social network will slow perceptions of time and narrow perceptions of space.
>
> Proposition 25b: Slowed perceptions of time resulting from greater exposure to novel/unpredictable information will increase the perceived effortfulness of self-regulation, leading to a higher rate of self-regulation failure.
>
> Proposition 25c: Narrowed perceptions of space resulting from greater exposure to novel/unpredictable information will be associated with increased anxiety and discomfort, leading to a higher rate of self-regulation failure.

Proposition 26: Perceiving many obligations *or* many opportunities arising from a social network will be associated with higher levels of distraction.

> Proposition 26a: Higher levels of distraction in response to the number of obligations or opportunities arising from a social network will accelerate perceptions of time and broaden perceptions of space.
>
> Proposition 26b: Accelerated perceptions of time in response to the number of obligations or opportunities arising from a social network will reduce the perceived effortfulness of self-regulation, leading to a greater ability to regulate behavior.
>
> Proposition 26c: Broadened perceptions of space in response to the number of obligations or opportunities arising from a social network will be associated with lower levels of anxiety and discomfort, leading to a greater ability to regulate behavior.

Discussion and Future Directions

Around half of Americans report feeling that they lack enough time in daily life, and this proportion has remained steady for decades (Newport, 2015). “Time pressure,” is also one of the top five reasons employees give for burnout at work (Clifton, 2022). A sense of “time famine,” (Perlow, 1999) is, then, plausibly a significant dynamic influencing social life. This is sociologically significant given prior findings indicating that time pressure

is associated with a range of concerning phenomena including insomnia, stress, depression, hypertension, procrastination, selfishness, social isolation and general impulsivity (Rudd et al., 2012).

It isn't just temporal perception that sociologists should care about, but spatial perception as well. According to industry sources, around half of Americans report feeling "trapped" in their general financial situation, around 1/3 feel "trapped" in their housing circumstances and around half of adults aged 18-25 report feeling anxious (a common response to perceptions of confinement) for "a lot of the day," (Self Financial Survey, 2022; All Star Home, 2023; Marken, 2023) Certainly, people may be using the term "trapped" metaphorically, and may be experiencing anxiety for many reasons. But, these caveats do not justify sociology's current absence of theory-building regarding spatiotemporal perception.

The 26 propositions above regarding spatiotemporality as a fundamental dynamic of micro- and meso-sociology can and should be evaluated, tested and further developed by other theorists. Several areas of subsequent theory development might be pursued.

First, theorists might develop the distinction between acute and chronic spatiotemporal perceptions. We can distinguish between experiencing time as relatively slow(er) or space as relatively narrow(er) in a given situation, which I've explored here, and the more chronic, long-term, experience of a slowed perception of time or a narrowed perception of space (and vice versa). Acute impacts of spatiotemporal perception on behavior may well differ substantially from chronic impacts, and this is an important question for future research, especially as it relates to historical change.

A second, related, area where theory might be developed is with regard to the distinction between global estimates of spatiotemporal perception (i.e., how much an individual perceives spatiotemporal alterations in general, across situations) and transient situational impressions (i.e., how much an individual perceives spatiotemporal alterations in a given situation). It is possible, for example, that global estimates of time compression might increase transient estimates of time duration. In other words, if one feels that they *are running out of time* generally, even small, easy-to-accomplish, tasks might feel as though they are *taking forever* to complete*:* a global sense of time compression, perhaps via increased impatience, anxiety or frustration, might make small, quick tasks seem longer to accomplish than they are, in fact. This would work in reverse as well— when one has a lot of time to kill (e.g., working at a job that underutilizes them, or if they are incarcerated), activities and tasks never seem to take up enough time.

Theoretically, this basic dynamic would also operate with regard to spatial perception, such that global estimates of space constriction might increase

transient estimates of space expansiveness. For example, if an individual generally experiences a narrowed spatial field, even an objectively large and expansive physical space might feel especially canalized and narrow. This might work in reverse, as well: if one generally experiences their field of view as open and expansive, an objectively narrow space might seem especially spacious to them (relative to how others perceive it).

Another consideration is whether spatiotemporal alterations—and, critically, their causes (e.g., unmet expectations) and consequences (e.g., impulse control)—vary systematically across cultures around the world. Of course, since the introduction of the Sapir–Whorf hypothesis in anthropology, researchers have been considering whether concepts of space and time differ with linguistic convention across cultures (Kay and Kempton, 1984). However, what I'm proposing here is different. Quite independent of how language organizes perception and concept development, my concern is more basic: does the actual embodied neurological perception of time (faster vs. slower) and space (larger vs. smaller) differ across situations in novel ways depending on the culture? And do these perceptual alterations correlate in similar ways with the same inputs and outcomes?

Another important consideration relates to the likely possibility that *groups, not just individuals,* vary in their—on average—spatiotemporal perception. Two groups interacting under the influence of divergent alterations in spatiotemporal perception should theoretically cooperate or conflict in distinct ways from groups interacting under the influence of largely homogeneous alterations in their spatiotemporal perception. Moreover, on-average variations in group spatiotemporal perception likely underlie the development and maintenance of norms and patterns of internal organization in ways sociologists have yet to consider.

Finally, theorists might consider the spatiotemporal alterations caused by whole ecologies, including both the natural and built environment as well as the general social environment. Perhaps larger, more internally differentiated, societies alter subjectivities such that time feels slower and space feels smaller (on account of high levels of novelty, stimulation and unmet expectations); alternatively, smaller and more internally homogenous societies might alter subjectivities such that time feels faster and space feels larger (on account of greater familiarity, predictability and met expectations).

Accumulating work does suggest that people in denser and more affluent ecologies—cities, in particular—perceive time to be moving more quickly, and people also walk faster in such ecologies (Bettencourt et al., 2007; Sircova et al., 2015). Urban birds also sing faster, so we can assume this is not only an effect on humans (Slabbekoorn and Boer-Visser, 2006). This is

plausibly a perceptual consequence of how stimulating—and more often than not positively valenced—city living can be.

However, an important caveat to the hustle and bustle of city life is that of habituation and fatigue. Constant exposure to variation, such that the fact of variation, in itself, becomes redundant and predictable, could lead to perceptions of time speeding up and space broadening because habituation blunts neurological responsiveness (Matthews and Gheorghiu, 2016). On the other hand, if the stimulation of city life is particularly intense or difficult-to-predict, it might be hard to habituate to, and therefore *fatiguing,* which will slow perceptions of time and narrow perceptions of space. Other aspects of urban life and economic development might also contribute to a fatiguing effect, such as the constant stimulation and unpredictability of social media (Robson, 2016; Twenge, 2023).

In addition to building and expanding on the 26 preliminary generalizations offered in this paper, several entirely new fields of research are also implied by this theoretical perspective. Many might be discussed, but below, I highlight four that exemplify the diversity of directions theorists might take.

One new area of research might involve so-called “flow states,” (Csikszentmihalyi, 1988). Flow states are periods of intrinsically motivated focus which emerge when (1) goals are clearly perceived, (2) goals are perceived to be achievable and (3) feedback regarding goal progress is immediate. If a situation presents a challenge that is too high, people will feel anxious; too low and they will be bored. Thus, a flow state emerges when the challenge of a task and one’s competencies and motivations are optimally aligned (Rutrecht et al., 2021). Being in a flow state is both a cause and consequence of playfulness, curiosity, efficacy and a sense of personal agency. Flow states have been documented widely, for example, in dancers, chess players, videogame players, surgeons, musicians, the religiously devout, rug weavers, gardeners and even those herding sheep on horseback. More relevant to our present purposes, being in flow state is associated with a lower awareness of time and, thus, an accelerated perception of time passing (Hintze and Yee, 2021).

Despite this interesting and generative area of work, sociologists have yet to consider how, for example, consistently met expectations in encounters might stimulate a “flow state” of perception which, in turn, might accelerate the passage of time thus boosting (for example) impulse control across situations. Other investigable possibilities abound. For example, individuals who perceive a spike in situational unpredictability, or an increase in doubt about their abilities, might fall out of a flow state, thus experiencing relatively dilated perception of time and, thus, potentially lower impulse control.

A second new field of research might pertain to spatiotemporal perceptual alterations that result from (and contribute to) cultural "tightness-looseness," (Gelfand et al., 2011; Gelfand, 2019).
"Tight" cultures are those with stricter, more formal, hierarchies, stronger punishments for deviance, and a greater number of normative expectations across situations. By contrast, "loose" cultures are those with more relaxed and less formalized hierarchies, weaker punishments for deviance, and fewer normative expectations across situations. Many factors have been found to influence the tightness or looseness of a society. In general, research suggests that greater aggregate perception of threat in a population (from, for example, the prevalence of natural disasters, civil wars, diseases, poverty or famine) has a tightening effect on culture.

Though obviously relevant to sociologists, few sociological theorists have taken tightness-looseness into account in their explanations of social phenomena. Critically, however, the perception of threat *also* influences spatiotemporal perception: in societies experiencing a greater amount of present and historical threat, time should become chronically slower and space chronically more narrow compared to societies experiencing fewer such threats over time.

Moreover, looser societies are generally associated with higher levels of individualism (i.e., self-focus), while tighter societies are generally associated with higher levels of collectivism (i.e., community or family-focus). This may be important because another, thus far unconnected, area of work suggests that greater levels of self-focus (or focus on self-referential stimuli) may dilate perceptions of time (e.g., Wittman, 2015; van Rijn, 2014; Li et al., 2019). One implication of this, open for future research, is that looser societies confer a slower perception of time than do tighter societies, all else equal. The combined insight here is potentially very interesting: greater threats and punishment might slow perceptions of time in tighter cultures, but self-focus in looser societies might also slow perceptions of time; two different mechanisms for a dilated perception of time depending on the cultures in question!

A third field of research might investigate the social patterning of the experience of "awe," an under-studied emotion. Awe can be stimulated in a number of ways, from ecology (e.g., thunderstorms, oceans, sunsets) to life-course transitions (e.g., childbirth) to the performance or witnessing of impressive athletic or creative performances (e.g., sports, art) to internal or mystical experiences (e.g., religious revelations, meditation) (Rudd et al., 2012). The experience of awe is associated with two basic components: (1) "perceptual vastness," or the "sense that one has encountered something immense in size, number, scope, complexity, ability, or social bearing," (Rudd et al., 2012, pg. 1130) and (2) a motivation to change how one perceives themselves in relation to the world. This is significant for our

purposes here, because awe might, therefore, be expected to alter perception of physical space (making it appear broader) as well as time (making the passage of time appear slower) (Walsh, 2003). This slower perception of time and broader perception of space might produce interestingly countervailing effects: impulse control reductions due to slowed time coupled with impulse control benefits due to broadening space.

A fourth area of research might target the phenomenon of rising affective political polarization. Many have now documented a steady rise in negative news coverage in developed democracies, along with a public demand for/interest in this negative coverage (Soroka, 2014; Trussler and Soroka, 2014). The interesting implication here is that increasingly scary news coverage (and the political polarization it could cause or intensify) might increase anxiety directly *and/or* indirectly via spatiotemporal distortion (Ogden et al., 2019; Harjunen et al., 2022). In general, fear of the future appears to direct attentional allocation to the present moment, which in turn, is expected to produce an overestimation of the passage of time and, thus, potential deficits in impulse control (Twenge et al., 2003).

A final speculative consideration might be that of widespread smartphone use and general screen time in younger generations. Twenge (2023) suggests that the apparent increase in sleep problems and poor quality sleep might be linked to the extensive screen time young people engage in, particularly around bedtime. The intensive magnitude and unpredictable attention-grabbing nature of stimuli on social media and popular internet sites (e.g., TikTok, YouTube) might in extreme cases lead to overstimulation, and neurological exhaustion is a known correlate of dilated time perception (Hayashi and Ivry, 2020). Overstimulation and resultant dilated time perception are correlates of a number of behavioral outcomes, in fact, including anxiety, anger and general self-regulation failure (Stetson et al., 2007; van Wassenhove et al., 2011; Zhang et al., 2019).

By way of conclusion, the possibilities for extending the present theory into new propositions and into entirely new subfields of research are endless. To the extent that alterations in spatiotemporal perception are a fundamental, basic, undergirding process in social life, we should expect its implications to be broad and numerous. Perhaps general sociological theory is not yet dead, and perhaps its fruits are, as it were, right in front of our eyes.

Finally, I want to reiterate an incredibly important point that I am concerned might be lost in the details of this, admittedly detailed, paper. Failures of self-regulation implicate normatively positive (e.g., creativity, sudden insight) *and* negative (e.g., inappropriate outburst, relapse) effects. Successful self-regulation implicates normatively positive (e.g., discipline, commitment) *and* negative (e.g., excessive conformity) effects. When thinking about how spatiotemporal perception influences self-regulation, we

must refrain from assuming that failures of self-regulation automatically cash out in terms of negative consequences. They certainly can, but they might also generate new and beneficial understandings of ourselves, our interpersonal relationships and the world around us.

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