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Self-Continuity

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Abstract

Self-continuity is the subjective sense of connection between one's past and present selves (past–present self-continuity), between one's present and future selves (present–future self-continuity), or among one's past, present, and future selves (global self-continuity). We consider the motivational character of the three forms of self-continuity, their regulatory properties, and the internal or external factors that consolidate them. We also review their consequences for attitudes and judgments or decisions, motivation, intentions and behavior, and psychological and physical health. We further detail the psychological and behavioral benefits of self-discontinuity (i.e., a sense of disconnect among temporal selves). We next turn to the brain regions that are activated synchronously with self-continuity. We consider developmental perspectives on self-continuity, discuss collective self-continuity (along with its consequences and regulatory properties), and elaborate on cultural differences in self-continuity. This inaugural Annual Reviews chapter demonstrates the breadth, excitement, and sense of synergy among self-continuity researchers and points to promising research directions.

Contents

INTRODUCTION

Whether one defines the self as "the sum total of all that [a man] can call his" [James 1950 (1890), p. 291], "relatively persistent. . .complex. . .and related to objects which are either personal or impersonal" (Calkins 1909, pp. 2–3), or, rather more ornately, "the totality of interrelated yet distinct psychological phenomena that either underlie, causally interact with, or depend upon reflexive consciousness" (Sedikides & Gregg 2003, p. 110), the construct is assumed to entail temporal continuity or to be diachronic. The construct maintains an essential sameness, or a sameness of essential features, over time. The self is chronologically integrated.

This is the inaugural Annual Reviews chapter on self-continuity, justified by rising psychological interest in the topic. Naturally, the first psychologist to muse on self-continuity was James [1950 (1890)] in his distinction between the "I" (self as knower, subject, or executive) and the "Me" (self as object of knowledge or self-concept). The self, James opined, is situated in time. The memorial link between one's past and present is the foundation both of the subjective sense of the self as thinker and causal agent (I) and of the concrete content assigned to the self (Me). The I unifies past and present experience. Similarly, other psychologists (Bruner 1990, Erikson 1968, Neisser 1988), alongside philosophers (Madell 1981, Wiggins 2001, Williams 1970), advocated that, despite assorted psychological or physical changes, the kernel of the self retains its likeness.

To extrapolate on the Jamesian view, the I, the ontological self, feels these changes and synthesizes them.

We devote this lay-of-the-land review to the diachronic, not synchronic (i.e., situated at a particular temporal moment), self. After delving into definitional issues, we consider self-continuity as a motive and discuss its regulation and consolidation. We next detail its benefits alongside those of self-discontinuity. Treatments of brain regions underpinning self-continuity, developmental views, collective self-continuity, and cultural differences in self-continuity ensue. The final section includes prescriptions for future research and concluding remarks.

DEFINITIONAL ISSUES

Self-continuity is a subjective sense, feeling, or judgment. But what is it about? What is being felt or judged? On what is the phenomenology of self-continuity based?

Several authors favored a somewhat reductionist approach. For some philosophers, what is being felt or judged are core features of the self. Granted, thinkers like Hume [1978 (1739–1740)] and Parfit (1971), as well as Buddhist theorists (Carpenter 2014), disputed the unitary and temporally persistent character of the self, championing instead a loose set of traits and mentally represented events that are in flux. Parfit (1971), in particular, maintained that lower-level and relatively isolated autobiographical facts confer significance to the self, and self-continuity entails the connection of those facts. Other philosophers emphasized central features of the self, like consciousness [Locke 1975 (1689)] or the body (Olson 1997), as contributing to self-continuity. Various psychologists treaded a similar path. Block (1961) was concerned with the sameness in the way his student participants thought that various adjectives (20 in number) described them across their social interactions with eight other persons—e.g., parent, friend, professor, stranger (this was the so-called principal components method). Further, Klein (2014) and Wolke et al. (2020) referred to the temporal linking of personal memory, emotions, body image, and social relationships. Yet, when the physical is pitted against the psychological, the latter emerges as more influential. The majority of respondents report that memories are the key to self-continuity (Nichols & Bruno 2010). More to the point, morality, personality, preferences, experiences, and memories appear to be the building blocks of self-continuity (Strohminger & Nichols 2014, 2015).

Another set of authors advocated a broader approach. The philosopher Mark Johnston (1997), for example, pointed out in disagreement with Parfit (1971) that, even if lower-level facts are relevant, they become so only because they converge to a higher level of abstraction. What matters is the sense of selfhood, not the specifics. Put otherwise, what matters is how connected one feels to past or future versions of the self-concept—a view that Johnson, and later Parfit (1984; see also Lewis 1976, Strawson 2009), would endorse. Many psychologists have also favored this view, explicitly or tacitly. We are partial to it as well. We find it promising and generative to conceptualize self-continuity at the abstract level as an overall sentiment of an unbroken trajectory (Atchley 1989, Hong et al. 2021, Kamphorst et al. 2017) or as the subjective perception that changes are linked to and fit with one's personal history (Cohler 1982, McAdams 2008, Steiner et al. 2017).

Still, this broader approach begs the question of what the origins of this overall sentiment are. The sentiment may derive from recalling, reasoning, and gauging the temporal connection of facets of the self—a nod to the reductionists. People might engage in thorough data-seeking to infer the continuity of the self, but we find this possibility unlikely. For starters, this approach would necessitate objective evidence of cross-temporal identity stability; such evidence is difficult to obtain given concurrent situational, maturational, and societal shifts. It would also necessitate reflective thinking each time a self-continuity judgment is made; however, people arrive at such judgments rapidly and effortlessly. We advocate an alternative origin of this overall sentiment.

Regardless of whether they loosely rely on underlying beliefs about the essentialism of identity or on fluctuating associations among its features (Chandler & Proulx 2008, Chandler et al. 2003), self-continuity judgments are made online, relatively devoid of source awareness, and perhaps influenced to some extent by prior similar judgments (or by perceived coherence, or the need to perceive coherence, in one's life). Self-continuity judgments, then, encompass a pre-reflective sense of the self extended backward and forward in time. This viewpoint is empirically substantiated. First-person subjectivity does not necessarily depend on concrete autobiographical information: People can experience the continuity of the self in the absence of specific self-knowledge (Strikwerda-Brown et al. 2019, Troll & Skaff 1997). For example, persons living with Alzheimer's disease (El Haj & Allain 2020, Ismail et al. 2018) or neurologically damaged patients (Klein 2014, Klein & Lax 2010), both with limited episodic memory, maintain a sense of self-continuity often in contradiction to facts. This is not to say that self-continuity is impervious to fact; indeed, abstract (as opposed to concrete) thinking facilitates the aggregation of facts or values into a unified summary representation, improving aggregation accuracy (Hadar et al. 2021). In all, subjective self-continuity is psychologically important and worth studying in its own right.

Researchers have defined self-continuity in three ways. All of them are anchored in the present self. As James [1950 (1890), p. 605] evocatively put it, the present is "a saddle-back, with a certain breadth of its own on which we sit perched, and from which we look in two directions into time." The first way of defining self-continuity refers to the connection between one's past and present selves (Dunkel et al. 2010, Sedikides et al. 2016, Woike et al. 2020). We refer to this as past–present self-continuity. The second way refers to the connection between one's present and future selves (Chishima & Wilson 2021, Ersner-Hershfield et al. 2009a, Sokol & Serper 2020). We will refer to this as present–future self-continuity. The third and final way refers to the connection among one's past, present, and future selves (Hong et al. 2021, 2022a; Ji et al. 2019; Sokol et al. 2017). We will refer to this as global self-continuity.

The literature has highlighted the similarity between past- and future-oriented cognitive processes as well as the similarity of the neurological underpinnings of past- and future-oriented cognitive processes (Baumeister et al. 2020, Buckner & Carroll 2007, Cheung et al. 2013), although thinking about one's future may be less restricted than thinking about one's past (Van Boven et al. 2008). Regardless, aiming for a more granular approach, we specify how self-continuity has been defined in each reviewed study (i.e., past–present, present–future, or global), while heeding to measurement nuances.

SELF-CONTINUITY AS A MOTIVE

People are motivated to attain self-continuity. Stated differently, self-continuity is a motive implicated in the construction of the self-concept. For example, participants perceive as more central those aspects of their self-concept that afford greater global self-continuity (i.e., confer stronger motive satisfaction; Vignoles et al. 2006). Also, participants desire most and fear least those possible future selves that promise greater global self-continuity (Vignoles et al. 2008).

The abovementioned findings (Vignoles et al. 2006, 2008) indicate that the self-continuity motive is approach oriented, that is, it reflects "the energization of behavior by, or the direction of behavior toward, positive stimuli (objects, events, possibilities)" (Elliot 2006, p. 111). More importantly, the motive is valenced, especially given that it typically connects aspects of one's identity (e.g., memories, values, group affiliations) that are positive (Berkman et al. 2017, Stephan et al. 2015). Stated otherwise, the motive serves, in part, self-protection and self-enhancement purposes: to minimize the negativity or maximize the positivity of self-conceptions as much as external constraints warrant (Alicke & Sedikides 2009, Sedikides 2020).

Research inspired by temporal appraisal theory illustrates that people use past–present self-continuity strategically to fortify, or elevate, the favorability of their current self-views (Wilson & Ross 2011). For example, people distance temporally from their objectionable past self (i.e., decrease past–present self-continuity). University students feel farther from a course in which they received a low (compared to high) grade, but they do not evince the same pattern for acquaintances or siblings (Ross & Wilson 2002). Also, university students retrospectively assess their career trajectory as involving less personal growth, purpose in life, and self-esteem than it actually did (Green et al. 2020). Moreover, people distance psychologically from their past self in general (i.e., essentially, decrease past–present self-continuity). They engage in harsh criticism of their past self to feel better about the present, improved self (Wilson & Ross 2000). This tendency is exacerbated among high (versus low) self-esteem individuals (Ross & Wilson 2002), while criticism of one's past self is tempered when the distance is manipulated to feel closer to it (Wilson & Ross 2001).

Research inspired by temporal appraisal theory also demonstrates that individuals strategically use present–future self-continuity for self-protection or self-enhancement purposes (Peetz & Wilson 2008). For example, students feel more distant from a future negative self (having failed on an exam) than a future positive self (having succeeded on an exam) (Peetz et al. 2009). Similarly, participants predict more favorable characteristics for their close compared to their distant future self, although they do not exhibit this pattern for an acquaintance or after having engaged in self-affirmation (i.e., strengthening the valued foundations of the self) (Wilson et al. 2012). Lastly, when self-enhancement concerns are accessible, participants are more likely to seek protection from a negative future self by bringing to mind a mental barrier, such as temporal landmarks (e.g., birthdays, holidays), which shields them psychologically from that self (Peetz & Wilson 2014).

We proposed that self-continuity serves, in part, self-enhancement considerations. But what if such considerations are dormant? As an example, the tendency to criticize harshly one's past self (i.e., reducing past–present self-continuity) is exacerbated among incremental (compared to entity) theorists (Ward & Wilson 2015). This pattern, though, may be due to the fact that incremental theorists are guided by long-term rather than short-term self-enhancement concerns (Sedikides & Strube 1997). As another example, self-continuity may be a function of a positive information ecology; that is, it may be due to an overreliance on the higher number of positive than negative self-attributes stored in memory (Baldwin et al. 2021). Arguably, however, the disproportionate storage of positive self-attributes is motivated to begin with (Sedikides & Skowronski 2020). Moreover, self-continuity is pursued even in the presence of a negative information ecology (Chandler et al. 2003; see also the section titled Regulation of Self-Discontinuity). In all, regardless of whether self-enhancement is sufficient or necessary for its elicitation, self-continuity is desirable.

REGULATION OF SELF-DISCONTINUITY

As we argued above, self-continuity is an important resource to the self. The utility of self-continuity is further illustrated in regulatory processes. Threats to self-continuity may culminate in self-discontinuity, a sense of disconnect from one's past or future self. We elaborate below on threats to self-continuity, the discomfort associated with self-discontinuity, and the regulatory cycle involved in offsetting self-discontinuity and reestablishing self-continuity.

Threats to Self-Continuity

Examples of threat to self-continuity are low self-concept clarity, visuospatial perspective, ostracism, variety of self-expression, and taxing life circumstances (e.g., unemployment, forced

displacement, life changes). A common element of these examples is that they imbue one's self-concept with confusion, uncertainty, fragility, or negativity (i.e., low self-esteem).

Self-concept clarity refers to perceived lucidity in one's self-concept and the integration of its aspects (Campbell 1990). In a series of studies (Jiang et al. 2020), self-concept clarity was either measured at the trait level (low versus high) or manipulated by asking participants to describe conflicting aspects of their personality (self-concept confusion) versus compatible aspects of their personality (self-concept clarity). Self-continuity was measured either via the Self-Continuity Index (e.g., "I feel connected with who I was in the past"; Sedikides et al. 2015) or via self-change following role transitions (Slotter & Walsh 2017). The results indicated that low self-concept clarity either was associated with weaker past–present self-continuity or undermined past–present self-continuity. The notion of visuospatial perspective refers to viewing the self from a first-person versus a third-person perspective. Thinking of the future self in the third rather than the first person decreases present–future self-continuity (Tausen et al. 2020). Ostracism is defined as being socially ignored, rejected, or excluded (Williams 2007). Ostracism—measured as long-term belongingness or manipulated via an imagination vignette, past experience, or the Cyberball paradigm—undercuts past–present self-continuity as measured by the Self-Continuity Index (Jiang et al. 2021a). Given that ostracism disrupts self-concept clarity (Ayduk et al. 2009), it is possible that ostracism dents past–present self-continuity by disrupting self-concept clarity. Likewise, visuospatial perspective may decrease present–future self-continuity by undermining self-concept clarity. Further, consumers are often encouraged to construct an assortment (i.e., a list of favorites in a choice domain) to represent their personal tastes or express themselves. Variety in self-expressive and self-relevant assortments—measured or manipulated—erodes present–future self-continuity (i.e., similarity, commonality, or perceived change to the self a year from now), as it signals that one's preferences are relatively unstable (Rifkin & Etkin 2019).

Finally, taxing life circumstances can constitute a threat to self-continuity. Unemployment, for example, was linked to lower global self-continuity (Sadeh & Karniol 2012). The latter construct was operationalized by asking participants to rate the descriptiveness of 25 traits to their past, present, and future selves and by computing the variance across the three selves, with lower variance indicating higher global self-continuity (Markus & Nurius 1986). Forced displacement also qualifies as an antecedent of low past–present self-continuity (Camia & Zafar 2021). In particular, among refugees, psychological distress was linked to lower self-continuity, assessed with Habermas & Köber's (2015) scale [e.g., "When I look at pictures of myself four years back, it feels a little unfamiliar," or "I have the feeling that at the core I am the same person I was four years ago" (reverse-scored)]. More generally, life changes, typically unwanted (e.g., childhood trauma, relocation, occupational change, relationship breakdown, illness or death of loved ones, and dissolution or formation of friendships), that occurred years before have been associated with lower self-continuity (Habermas & Köber 2015, Sedikides et al. 2015, Zhang et al. 2022).

Psychological Consequences of Self-Discontinuity

Self-discontinuity entails discomfort due in part to loss of meaning, whether meaning is conceptualized as a sense of mattering, purpose, or coherence (Costin & Vignoles 2020). Indeed, self-discontinuity is often a marker of psychological ill-being (Lampinen et al. 2004, Sedikides et al. 2008) or, at an extreme, mental illness (Zepinic 2016, Zimbardo 1999). We chronicle representative findings.

Research has indicated that self-discontinuity can be a signature of psychological ill-being. In one study (Sokol & Eisenheim 2016), researchers assessed global self-continuity in two ways. First, they used the Self-Continuity Scale (Ersner-Hershfield et al. 2009a). Participants were

presented with pairs of circles ranging from no overlap to almost full overlap. They were instructed to select the pair that best represented the similarity and connectedness with their past self (10 years ago) and future self (10 years from now). Second, researchers used the me/not me continuity task (D'Argembeau et al. 2008). Participants rated the degree to which each of 20 adjectives (10 positive, 10 negative) described their past, present, and future selves. Researchers computed the mean absolute change (based on the 20 adjectives) for each participant and for both past–present and present–future self-continuity (assessed separately), with lower values indicating higher self-continuity. Reduced global self-continuity on both indices was associated with greater depression, anxiety, stress, and suicidal ideation (see also Ball & Chandler 2009, Sokol & Serper 2017). Correlational studies have also linked reduced past–present self-continuity to higher loneliness, lower agreeableness, and weaker win-win values (i.e., deficits in combining self-interest with mutual benefit; Zhang et al. 2022) as well as higher psychosocial stress and lower work adjustment (Anderzén & Arnetz 1999). Further, reduced present–future self-continuity (e.g., deficient generation of possible futures) might be a causal factor in depression (Roepke & Seligman 2015).

Research has also indicated that self-discontinuity can be a signature of mental illness. For example, individuals with psychiatric illness (i.e., schizophrenia, schizoaffective disorder, DSM-5 bipolar I or II diagnosis) manifested lower levels of global self-continuity (assessed in terms of the Self-Continuity Scale; Ersner-Hershfield et al. 2009a) compared to healthy controls (Sokol & Serper 2019b). Further, among individuals with psychiatric illnesses, low global self-continuity was linked to a lack of clinical insight and decreased adaptive functioning capacity in communication and finances, whereas low present–future self-continuity was related to the severity of psychiatric symptoms and a lack of cognitive insight—namely, introspection and ability to acknowledge fallibility as well as overconfidence in one's beliefs (Sokol & Serper 2019b).

Counteracting Self-Discontinuity

The discomfort associated with self-discontinuity is regulated through several psychological mechanisms. These are autobiographical reasoning, nostalgia, self-affirmation, and high prior self-continuity—both past–present and global.

In the presence of self-discontinuity induced by life changes, autobiographical reasoning (i.e., the percentage of propositions that reflect autobiographical arguments, such as gaining insight or learning a lesson) was positively related to past–present self-continuity (Habermas & Köber 2015). Similarly, resorting to autobiographical reasoning countered self-discontinuity that was inflicted by (measured or manipulated) low self-concept clarity (Jiang et al. 2020). Lastly, in the presence of self-discontinuity, autobiographical reasoning among refugees was related to higher past–present self-continuity; this relation, however, reversed when self-discontinuity and the accompanying psychological distress—such as memory intrusion or hyperarousal—were acute, thus delineating a boundary to the regulatory effectiveness of autobiographical reasoning (Camia & Zafar 2021).

In a correlational study, participants expressed self-discontinuity in terms of the prevalence of various life events, mostly unfavorable (e.g., a change in financial situation, death of a close family member) but also favorable (e.g., gaining a new family member), in the prior 2 years. Self-discontinuity was positively associated with nostalgia, especially in the case of negative life events (Sedikides et al. 2015). A follow-up experiment involving undergraduate students contrasted a negative self-discontinuity condition (asserting that the university years cut off students from family and friends, leading students to question their values, goals, and self-beliefs) with a positive self-discontinuity condition (asserting that the university years render students more independent, strengthening their values, goals, or self-beliefs) and a self-continuity condition (asserting that the university years contribute to a well-specified student role, that of being surrounded by a stable

group of friends in a familiar surrounding and exploring consistently a subject matter). Negative self-discontinuity (relative to the other two conditions) triggered nostalgia (Sedikides et al. 2015). A complementary set of findings indicated that nostalgia increases past–present self-continuity (Sedikides et al. 2015, 2016).

Besides autobiographical reasoning and nostalgia, self-affirmation also qualifies as a psychological mechanism involved in the down-regulation of self-discontinuity. Following an ostracism induction (involving a past social exclusion experience versus a neutral one), participants undertook a self-affirmation manipulation. Specifically, experimental participants reflected on their lives, listed four valued characteristics, and provided corresponding behavioral examples, whereas control participants thought of favorite foods, listed four of them, and generated reasons for their preferences. Self-affirmation, compared to the control condition, weakened the self-continuity loss that was inflicted by ostracism (Jiang et al. 2021a).

Finally, the prior level of self-continuity constitutes a regulatory mechanism. For example, higher past–present self-continuity (e.g., "I am the same person as I always was") predicted lower social loneliness (e.g., "I know many people on whom I can depend," reverse-scored) for relatively long-term divorced individuals (i.e., 2–5 years post-divorce; Lampraki et al. 2019). Also, higher past–present self-continuity assessed with an eight-item scale [e.g., "I'm always the same," "I just change in the way I show it," or "My life is like a book where each chapter is a different story" (reverse-scored)] buffered the effect of perceived peer victimization among adolescents (e.g., being called by bad names) on negative affect (e.g., sadness), controlling for self-blame, hopelessness, self-concept clarity, self-esteem, number of friends, and academic performance (Santo et al. 2018). Moreover, among unemployed individuals who experienced self-discontinuity, those higher on global self-continuity (assessed through variability of self-description among past, present, and future selves, or the Possible Selves Questionnaire; Markus & Nurius 1986) reported better crisis management, such as increased detachment and rational or problem-focused coping, as well as decreased emotional and avoidance coping (Sadeh & Karniol 2012).

CONSOLIDATION OF SELF-CONTINUITY

We reviewed literature demonstrating that self-continuity is such a vital resource to the self that its disruption (i.e., self-discontinuity) is directly regulated for the sake of psychological homeostasis. However, even in the absence of threat, this self-resource is consolidated by a range of instigators. Some of them are situational, such as transient states, judgmental dimensions, or metaphors. Others are intrapersonal, such as the representation of family legacy, autobiographical memory, or nostalgia.

Situational Instigators

In terms of transient states, affective valence conduces to self-continuity. Positive affect is correlated with stronger, and negative affect with weaker, present–future self-continuity (Blouin & Pychyl 2015), in accordance with the view that positive emotions broaden one's attentional scope (Fredrickson 2001). Accessibility of the future self also conduces to self-continuity. After interacting virtually with an aged version of them, people reported elevated present–future self-continuity (Hershfield et al. 2011, study 3B; see also Sims et al. 2020).

In terms of judgmental dimensions, central (compared to peripheral) self-conceptions are high on positivity, self-descriptiveness, certainty, and importance (Sedikides 1993). People regard their current central self-conceptions (e.g., moral values) as more likely to characterize their future selves (Sun & Goodwin 2020), in part because they desire and expect a higher rate of improvement on those self-conceptions (Molouki & Bartels 2017), and this is especially true of individuals who

are dispositionally optimistic (Lachowicz-Tabaczek & Bajcar 2018). Indeed, desirability of self-change is a determinant of present–future self-continuity (Salgado & Berntsen 2020).

In terms of metaphors, the journey metaphor influences past–present self-continuity. Individuals who visualized past events in their life as physical locations along a pathway (compared to those who organized those events chronologically) reported that the past shaped more decisively the present self; this pattern was more pronounced among individuals who were uncertain about their current identity (Keefer et al. 2011). In addition, the journey metaphor influences present–future self-continuity. First-year university students who visualized their future as a destination on a pathway (compared to those who did not engage in metaphorical thinking) perceived a more robust connection between their present and future selves (Landau et al. 2014). Relatedly, chunking, or the partitioning of one's experiences in units, affects the felt rate of change and, indirectly, self-continuity. Older people who reported that time passed quickly (which was taken as a proxy for higher past–present self-continuity) were likely to chunk their past experiences in broader (versus narrower) categories (Landau et al. 2018).

Intrapersonal Instigators

One intrapersonal instigator of self-continuity is the representation of family legacy. Some university students follow in the footsteps of their family in attending university (legacy students), whereas others are first-generation students. Legacy (compared to first-generation) students reported that they shared their academic experiences more frequently with their families. This conversational practice strengthened university identification, which predicted higher past–present self-continuity (Baldwin et al. 2020).

Another intrapersonal instigator of self-continuity is autobiographical memory. We begin by considering autobiographical memory positivity. In a study, participants described five key life phases (e.g., marriage, occupation); the more positive the stories participants narrated were, the higher their past–present self-continuity was (Steiner et al. 2017). Similarly, the more positive refugees' autobiographical reasoning was (i.e., descriptions of their personality, values, relationships, or worldviews), the higher their past–present self-continuity was (Camia & Zafar 2021).

We now turn to structural aspects of autobiographical memory as correlates or causes of global self-continuity. People may construct a narrative to comprehend changes in themselves or their lives. The narrative causally binds temporally discrepant events as they progress from one's past through the present to the future. Associative links pertain to connections between objects such as a possession, keepsake, feeling, thought, or action on the one hand, and one's past, present, or future self on the other. Stability refers to an emphasis on the self's immutability or fixedness across time. Narrative, associative links, and stability are all positively related to global self-continuity (Becker et al. 2018, Hong et al. 2021), with individuals who endorse mutability beliefs (i.e., who perceive personal characteristics as malleable or changeable) being more likely to display stability-based global self-continuity (Becker et al. 2018). Another structural aspect of autobiographical memory is holistic thinking. Holistic (versus analytic) thinking involves the propensity to see objects as interconnected rather than isolated (Nisbett et al. 2001). A key component of holistic thinking is interactional causality, which presumes that multiple causes act in synergy to influence behavior ("Everything in the universe is somehow related to each other"; Choi et al. 2007). Interactional causality is positively related to, and engenders, global self-continuity (Hong et al. 2022a).

The third intrapersonal instigator of self-continuity is nostalgia, a sentimental longing for one's past. Nostalgia is positively associated with (Chang et al. 2019a, Sedikides et al. 2016, Zou et al. 2018) and elevates (Jiang et al. 2021b; Ju et al. 2016; Wildschut et al. 2018, 2019) past–present self-continuity. Nostalgia augments this form of self-continuity via at least two routes.

First, it increases state authenticity, a sense that one is currently in alignment with one's true self (Lasaleta & Loveland 2019). Nostalgia entails personally relevant or meaningful recollections (Wildschut et al. 2006), and so it raises authenticity. Second, nostalgia augments self-continuity by elevating social connectedness, a sense of belongingness, acceptance, and social support (Sedikides et al. 2016, Van Tilburg et al. 2019). Nostalgia is a social emotion, as nostalgizing refers mostly to close others or experiences shared with close others, intensifying social connectedness (Wildschut et al. 2006). Further, by bringing to mind close others or momentous occasions shared with them—such as vacations, family customs, or cultural rituals (e.g., Thanksgivings, birthdays, weddings)—one links the past with the present, viewing their life trajectory as a continuous social journey (Landau et al. 2010). For instance, nostalgic memories of early family Thanksgivings may prompt recollections of subsequent family Thanksgivings, producing a mental storyboard of one's relationships with parents, siblings, and grandparents over time. These recollections foster continuity between one's past and present selves.

Additionally, nostalgia is positively associated with and elevates global self-continuity (Hong et al. 2021, 2022a). Nostalgia amplifies this form of self-continuity through at least two pathways. First, it does so via narrative and associative links. In nostalgizing, individuals often recount a story of meaningful events from their past (Wildschut et al. 2006), easing transition into narrative. Also, in nostalgizing, people frequently link their past (e.g., "When I look at the ball pen that my friend gave me. . .") with the present (e.g., ". . .I chuckle") (Stephan et al. 2012) and likely the future ("We will be friends forever") (Cheung et al. 2020), easing transition into associative links. In turn, narrative or associative links map nicely onto, and facilitate, global self-continuity. Second, nostalgia amplifies self-continuity by strengthening the interactional causality component of holistic thinking. This component may be part of the narrative. In nostalgizing, the individual reflects on close others as well as on how they relate to each other and the self (Sedikides & Wildschut 2019). The individual, then, searches for meaning or patterns (Sedikides & Wildschut 2018), that is, for causes of their past social behavior and ways in which their present behavior is likely to shape their future (Sedikides & Wildschut 2020). As such, nostalgia prompts an interactional causality mode. This mode then precipitates thinking about self-continuity globally—from one's past through one's present to one's future.

BENEFITS OF SELF-CONTINUITY

Having been protected (i.e., regulated) and consolidated, what good is self-continuity for? We postulate that self-continuity confers a variety of psychological benefits. These relate to attitudes, judgments, decisions, motivation, intentions, behavior, and psychological and physical health.

As we mentioned, self-continuity is approach oriented (Vignoles et al. 2006). When one feels subjectively closer to their past (i.e., higher past–present self-continuity), perhaps by representing it vividly in their imagination (Hershfield et al. 2011, Marks 1973), they will express more favorable attitudes, judgments, decisions, motivation, intentions, and behavior in reference to objects linked to their past (Hamilton & Cole 2017, Parfit 1971). Likewise, when one feels subjectively closer to their future self (i.e., higher present–future self-continuity), perhaps by representing it vividly in their imagination (Hershfield et al. 2011, Marks 1973), they will express more favorable attitudes, judgments, decisions, motivation, intentions, and behavior in reference to objects linked to their future (Hamilton & Cole 2017, Parfit 1971). Further, higher past–present and present–future self-continuity is associated with better psychological and physical health, although subjective proximity (Peetz & Wilson 2008) may be only one of several mechanisms underlying this association. The literature is consistent with these general principles.

Attitudes, Judgments, and Decisions

Research on attitudes, judgments, and decisions has been concerned with all three forms of self-continuity. A study linked past–present self-continuity to attitudes. Past–present self-continuity, induced via nostalgic (versus present-focused) advertisements, yielded more favorable attitudes toward products of one's past (Ju et al. 2016). Also, participants evaluated a product more favorably when they experienced a stronger (versus weaker) connection with past ownership (e.g., imagining owning the product 5 years ago) (Zhang & Aggarwal 2015).

Other research focused on present–future self-continuity, linking it to ethicality of business decisions at the trait level. Participants completed the Future Self-Continuity scale (Ersner-Hershfield et al. 2009b). They indicated the extent to which they felt similar to or different from their future selves (10 years into the future) by selecting a pair (out of seven) of Venn diagrams. They also completed the Unethical Business Decisions scale (Ashton & Lee 2008). Here, they recorded their decisions on six dilemmas that pit financial interests against ethical considerations (e.g., choosing to market a lucrative food product with established health hazards). Participants who felt similar (versus dissimilar) to their future selves made more ethical decisions (Hershfield et al. 2012). In addition, participants who felt similar (versus dissimilar) to their future selves disapproved of lies, bribes, and other unethical business negotiation tactics (Hershfield et al. 2012). Further, in an experiment, participants imagined and wrote about how they would remain similar to their selves and what they would be like 10 years from the present. Those high (versus low) on present–future self-continuity made fewer unethical decisions (Hershfield et al. 2012).

Motivation

A small literature has examined the link between present–future self-continuity and motivation. Higher present–future self-continuity among undergraduates predicted increased consideration of the future (as opposed to immediate) consequences for their actions, which promoted self-control, especially among family legacy (compared to first-generation) students (Adelman et al. 2017).

Present–future self-continuity also affects academic motivation. Students were induced to feel either close to or distant from their future self (i.e., graduation). Subsequently, they generated possible desired selves (e.g., being admitted to an advanced degree program) and possible feared selves (e.g., being directionless) at graduation time. Next, they outlined in writing the strategies that they would implement to attain their goals at graduation and reported the strength of their current academic motivation (i.e., determination to focus on their studies). Participants high (versus low) on present–future self-continuity listed more concrete or immediate strategies, which predicted the strength of their academic motivation (Peetz et al. 2009; see also Lewis & Oyserman 2015).

Intentions and Behavior

Self-continuity is associated with, or affects, intentions and behavior.

Intentions. The burgeoning literature on intentions has zeroed in on both past–present and present–future self-continuity. Past–present self-continuity, induced via nostalgic (versus present-focused) advertisements, led to stronger purchase intentions of products reminiscent of one's past (Ju et al. 2016). Also, when informed that their favorite sports team valued corporate social responsibility, participants high (versus low) on past–present self-continuity who were tethered to their team (e.g., "my team makes me feel connected with my past") were more likely to disseminate information about their sports team, an effect mediated by team pride (Chang et al. 2019a).

In regard to present–future self-continuity, community college students enrolled in a Transitioning to College course interacted in virtual reality with either an aged version of themselves (present–future self-continuity) or a same-aged version of themselves (control) (Sims et al. 2020). Those high on present–future self-continuity expressed stronger intentions to attend longer-term financial planning workshops (e.g., on investing and retirement). In addition, higher present–future self-continuity (i.e., writing a letter to one's self 20 years versus 3 months into the future) led to decreased self-reported likelihood of engaging in delinquent behavior such as buying stolen goods or committing theft, insurance fraud, and illegal downloading (Van Gelder et al. 2013).

Behavior. The sizeable literature on behavior has, for the most part, focused on present–future self-continuity. The academic domain has been a popular arena for this research. Children high (versus low) on present–future self-continuity worked harder and achieved better grades (Nurra & Oyserman 2018). Also, students higher on present–future self-continuity practiced more on a test due to their imminent planning (Peetz et al. 2009; see also Lewis & Oyserman 2015). Similarly, students higher on present–future self-continuity (i.e., those who viewed an age-progressed versus a control version of themselves in virtual reality) generated a greater number of correct answers on a financial literacy test, due in part to their elevated confidence (Sims et al. 2020). Lastly, students higher on present–future self-continuity evinced better academic performance (in terms of GPA) due to a stronger consideration of the future consequences of their actions as well as greater self-control (Adelman et al. 2017).

Higher academic performance may be partially due to weaker temporal discounting. Participants high (versus low) on present–future self-continuity selected more delayed than immediate rewards (Bartels & Rips 2010; Ersner-Hershfield et al. 2009a,b) and accrued more assets, controlling for age (Ersner-Hershfield et al. 2009a,b). Also, participants who experienced higher present–future self-continuity in a virtual reality environment or by envisaging life events occurring to their future (rather than present) self were more likely to opt for delayed (versus immediate) gratification (Faralla et al. 2021, Wu et al. 2017). Relatedly, participants higher on present–future self-continuity (Ersner-Hershfield et al. 2009a) were less likely to report procrastination behaviors (Haghbin & Pychyl 2014) linked to the dimensions of hedonistic delay (e.g., "I am not interested in starting academic tasks ahead of time because I would rather do more enjoyable things instead") and irrational delay (e.g., "Despite my intention to start and finish academic tasks on time, I engage in other unnecessary activities instead") (Blouin-Hudon & Pychyl 2015).

The ethical domain has been another popular focus of the behavior literature. Participants higher on present–future self-continuity were more likely to uphold a promise to the experimenter by attending a follow-up laboratory session, and they were less likely to lie in a deception game or cheat (i.e., to misrepresent their performance on an anagrams task) regardless of level of self-control or personality trait (i.e., honesty–humility, emotionality, extraversion, agreeableness, conscientiousness, and openness to experience) (Hershfield et al. 2012). Moreover, participants higher on present–future self-continuity (i.e., those who imagined the future self experiencing life events) cheated less in a 5-minute matrix task (i.e., finding three-digit numbers in a matrix that sum to 10; Wu et al. 2017). Further, in a field experiment with high-school participants, present–future self-continuity was manipulated via proximity to an avatar. Those in the experimental condition befriended their future self on Facebook, and for each of 7 days received, and responded to, a daily message from this future self. Those in the control group interacted with a present-self avatar. When present–future self-continuity was high (versus low), participants reported reduced delinquent and antisocial behavior (Van Gelder et al. 2015). Lastly, participants who imagined, drew, and described their future self (at the age of 60) versus their present self (or another person in their present life) behaved more sustainably by refraining from depleting the pool of fish in a

fishing simulation, independent of prior level of environmental attitudes or self-continuity (assessed with the Future Self-Continuity Scale; Engle-Friedman et al. 2022).

The third popular domain for the behavior literature has been the financial one. University employees were exposed to a plea that framed monetary savings either as a social responsibility to their future self (induction of present–future self-continuity) or as rational self-interest (Ersner-Hershfield et al. 2009b). Participants high on present–future self-continuity were impacted more by the social responsibility (compared to the rational self-interest) plea, manifesting more precipitous saving rates over a 2-week period (Bryan & Hershfield 2012). Also, higher present–future self-continuity is positively related to, and leads to, saving money for the future self versus giving it to a charity (Bartels et al. 2013, Macrae et al. 2017). More generally, present–future self-continuity is positively related to, and leads to, increased patience for financial rewards and consumption experiences (i.e., temporal discounting), independent of uncertainty regarding future preferences, anticipated change in spending money and free time, positive and negative affect, construal abstraction, future time perspective, and self-control (Bartels & Urminsky 2011). Finally, participants donated more money (out of an experimenter-provided cash payment) to a charitable organization when they felt a stronger connection to their future self (i.e., similarity of important self-aspects to those of 5 years later) and also to their past self (i.e., similarity of current self-aspects to those of 5 years before) (Zhang & Aggarwal 2015).

Psychological Health

Past–present self-continuity is positively associated with a variety of psychological health indices. Meaning in life is a case in point; an experiment clarified the causal direction (Van Tilburg et al. 2019). Participants were induced to experience higher past–present self-continuity (by describing a part of their life that was invariant across their past and present selves) or lower past–present self-continuity (by describing a part of their life that no longer characterized them in the present) (Sedikides et al. 2015). Higher past–present self-continuity raised meaning in life (as expressed by statements such as "I feel that life is meaningful," "I feel that life has a purpose") (Van Tilburg et al. 2019). In other research, present–future self-continuity also increased meaning in life (Hong et al. 2022b); here, participants described an important aspect of their lives that was the same (versus different) for their present and future selves, and then completed the Presence of Meaning subscale of the Meaning in Life Questionnaire (with items such as "My life has a clear sense of purpose") (Steger et al. 2006).

Past–present self-continuity is also positively related to self-esteem (Zou et al. 2018), pride (Chang et al. 2019b), job satisfaction (Zou et al. 2018), life satisfaction (Iyer & Jetten 2011), and eudaimonic well-being operationalized as subjective vitality (i.e., a feeling of aliveness and energy; Sedikides et al. 2016). In addition, past–present self-continuity (assessed with the principal components method; Block 1961) is positively associated with psychological well-being (Block 1961, Campbell et al. 2003, Diehl et al. 2001, Lutz & Ross 2003, Sheldon et al. 1997) and self-esteem (Bigler et al. 2001, Campbell et al. 2003, Donahue et al. 1993, Lutz & Ross 2003, Sheldon et al. 1997), and it is negatively associated with anxiety (Block 1961, Donahue et al. 1993), neuroticism (Donahue et al. 1993), and depression (Block 1961, Donahue et al. 1993).

Present–future self-continuity is likewise linked to several indices of psychological health. For example, present–future self-continuity (assessed with the Future Self-Continuity Scale; Ersner-Hershfield et al. 2009b) is positively related to subjective well-being (Zhang & Chen 2018) and life satisfaction (Iyer & Jetten 2011, Sokol & Serper 2019a). Further, higher present–future self-continuity predicts greater life satisfaction 10 years later, controlling for baseline life satisfaction (Reiff et al. 2020).

Physical Health

A few studies have examined the link between self-continuity and physical health. Greater past–present self-continuity (indexed by relocation) is related to better physical health in terms of circulating levels of prolactin and testosterone (Anderzén & Arnetz 1999). Also, greater present–future self-continuity (perceived similarity to the future self, and liking and caring for the future self) is positively associated with physical well-being, as assessed by Cella et al.'s (2010) Global Health Scale of the Patient-Reported Outcomes Measurement Information System (Rutchick et al. 2018).

In an experiment, participants were induced to experience either high present–future self-continuity (by writing a letter to themselves 20 years into the future) or low present–future self-continuity (by writing a letter to themselves 3 months into the future) (Rutchick et al. 2018). Participants in the former condition exercised more in the days following the experiment. Moreover, present–future self-continuity influences dietary practices. In a different experiment, undergraduates who had reported an intention to lose weight interacted with an avatar representing either their weight-reduced self (high present–future self-continuity) or their current self (low present–future self-continuity) (Kuo et al. 2016). Participants in the high (compared to the low) present–future self-continuity condition ate less ice cream in a taste test and were more likely to select a sugar-free drink as a reward.

Lastly, higher present–future self-continuity likely promotes the valuation of plans to safeguard the future self and protect it against health risks. In a longitudinal investigation, present–future self-continuity (how similar/connected participants felt to their future self and how much they cared about their future self 15 years from the present) predicted reduced mortality rates, controlling for baseline health and present–future self-continuity levels (Fry & Debats 2011). Meaning in life might have mediated the relation between present–future self-continuity and reduced mortality risk (Hill & Turiano 2014), given that present–future self-continuity increases meaning in life (Hong et al. 2022b).

BENEFITS OF SELF-DISCONTINUITY

Paradoxically, self-discontinuity (i.e., low past–present self-continuity) can confer behavioral benefits. The sunk cost bias is an example. This bias refers to the tendency to persist on an inferior course of action after investing substantial and irrecoverable resources on it (e.g., effort, time, money). People experience negative emotions (e.g., regret, guilt, wastefulness) at the prospect of abandoning their investments, and this sense of personal responsibility for their past behavior contributes to perseverance of such behavior. Schanbacher et al. (2021) hypothesized that low past–present self-continuity would prompt people to place less weight on their past investing behavior, thus reducing their sense of personal responsibility making them less likely to manifest the sunk cost bias. In one study, lower past–present self-continuity (assessed with the Venn diagram measure of similarity to the self of 3 years ago) was linked to reduced sunk cost bias—namely, participants' intentions to expend money and effort in fixing the wallpaper with which they had original decorated their bedroom instead of buying a new one (Ersner-Hershfield et al. 2009a). In another study (Bartels & Urminsky 2015), past–present self-continuity was manipulated with a trait-stability task in which participant were informed that their core identity (i.e., personality, traits, values, beliefs) would remain the same across time (high past–present self-continuity) or change significantly (low past–present self-continuity). Low past–present self-continuity decreased the sunk cost bias.

Addiction is another example in which self-discontinuity can confer behavioral benefits. Individuals engaged in addictive behaviors such as disordered gambling or drinking demonstrate a very low rate of behavior change. It is difficult to motivate self-directed readiness to change

in them (DiClemente et al. 1991). The harms of addiction include acute psychological problems (Bergh & Kühlhorn 1994, Shaffer & Albanese 2005), which are often accompanied by gradually more negative self-perceptions (Best et al. 2007, Shinebourne & Smith 2009). When awareness of those negative self-perceptions is heightened, individuals living with an addiction might initiate a change back to the pre-addicted self. Such awareness can be heightened by self-discontinuity. Indeed, in several studies, self-discontinuity has emerged as promising motivator of self-change.

In one such study, self-discontinuity was assessed among disordered gamblers with two items ("Gambling has changed who I am" and "The person I was before I started gambling is different from the person I am now"). The gamblers were contacted a second time 6 months later. Those higher on self-discontinuity were more likely to have engaged in self-directed change, controlling for such barriers to change as guilt, shame, and self-stigma (Kim et al. 2017). In other research, self-discontinuity was either measured with the same two items as above or manipulated by informing disordered gamblers and drinkers that addiction (via alterations in moods, personality, and behavior) would result in losing a sense of self (self-discontinuity condition) or not (control condition). Self-discontinuity was associated with, and it increased, nostalgia for the pre-addicted self, which in turn precipitated readiness to change (Kim & Wohl 2015). Such a readiness to change effected by self-discontinuity-induced nostalgia is manifested not only in self-reported but also in informant-reported attempts to quit among disordered gamblers and drinkers 1 month following the initial assessment (Wohl et al. 2018). Attempts to quit are most successful when disordered gamblers hold incremental theories, namely, beliefs in behavioral malleability (Salmon et al. 2018). In all, self-discontinuity in individuals engaging in addictive behaviors is a catalyst for moving them from addiction to action.

Finally, low past–present self-continuity has moral implications. Participants who reflected on how they have fundamentally changed (low past–present self-continuity) rather than remained the same (high past–present self-continuity) were more likely to confess voluntarily to a prior misdeed and less likely to justify prior misdeeds, disregarding the possibility of a stain on their current moral character (Helgason & Berman 2022).

BRAIN REGIONS UNDERLYING SELF-CONTINUITY

Self-continuity has attracted the attention of social neuroscience. Brain regions or networks that underlie self-continuity have been explored by conducting fMRI studies.

The ventromedial prefrontal cortex (vmPFC) is associated with self-referential judgments. In particular, consideration of self-relevant versus other-relevant information elicits activation in medial prefrontal regions, extending from the medial prefrontal cortex (MPFC) to the rostral anterior cingulate cortex (rACC) (Kelley et al. 2002, Moran et al. 2006, Northoff et al. 2006). Information pertaining to the past, present, and future selves increases activation among various subregions within those medial prefrontal regions.

The vmPFC, which is part of the anterior cortical midline structures (CMS), is also crucial for past versus present versus future self-knowledge or self-judgments (Ciaramelli et al. 2021, Mitchell et al. 2011, Stendardi et al. 2021). In one study mentioned above (D'Argembeau et al. 2008), participants reflected on own and close-other traits for the present self (in college) and past self (in high school, 5 years before). Specifically, they judged whether 20 positive and 20 negative adjectives described each temporal own self and close-other self. Two CMS, the MPFC and the posterior cingulate cortex (PCC), were more heavily engaged when participants reflected on their own present self compared to their own past self and to the close-other. Thus, activity in CMS is related to comparisons between the past and present selves.

Moreover, activity in CMS is heightened when one reflects on their present versus future self. Participants judged whether 18 positive and 18 negative traits described their present self, their future self 10 years later, a famous actor in the present, and the same famous actor 10 years later. Portions of the anterior cingulate cortex (ACC), that is, the right and left rACC, were activated when making present- versus future-self judgments. However, this activation overlapped with that observed when making self versus other judgments (Ersner-Hershfield et al. 2009b). This does not necessarily mean that the future self is perceived as another (albeit familiar) other. The observed pattern may be due to a common process, but more likely it is due to one or more of the following mechanisms: similarity, distinctiveness, differential valence, depth of processing, and difficulty in inferring the other's thoughts (Ersner-Hershfield et al. 2009b). In addition, individual differences in rACC activation predicted devaluing of future (relative to immediate) monetary gains in a succeeding behavioral task, indicating that present–future self-continuity has implications for financial saving (Ersner-Hershfield et al. 2009b). Stated otherwise, present–future self-discontinuity as assessed by rACC activation predicted the discounting of the future (see also D'Argembeau et al. 2010).

Brain regions, and in particular the MPFC, also underpin judgments of the past, present, and future selves. Participants indicated whether each of 100 trait adjectives described their past self (5 years before), their present self, or their future self (5 years into the future). Participants varied on the degree of fulfillment of the three self-determination theory needs: autonomy, competence, and relatedness. Activity in the right MPFC depended on individual differences in need fulfillment and chronological self-involvement. That is, participants low on need fulfilment showed reduced activity when making self-descriptive judgments about their past and future (compared to their present) selves, suggesting that, when need fulfilment is low, the MPFC processes temporally separated selves in a different way. However, participants high on need fulfillment showed uniformly increased activity for all three selves, suggesting that, when need fulfilment is high, the MPFC processes temporally separated selves in a similar way (Di Domenico et al. 2018).

Beyond judgments involving the past, present, or future self, brain regions underpin self-continuity and, more concretely, the degree of connection to the future self. In an experiment (Brietzke & Meyer 2021), participants rated themselves on various traits on a past–future continuum, from 1 year into the past to 1 year into the future, spaced 3 months apart (i.e., across nine time points). A representational similarity analysis indicated that the past and future selves became more indistinguishable as they grew more distant, and these judgmental patterns were underlain by activity in the MFPC and PCC.

DEVELOPMENTAL PERSPECTIVES ON SELF-CONTINUITY

A nascent literature has examined age differences in self-continuity, and it has concluded that self-continuity is higher in later life (Löckenhoff & Rutt 2017). For example, older adults are less likely than younger ones to discount future rewards (Li et al. 2013, Löckenhoff et al. 2011). People are more likely to experience momentous events (e.g., graduation, wedding, birth of a child, employment, relocation; Sedikides et al. 2015) earlier in their lives, and such events disrupt past–present self-continuity. Also, adolescents and younger adults are more concerned with change and growth, whereas older adults are more concerned with stability and coherence (Ebner et al. 2006, Freund et al. 2010), such as weaving aspects of their personal history into an integrated story (McAdams 2008). Moreover, because older people are likely to chunk their past experiences in broader (as opposed to narrower) categories (Landau et al. 2018), they will experience higher past–present self-continuity; that is, time will feel to be passing by faster.

In accordance with these assertions, younger adults tell stories (i.e., narrate self-defining memories) that reflect change, whereas older adults tell stories that are more thematically coherent and reflect stability (McLean 2008). More critically, older adults express higher explicit and implicit global self-continuity, especially moving deeper into their past and future. In Rutt & Löckenhoff's (2016) study, explicit self-continuity was assessed in terms of similarity to one's self across six past and six future temporal points that were from 1 month to 10 years apart. Implicit self-continuity was assessed in terms of the me/not me trait-rating task (D'Argembeau et al. 2010). Taken together, the results suggest that older adults may use self-continuity in the face of age-related changes as a way to sustain well-being and meaning in life (Baltes et al. 1998, Steger et al. 2009).

CULTURAL DIFFERENCES IN SELF-CONTINUITY

An emerging literature has begun to explore culture as a moderator of self-continuity. This literature has compared Western cultures with Eastern cultures.

East Asians (relative to Westerners) think more holistically, focusing on relationships not only among objects but also between objects and contexts. East Asians are more likely to link an object with its background than to dissociate the object from it (Masuda & Nisbett 2006). These cultural differences extend to the temporal dimension, with past and future representing the context or background. East Asians (relative to Westerners) consider someone's past and future behaviors more relevant to their impression of that person, and they remember pertinent past and future behavioral information better (Ji et al. 2009). Also, East Asians are more likely to take into account information from the distant past when predicting future events (Ji et al. 2008) and attend more carefully to the consequences of future events (Maddux & Yuki 2006), while being more motivated to maximize performance linked to distal rather than proximal goals (Shechter et al. 2011). In all, East Asians perceive the past as more relevant and subjectively closer to the present, and they are more likely to connect the future to the present as well as appreciate the future implications of an event. These cultural differences manifest themselves in perceptions of self-continuity. In particular, relative to Euro-Canadians, Chinese participants reported higher global self-continuity—measured in terms of associative links, stability, and narrative—both momentarily and over time (Ji et al. 2019). This effect was mediated and caused by closer subjective proximity to their past and future selves.

As mentioned previously, perceptions of identity narrative, stability, and associative links are positively related to global self-continuity (Becker et al. 2018). These findings generalize across cultures (Becker et al. 2018, Hong et al. 2022a), although cultural beliefs of higher mutability are associated more strongly with narrative-based self-continuity (Becker et al. 2018).

Religious or philosophical orientation is also relevant. Although Western philosophical traditions emphasize the persistence of self throughout the life course (Hume and Parfit aside), Buddhists reject the idea of a unitary, temporally persistent self and instead endorse the self as a loose conglomerate of momentary or in-flux traits and experiences (Siderits 2007). Indeed, in a study (Nichols et al. 2018), Tibetan monastics who showed the stronger endorsement of Buddhist philosophy expressed a lower degree of self-continuity than Indians or Americans. Similarly, Tibetan monastics advocated a belief in an impermanent self as an abstract entity more strongly than Indians or Americans. Further, according to the Buddhist doctrine, illusionary beliefs in self-continuity underlie fear of death; if so, beliefs in self-discontinuity would eradicate, or at least alleviate, fear of death. [This doctrine is reminiscent of Parfit's (1984) argument that belief in a nonunitary self would reduce selfishness or increase prosociality.] Paradoxically, though, monastic Tibetans manifested both greater fear of death and lower prosociality (measured as willingness to shorten their life to extend another person's life) compared to Indians or Americans.

COLLECTIVE SELF-CONTINUITY

People perceive continuity with regard not only to their individual self but also to their collective self (Sedikides et al. 2013). People see their ingroups as traversing time. Collective self-continuity comprises both cultural continuity (i.e., temporal persistence of norms, values, and custom) and historical continuity (i.e., perceived interconnection between historical events and phases) of one's group—be it a family, an occupational organization, a religious institution, a community, or a nation (Sani et al. 2007).

Benefits of Collective Self-Continuity

Collective self-continuity is positively associated with group identification (i.e., how strongly one defines themselves in terms of the ingroup) and collective self-esteem (i.e., having positive regard for one's group) (Sani et al. 2007, Smeekes & Verkuyten 2014). Entitativity, the degree to which the group is perceived as cohesive or unified, mediates the effect of collective self-continuity on group identification and collective self-esteem (Sani et al. 2007). Furthermore, collective self-continuity is positively related to social well-being (i.e., effective social functioning in terms of social acceptance, actualization, contribution, coherence, and integration), and this effect is mediated by collective self-esteem (Sani et al. 2008). Cultural self-continuity among Canadian Aborigines, and Inuits in particular, has also been linked to better self-reported physical health (Newell et al. 2020).

Regulating Collective Self-Discontinuity

Life transitions or traumatic experiences conduce to a loss of collective self-continuity—that is, collective self-discontinuity. In turn, collective self-discontinuity can have adverse consequences (e.g., suicidal ideation or suicide) but can also motivate nostalgia for one's culture or improved adjustment to one's culture (Chandler et al. 2003). Subsequently, cultural nostalgia or adjustment may help assuage the deleterious consequences of collective self-discontinuity.

Collective self-continuity buffers against mortality threat. Specifically, pondering one's death compared to pondering an important exam—that is, activating death cognitions versus discomforting academic cognitions—enhanced collective self-continuity, which in turn strengthened group identification (Sani et al. 2009). Also, cultural continuity attenuated suicide risk among Canadian First Nations: Higher cultural continuity was associated with lower risk of youth suicide (Chandler & Lalonde 1998).

Collective nostalgia also buffers against collective self-discontinuity, although the available relevant example involves a majority population that is prejudicial toward minorities. In a Dutch sample, collective self-discontinuity (expressed in statements such as "Dutch identity is no longer what it used to be in the past" and "Many Dutch traditions have been lost over time") was longitudinally associated with nostalgia for the glorified past of one's country (e.g., "I am nostalgic about the good old days of the Dutch," "I am nostalgic about the sort of place The Netherlands was before"); in turn, collective nostalgia was linked to stronger collective action intentions to protect the national ingroup and curtail immigration through willingness to send the government a protest email, to donate money to anti-immigration causes, or to demonstrate (Smeekes et al. 2022).

A study examined the link between threat to collective self-continuity at the national level and prejudice against minorities (Badea et al. 2020). Non-Muslim French participants recorded their beliefs regarding the extent to which national continuity is based on Christian roots. Then, they read an essay that exalted the value of family continuity and segued into describing France as a big family, emphasizing its shared history and future and concluding with "This is why your country,

like your family, can give you a feeling that you continue to exist through time" (Badea et al. 2020, p. 68). Participants then were instructed as follows: "Think about France as one big family with a shared heritage and future. Imagine that France no longer exists, hence there no longer is a shared national past and future. Try to imagine how you feel" (ibidem). A self-affirmation manipulation followed. All participants ranked the importance of nine values (e.g., honesty, respect, loyalty). However, participants in the group-affirmation condition ranked the importance of these values to them as French citizens, participants in the control condition ranked the values' importance to someone else, and participants in the self-affirmation condition ranked their importance to them personally. Finally, all participants reported their attitudes toward Muslim immigrants, namely, opposition to Muslim rights (e.g., "In France, wearing a headscarf should not be forbidden"). The most relevant finding for our purposes is that group affirmation (versus control) weakened opposition to Muslim rights among participants who believed strongly that national continuity is based on Christian roots.

UNRESOLVED ISSUES AND FUTURE RESEARCH DIRECTIONS

We have broken down subjective self-continuity into three forms: past–present self-continuity, present–future self-continuity, and global self-continuity. This tripartite definition has added structure and specificity to our review. Nonetheless, evidence indicates that mental time travels to one's past self (i.e., retrospection) and to one's future self (i.e., prospection) are underlain by similar cognitive (Albarracin & Wyer 2000, Johnson & Sherman 1990, Sedikides & Wildschut 2020) and neurological (Hassabis & Maguire 2007, Schacter & Addis 2007, Viard et al. 2011) processes. The evidence, though, is not definitive. Hence, it is worth exploring subtle differences—both cognitive and neuronal—in the antecedents and consequences of the three forms of self-continuity. For instance, is past–present self-continuity necessary for present–future self-continuity, and in what ways does the former contribute to the latter, momentarily and longitudinally (Fry & Debats 2011)? Somewhat relatedly, does objective self-continuity contribute substantially to the aforementioned consequences above and beyond subjective self-continuity? It is also worth exploring individual differences and group differences. For example, it is possible that persons high on brooding rumination would be marked by deficits in all three forms of self-continuity, whereas those high on optimism are marked by surfeits in present–future self-continuity but not necessarily in past–present self-continuity (Beaty et al. 2018). Additionally, persons living with dementia may find a specific form of self-continuity (i.e., present–future; El Haj et al. 2022) particularly challenging.

The motivational character of self-continuity deserves further empirical scrutiny. In what other ways might self-continuity enhance or protect the self, beyond those stipulated by temporal appraisal theory, and in whom? Further, is the regulation of self-discontinuity always desirable? Relatively transient self-discontinuity, for example, might unleash vitality and creativity in arts and science. Also, how do difficulties or failures in imagination, or how does lack of motivation to engage in imagination among older persons, influence present–future self-continuity (Hershfield & Bartels 2018)? Here, digital technology (e.g., virtual reality, smartphones) may assist in clarifying theoretical issues (Eliseev & Marsh 2021). More generally, research is needed on additional parameters that might qualify the strength of the various forms of self-continuity (Kapogli & Quoidbach 2022) as well as characterize the precise pathways through which self-continuity fosters psychological and physical health.

Relatedly, we outlined the benefits of both self-continuity and self-discontinuity. Whether these are really beneficial will depend on the extent to which one's past is construed as positive or negative. In their narratives, individuals might endorse their past as a set of rewarding steps

culminating in fulfillment or might renounce their past as a set of unrewarding sequences culminating in misery. Future work will do well to test this proposal.

Moreover, does self-continuity merely accentuate a favorable or functional aspect of one's past—be it attitudes and judgments, motivation, intentions and behavior, or psychological or physical health? Identity-based motivation theory (Oyserman & Horowitz 2022) places boundaries on self-continuity's (and perhaps also on self-discontinuity's) benefits. Extrapolating from the theory, self-continuity will be most beneficial not only when one regards the past or future as having high value or high odds of success (i.e., as positive) but also when one regards their past or future as highly relevant to a present action. The theory merits empirical evaluation.

In terms of the brain regions underlying self-continuity, CMS appear to play a key role (Northoff 2017). Investigations will do well to focus on distinct regions within the CMS and how neuronal activity in them culminate in the psychological experience of past–present, present–future, and global self-continuity.

The developmental literature has established that self-continuity is higher in later life, perhaps as an aid to meaning and well-being maintenance. Research may address when, in which form, and how self-continuity emerges in childhood, and what trajectory it takes in adolescence and middle- to late-adulthood. Collective self-continuity, or the threat of collective self-discontinuity, is a candidate for understanding prejudice and intergroup hostility at the national level. Further, cultural investigations would need to move beyond a small set of variables (e.g., holistic versus analytic thinking), and cross-cultural investigations would need to move beyond a staple set of cultures (typically, East-Asian versus Western) to incorporate, for example, African samples (Adetula et al. 2022).

Interventional attempts are few and far between. We mentioned a self-discontinuity intervention to precipitate change among persons living with addiction (Wohl et al. 2018) and a self-continuity intervention to increase exercise behavior (Rutchick et al. 2018). Another self-continuity intervention to curb suicide among US veterans with a serious mental illness is also worth noting (Sokol et al. 2021). This intervention reinforced present–future self-continuity by nurturing a meaningful life story with one's future (and positive) self. Preliminary results pointed to reductions in suicidality, hopelessness, and depression over a 1-month period. Although the effect sizes of these interventions are small, the societal benefits can be large (Götz et al. 2022, Rutchick et al. 2018). Future interventional efforts could capitalize on nudging, already shown to be effective in reducing temporal discounting (Pietroni & Hughes 2016) and in strengthening consumers' purchase intentions for upcycled (i.e., created from wasted ingredients) food (Yang et al. 2021).

CONCLUSION

The ephemeral, yet enduring, character of the self remains an alluring enigma. Some have regarded the self as a grammatic fiction, a cultural artifact, or a set of incoherent autobiographical facts (Gergen 1991, Parfit 1971, Wittgenstein 1953), denying its very existence (Albahari 2006), let alone its unity. Most, however, have advocated its significance as a psychological construct, its suitability for objective empirical investigation, and its diachronicity, pointing to its evolutionary relevance, neurological underpinnings, and considerable consequences in daily life (Baumeister 2022, Cohen & Sherman 2014, Lieberman et al. 2019, Sedikides & Skowronski 1997). The current review owes a debt of gratitude to the latter perspective. Although the science of self-continuity, the "backbone of the self" (Sadeh & Karniol 2012, p. 93), is recent, it has amassed diverse theoretical and empirical tools and achieved impressive breakthroughs. Its energy and innovation guarantee continuity into the future.

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