Idiographic Longevity: The Individual as a Bioinformational Field

The Statistical, Epistemological, and Ontological Insufficiency of Nomothetic Models in Exceptional Aging

Mario E. Martinez

Biocognitive Monographs Series BM-2026-19 | Archived 2026

Citation

Martinez, M. E. (2026). *Idiographic Longevity: The Individual as a Bioinformational Field*. Biocognitive Monographs Series, BM-2026-19. Biocognitive Science Institute. https://www.biocognitiveculture.com/archive-working-papers-pub

Abstract

Longevity science has identified numerous genetic, metabolic, immunological, and environmental correlates of exceptional survival. Yet identifying what centenarians share does not explain how longevity is organized within a particular life. This paper proposes a paradigm shift from the population as the dominant explanatory referent to the individual as a bioinformational field: a historically constituted, embodied organization in which biological processes, cultural informing, lived duration, and meaning-making contextually coemerge. Drawing on autopoiesis, affordances, and biocognitive theory, the framework distinguishes the measurement of biological constituents from their idiographic integration. The Centenarian Consciousness Index (CCI™), developed through cross-cultural ethnographic investigation, offers eight culturally informed referents—four perceptual and four affective—for examining how individuals contextualize time, aging, health, self-valuation, and interpersonal experience without reducing them to psychological classifications. Preliminary observations involving centenarian orientations and selective

biological responses motivate longitudinal investigation rather than causal conclusions. The proposed methodology combines differentiated biological measures with repeated within-person assessments to investigate reproducible relationships between contextual organization and biological responsiveness. Idiographic longevity does not replace population science; it addresses an explanatory dimension that population regularities alone cannot resolve. The fundamental question is not only what extends life, but who lives that life.

Keywords: Idiographic Longevity; Bioinformational Field; Contextual Coemergence; Affective Referents; Centenarian Consciousness Index (CCI™); Duration Theory; Psychoneuroimmunology; Meaning-Making.

Introduction

Nomothetic research has contributed substantially to the scientific understanding of aging through population-based observations, statistical distributions, and the identification of biological mechanisms. These approaches remain indispensable to longevity science. However, their explanatory reach becomes insufficient when investigating exceptional longevity, particularly among centenarians, who are, by definition, statistical outliers in survival.

This insufficiency can be considered at three levels. Statistically, population averages and associations do not fully characterize the biological organization of exceptional individuals. Epistemologically, relationships established across populations do not necessarily explain how biological processes operate within a particular individual. Ontologically, population-derived descriptions are insufficient to account for the individual as a historically constituted, contextually

responsive human ecology. These limitations do not invalidate nomothetic science; rather, they identify explanatory questions requiring complementary methods of investigation.

We propose Idiographic Longevity, a scientific framework that investigates the individual as a bioinformational field. The bioinformational field is the human ecology interacting with other ecologies, within which biology responds to signals to implement contextual relevance. Its organization provides affordances that enable and constrain biological responsiveness, while interactions within and across ecologies contribute to changing horizons of contextual relevance.

This formulation draws upon Maturana and Varela's theory of autopoiesis, which describes the self-producing organization of living systems (Maturana & Varela, 1980), and Martinez's biocognitive epistemology, which advances contextual coemergence as a framework for understanding biological and cognitive processes within their constitutive relationships (Martinez, 2001).

At the cellular level, neutrophils and T lymphocytes illustrate differentiated biological affordances. Although both participate in the immune ecology, their distinct receptor architectures, signaling pathways, and functional capacities enable different responses to biologically relevant signals. Their responsiveness is organized according to the signals encountered, their available affordances, and their prevailing contexts.

The scientific foundation for investigating these relationships across psychological, neural, endocrine, and immune processes is established in psychoneuroimmunology. Ader and Cohen's demonstration of behaviorally conditioned immunosuppression (1975), together with Felten and colleagues' investigations of neural innervation of lymphoid tissues (1985), provided experimental evidence that behavioral and neural processes participate in immune regulation. These findings

contributed to a discipline in which psychological experiences and physiological processes are investigated as interacting constituents of biological regulation (Ader, 1981).

Within this framework, biocognitive orientations are organized configurations of emotions and perceptions that provide affordances for psychoneuroimmunological processes of stress regulation and inflammatory modulation. Their biological significance is investigated through the contextual relationships among perception, emotion, physiological responsiveness, and immune function.

The Centenarian Consciousness Index (CCI™) assesses eight differentiated biocognitive orientations comprising four perceptual dimensions—Time, Aging, Health, and Self-Valuation—and four emotional dimensions—Gratitude, Generosity, Curiosity, and Admiration. Their individual configurations provide a basis for investigating how perceptual and emotional orientations participate in the biological responsiveness of exceptionally long-lived individuals.

Unlike generalized interventions that assume comparable responses across populations, the proposed idiographic methodology examines the individual's existing configuration and permits the development of targeted clinical protocols addressing specific biocognitive orientations. Repeated assessments of these orientations, together with molecular measurements such as IgG glycan indexes, provide an experimental approach to investigating biological changes relative to the individual's own baseline.

The central proposition of Idiographic Longevity is that nomothetic science, while indispensable for identifying population-level regularities, is insufficient to explain how exceptional longevity is constituted within a particular individual. We propose the individual bioinformational field as the primary unit of inquiry for understanding how biological organization, contextual experience, and biocognitive responsiveness coemerge throughout a lifetime. Idiographic investigation does not

replace population-based research; it addresses an explanatory dimension that population-level associations alone cannot resolve: how longevity is organized and realized within the individual.

A subsequent research question follows: whether biocognitive orientations identified among exceptionally long-lived individuals can be selectively cultivated at younger ages, and whether such cultivation is accompanied by measurable changes in biological responsiveness.

The Insufficiency of Nomothetic Models in Exceptional Longevity

The distinction between nomothetic and idiographic inquiry concerns not simply the number of individuals studied, but the kind of explanation sought. Nomothetic investigation identifies regularities across persons, estimates distributions, and evaluates relationships among variables at the population level. These accomplishments are indispensable to aging research: without them, the exceptional survival of centenarians could not be situated within a broader demographic and biological context. Yet occupying an extreme position in a survival distribution does not establish how an individual's biology has been organized over the course of a century. Statistical characterization of exceptional longevity and biological explanation of an exceptionally long-lived individual are different scientific achievements.

This distinction recalls Windelband's differentiation of nomothetic and idiographic modes of knowledge, but its contemporary significance is methodological rather than merely philosophical. Molenaar (2004) demonstrated the restrictive conditions under which interindividual statistical relationships can represent intraindividual processes. Fisher, Medaglia, and Jeronimus (2018) further documented the limitations of generalizing group-level psychological relationships to individuals. The relevant issue is one of inferential scale: relationships observed among people do not necessarily describe relationships among processes within the same person. This distinction

becomes particularly consequential when studying individuals whose survival extends well beyond that of most participants in conventional aging cohorts.

Statistical insufficiency does not imply that conventional statistical methods are incapable of examining extreme observations. Survival analysis, extreme-value approaches, hierarchical models, and appropriately designed cohort comparisons remain valuable. The limitation arises when population estimates are treated as explanations of individual biological organization. For example, two centenarians with similar composite biological-age estimates may exhibit markedly different molecular profiles. A composite measure can summarize biological variation while concealing differences among its constituent measures. Explaining those differences requires investigating the relationships among the biological constituents rather than relying exclusively on their aggregate representation.

The epistemological distinction concerns the evidence required to answer different scientific questions. Population research identifies characteristics associated with outcomes across individuals. Idiographic research investigates how particular processes are related, maintained, and modified within the same individual over time. Cross-sectional differences among centenarians can generate hypotheses about biological configurations, but repeated observations are necessary to examine their temporal organization and responsiveness to changing conditions. An individual's longitudinal baseline consequently becomes a primary scientific referent, while population distributions remain valuable comparators. This distinction is consistent with Rose's (1985) differentiation between individual and population approaches to understanding and preventing disease, while the within-person inference problem is more directly addressed by Molenaar (2004) and Fisher et al. (2018).

At the ontological level, the question concerns what constitutes the primary object of scientific explanation. A population average is a statistical construct rather than a living organism with a biological history. Likewise, an individual cannot be fully characterized by their position within several reference distributions. Biological organization develops through interactions among physiological processes, individual histories, social relationships, and changing environments. These relationships constitute dimensions of the individual's biological existence rather than merely unexplained deviations from population expectations. An idiographic ontology therefore treats the historically and contextually constituted individual as scientifically consequential.

Centenarians make this distinction especially relevant. Their survival is exceptional, but their molecular, functional, and biocognitive characteristics need not conform to a single profile. This heterogeneity raises a more consequential scientific question: **How can different configurations of biological responsiveness sustain exceptional survival?** Addressing that question requires identifying relationships among biological constituents, distinguishing relatively stable characteristics from responsive processes, and examining how those relationships change under specified conditions. Longitudinal assessments and carefully designed within-person interventions can contribute to this investigation. Scientific replication may involve reproducing a method for identifying individual patterns of responsiveness rather than assuming identical responses across individuals.

The resulting scientific task is to develop a conception of the individual capable of accommodating biological organization, contextual responsiveness, and change across time. The **bioinformational field** is proposed as this complementary unit of inquiry.

The Bioinformational Field: Autopoiesis, Affordances, and Contextual Coemergence

Autopoiesis provides an important foundation for understanding living organization as self-producing and capable of structural transformation through interactions with its environment (Maturana & Varela, 1980). Yet identifying the organizational continuity of a living system does not fully explain how its particular conditions make some responses possible, others unavailable, and still others consequential only when circumstances change. This distinction becomes especially important in exceptional longevity, where biological persistence must be examined alongside the capacity to encounter changing conditions across an individual lifetime. The idiographic bioinformational-field model addresses this additional explanatory requirement by investigating the conditions through which affordances become available, contextual relevance is determined, and previous responses modify the possibilities of subsequent biological action.

Upward and downward causality offer informative descriptions of relationships among levels of biological organization. Molecular interactions contribute to cellular and organismic functions, while higher-order organization can constrain or modulate constituent processes (Ellis, 2012). Their explanatory limitation is not that these relationships are incorrect or necessarily linear, but that causal direction alone cannot identify where the most consequential integration of contextual information occurs. An upward account may trace how constituent interactions contribute to a response, while a downward account may identify constraints imposed by a broader organization. Neither description, considered independently, establishes which configuration of interacting conditions permits the greatest contextual complexity relevant to a particular determination. Contextual coemergence introduces a complementary principle: the conditions of contextual determination are not assigned in advance to a privileged biological level or causal direction, but emerge through the prevailing relationships among consequential conditions. The degree of

contextual complexity accessible within those relationships becomes a further question for theoretical and empirical investigation.

Within this framework, the bioinformational field refers to the historically constituted human ecology interacting with other ecologies. Its explanatory significance lies in the relationships through which biological signals become consequential, rather than in treating the organism as a closed collection of components. Affordances establish the possibilities and limits of responsiveness within those relationships. Gibson's (1979) ecological conception of affordances provides the relational foundation, although extending the concept to molecular and cellular responsiveness requires distinguishing perceptual possibilities for action from the mechanisms of biochemical signaling. A receptor configuration, for example, may permit a response to one signal while excluding another; prior activation, metabolic conditions, and regulatory interactions may further alter what the cell can accomplish. The limits of an affordance are therefore not merely restrictions imposed on biological action. They are part of the information through which the ecology's available possibilities become distinguishable, permitting contextual relevance to be determined within the conditions that actually prevail.

Maximum accessible contextual complexity is proposed as the condition through which the greatest potential for contextual relevance becomes possible. Complexity does not mean accumulating the largest quantity of information. It concerns the integration of consequential relationships among available conditions, including the limits that distinguish possible from unavailable responses. A signal acquires contextual significance through its participation in these relationships; its presence alone does not determine its biological consequence. Importantly, the greatest accessible complexity need not be located at the highest organizational level or concentrated within a single biological structure. It may be constituted through distributed

interactions whose relevance depends on the particular encounter. Within the proposed model, maximum denotes the greatest integration of consequential contextual relationships accessible under the prevailing conditions of a particular determination, rather than an absolute informational maximum or an optimization process presumed to occur in every biological response. Its status is therefore that of a theoretical principle whose empirical identification requires investigation of the relationships and limits governing responsiveness. The explanatory task is to identify the configuration in which consequential information becomes integrated, and to investigate the extent of that integration, rather than to assume that biological complexity necessarily increases in an upward direction or originates from higher-level control.

This integration is not proposed as a rigid sequence in which an ecology first inventories its possibilities, subsequently accumulates information, and finally selects a response. Affordances and contextual complexity may be constituted recursively: as interacting conditions become consequential, they can modify which possibilities remain available and which additional relationships can participate in the determination. The limits of an affordance may themselves change during an encounter, making previously unavailable responses possible or rendering familiar responses inappropriate. Maximum accessible complexity is consequently relative to the prevailing organization, temporal conditions, and demands of the particular context, including changes that occur while the encounter unfolds. The model does not require a biological system to identify every conceivable variable before acting. Rather, it proposes that the fullest integration of consequential information accessible within those conditions provides the greatest potential for an appropriate determination, a proposition whose validity must be examined rather than inferred from the occurrence of a response. This distinction also separates contextual complexity from

computational quantity: the relevant issue is not how much information is processed, but how the available relationships become organized for contextual relevance.

The signal for action represents the implementation of contextual relevance determined within those conditions. Its biological expression need not reproduce the complexity of the relationships that made the determination possible. Multiple interacting signals may culminate in a comparatively simple response, such as activation, inhibition, migration, or secretion. Cost refers to the investment of energy or resources required to implement a biological response, whereas value refers to the contextual relevance of that response within the prevailing configuration of affordances. A response involving minimal cost may have considerable contextual value, while a costly response may have little relevance to the demands of the particular encounter. The apparent simplicity of the response therefore does not establish the simplicity of its contextual determination. Conversely, a highly elaborate response is not necessarily more relevant merely because it involves more biological activity. The proposed relationship between complexity and efficiency concerns the capacity to integrate consequential conditions before implementing a response appropriate to the available affordances, not the assumption that greater complexity invariably produces better outcomes. Whether a particular response reflects the greatest accessible contextual complexity must be investigated independently of the fact that a response occurred.

Immune-cell signaling offers a biological illustration of why contextual determination cannot be inferred from an isolated stimulus. T-cell activation involves the integration of antigen recognition with costimulatory interactions and cytokine-mediated signals, whose combinations influence activation, differentiation, and subsequent function (Curtsinger & Mescher, 2010). Recognition of an antigen therefore does not, by itself, specify the consequences of the encounter. The physiological and signaling conditions of the receiving cell influence which responses become

available and how they are expressed. These established mechanisms demonstrate context-dependent integration without establishing that an immune cell necessarily reaches an informational maximum before responding or independently validating contextual coemergence as a general explanatory principle. The idiographic model introduces a further investigative question: how do the particular limits and relationships of a cell's prevailing affordances establish the complexity through which one response becomes contextually consequential rather than another? This question shifts attention from the presence of individual signals to the organization of the conditions under which their combined effects become relevant.

Novelty is defined within the proposed model as added contextual complexity. This definition does not equate novelty with unfamiliar information alone. Novelty becomes consequential when new information or relationships alter the conditions through which contextual relevance can be determined. The significance of this distinction is that a living ecology cannot rely exclusively on configurations established before an encounter, because the context may present relationships that were not previously available in the same form. The requirement for maximum accessible contextual complexity arises from this openness to novelty: a determination restricted to previously established relationships could fail to incorporate consequential conditions emerging during the encounter. The greatest accessible contextual complexity must therefore remain open to additional consequential information. This openness provides the proposed basis for incorporating novelty without requiring that the resulting response be specified in advance. A priori explanations can identify established principles and anticipated possibilities, while a posteriori explanations can reconstruct observed outcomes. Both remain informative, but neither alone describes how an ecology integrates consequential novelty while the context is unfolding.

Contextual coemergence addresses this dynamic requirement through the changing relationships among affordances, their limits, and the complexity accessible during an encounter.

Adaptive immune memory illustrates how the incorporation of novelty can alter the conditions of future responsiveness. During an initial encounter with a previously unrecognized pathogen, antigen recognition and associated signaling can initiate lymphocyte activation, differentiation, and the establishment of immunological memory. During a subsequent encounter, antigen-experienced lymphocytes and other components of immune memory can change the timing, magnitude, and character of the response (Lam et al., 2024). The second encounter therefore does not reproduce the conditions of the first. The biological consequences of the earlier encounter have become part of the organization through which subsequent signals acquire relevance. In the proposed idiographic interpretation, the first response may modify the limits of existing affordances, permitting a different integration of contextual information during the next encounter. Immunological memory thus provides an established example of historically altered responsiveness, while contextual coemergence offers a theoretical interpretation of how incorporated novelty may reorganize the conditions of future determinations.

The recursive implication is that the greatest accessible contextual complexity is a changing horizon rather than a permanent organizational achievement. The incorporation of consequential novelty can modify the affordances through which subsequent encounters are evaluated, so that a determination made under one configuration may contribute to the conditions available under another. This does not imply that biological organization must continually increase in complexity or that every novel encounter improves adaptation. Some incorporated changes may narrow future possibilities, produce inappropriate responses, or impose additional regulatory constraints. The relevant proposition is that biological history can alter the complexity accessible to subsequent

determinations. Contextual coemergence is therefore historical without being confined to repetition: previous responses contribute to present conditions, while novel relationships may change the possibilities through which future contextual relevance becomes constituted.

The same proposed principles of contextual organization can be investigated across molecular, cellular, organismic, and cognitive domains without treating their mechanisms as identical. A cell's responsiveness depends on receptor configurations, signaling relationships, and physiological conditions; human cognition can additionally incorporate perception, emotion, memory, anticipation, and autobiographical meaning. Within the human bioinformational field, biocognitive dimensions, including perception, emotion, memory, anticipation, and meaning, can participate in the determination of contextual relevance through the affordances available to the individual. Their incorporation expands the dimensions of contextual organization that can be investigated without implying that biocognitive processes arise at a universal threshold of increasing complexity or through a predetermined upward causal hierarchy. The ontological proposition is one of continuity in relational organization rather than identity among biological processes. Its epistemological counterpart is that contextual relevance must be investigated through the particular history, conditions, and affordances of the ecology under examination. This shared principle does not imply methodological uniformity: molecular signaling, immune regulation, and lived meaning require different forms of evidence. The idiographic model provides a common explanatory orientation while preserving those differences.

For exceptional longevity, the resulting investigative question is how the historically constituted affordances of an individual permit changing biological conditions, including consequential novelty, to be incorporated into contextually relevant responsiveness over time. The model does not assume that greater contextual complexity necessarily extends life or that established

molecular explanations lose their validity. It proposes an additional level of inquiry into how the conditions of responsiveness are constituted, how they change through experience, and how those changes influence subsequent biological possibilities. This foundation permits investigation of whether targeted clinical protocols can modify the conditions and limits of biocognitive affordances, thereby changing the contextual relationships through which perceptions and emotions participate in psychoneuroimmunological responsiveness, alongside measurable biological outcomes.

Biocognitive Orientations and Psychoneuroimmunological Affordances

The bioinformational field developed in the preceding section provides a framework for examining how perceptual and emotional orientations participate in biological responsiveness. Biocognitive orientations are not fixed personality traits or independent psychological determinants, but historically constituted, cultivable propensities whose significance emerges through their relationships with context. Whereas personality descriptions generally concern relatively enduring patterns of response, biocognitive orientations emphasize which possibilities become relevant within a particular encounter. Their affordances include possibilities and limits, allowing familiar responses to remain unexpressed when alternative responses acquire greater relevance. Novelty may therefore reorganize the possibilities through which an individual responds.

The operational value of the Centenarian Consciousness Index (CCI™) lies in its differentiation of biocognitive orientations into more delimited domains of contextual inquiry. Whereas broad psychological constructs encompass heterogeneous horizons of affordances, each CCI factor constrains the investigative field to a more identifiable terrain of meaning without reducing the complexity of its contextual enactment. This differentiation permits examination of how cost–value relationships organize the possibilities available within a particular orientation and how

those possibilities may become biologically consequential. The factors therefore serve not as independent predictors of biological outcomes, but as operational referents through which increasingly discriminating idiographic hypotheses can be developed.

Within the CCI™, Gratitude, Generosity, Curiosity, and Admiration are designated *Affective Referents* rather than discrete emotions. Identified through cross-cultural content analysis of centenarian experience, they represent epistemological orientations through which individuals contextualize the affective dimensions of experience, rather than an exhaustive taxonomy of emotions or clusters reducible to particular emotional states.

Time and Self-Valuation illustrate this operational advantage. Time concerns the allocation of perceived available duration across contextual possibilities, while Self-Valuation concerns the allocation of value between oneself and others. These referents participate jointly in cost–value discrimination without reducing Time to anticipated cost or Self-Valuation to a fixed attribution of personal worth. Their relationships with other orientations help distinguish the contextual relevance of responses that might otherwise appear psychologically equivalent.

Two centenarians may exhibit similarly salient Gratitude and Generosity yet differ in how these orientations become enacted. For one, generosity may become relevant through another person's needs and the perceived availability of time. For another, protecting personal boundaries or conserving time may make declining a request more relevant. Neither response independently establishes greater or lesser generosity. The distinction illustrates how comparable emotional orientations can participate in different configurations of contextual relevance.

This differentiation is especially important in exceptional longevity. Centenarians occupy the extremes of the longevity distribution, but shared survival does not imply identical psychological

or biological organization. In our ongoing preliminary CCI investigation, Gratitude and Generosity have consistently emerged as particularly salient within the individuals assessed. These descriptive observations do not establish their prevalence among centenarians generally, nor do they demonstrate that centenarians invariably express these emotions or that the emotions caused their longevity. Differences across Time, Self-Valuation, Aging, Health, Curiosity, and Admiration may distinguish individuals with otherwise similar emotional profiles. Such variation provides a rationale for idiographic investigation.

Existing research supports examining these orientations while preserving the distinction between association and mechanism. Algoe (2012) described gratitude's role in recognizing and strengthening interpersonal relationships, while Algoe and Way (2014) identified evidence involving CD38 genetic variation, associated with oxytocin-system functioning, in the social-bonding effects of expressed gratitude. Chen et al. (2024) reported an association between higher gratitude and lower subsequent mortality risk among older female nurses. These findings establish the relevance of gratitude to social and longevity research without demonstrating a specific causal pathway. More broadly, psychoneuroimmunological research connects psychological and social conditions with immune and inflammatory regulation (Kiecolt-Glaser et al., 2002; Slavich & Irwin, 2014), providing an empirical foundation for investigating differentiated biocognitive orientations without assuming a one-to-one correspondence between any factor and a biological mechanism.

McClelland and Kirshnit (1988) provided an early experimental illustration of differentiated psychoneuroimmunological responsiveness. Films designed to evoke affiliation and power motivation were associated with different patterns of salivary immunoglobulin A (IgA), including responses differentiated by participants' motivational characteristics. Within the proposed

bioinformational framework, these contrasting presentations can be interpreted as offering different affordances for emotional engagement, whose enactment may depend on the individual's contextual cost–value discrimination rather than the stimulus alone. The Mother Teresa film also illustrates compassion as a possible expression of Generosity: **emoting into the suffering of another is itself a form of giving.** This interpretation extends beyond the variables directly measured in the experiment, which did not assess the CCI orientation of Generosity or the proposed cost–value processes. The empirical findings therefore provide an illustration of differentiated psychoneuroimmunological responsiveness rather than direct validation of the biocognitive interpretation. They nevertheless support investigating how emotionally meaningful affordances may become differentially consequential for biological responsiveness.

A further theoretical connection emerges from the distinction between implicate and explicate epistemology developed in *Contextual Relevance and the Evolution of Meaning: A Biocognitive Theory of Epistemological Complexity* (Martinez, 2026c). Implicate epistemology refers to contextual discrimination embodied in biological organization without reflective awareness. Cellular signaling and immune regulation operate through historically constituted conditions of responsiveness. Within this theoretical formulation, epistemology refers to the organization of contextual discrimination rather than attributing reflective knowledge or human cognitive capacities to cellular processes. Explicate epistemology introduces recursive awareness, allowing individuals to examine interpretations, anticipate alternatives, and reconsider their responses. This distinction does not attribute human consciousness to cells; it proposes continuity in contextual responsiveness while recognizing qualitatively different epistemological capacities.

Immune regulation illustrates the distinction. During the contraction of certain immune responses, activated cells undergo programmed cell death, contributing to regulatory restoration. The cellular

cost may be substantial while benefiting the larger biological ecology, although similar processes can become pathological under different conditions. At the implicate level, such responses arise through biological signaling without reflective appraisal. At the explicate level, individuals may additionally reconsider the perceived cost and attributed value of their responses, including whether generosity, personal boundaries, or unfamiliar possibilities warrant engagement. The analogy concerns contextual responsiveness across levels, not an equivalence between cellular self-elimination and human generosity.

Recursive awareness also introduces possibilities for cultivation. Gratitude, Generosity, Curiosity, and Admiration need not be prescribed emotional states whose frequency must increase regardless of circumstances. Cultivation may instead reorganize the affordances through which these orientations become available and consequential. Consistent with the second-order approach developed in *Changing the Epistemology of Spacetime: Toward a Second-Order Science* (Martinez, 2026b), recursive inquiry can expand the possibilities available within an established explanatory framework. Applied to Centenarian Consciousness, the hypothesis is that cultivation may alter biocognitive affordances and potentially their relationships with psychoneuroimmunological processes. Whether these changes occur requires empirical investigation.

The methodological challenge is therefore not simply to determine whether particular orientations are associated with favorable biological measures across populations, but to investigate their contextual expression and biological covariation within individuals over time. This requires distinguishing changes in factor magnitude from changes in the relationships through which a factor becomes consequential, without assuming that higher scores necessarily represent improvement. Repeated idiographic investigation can examine whether changing affordances are

accompanied by reproducible biological variation, providing the transition to the clinical methods considered in the following section.

From Population Biomarkers to Idiographic Clinical Investigation

The transition from population biomarkers to idiographic clinical investigation requires greater specificity in both biocognitive and biological measurements. Broad constructs such as personality, stress, and general well-being possess established descriptive and predictive validity, but their heterogeneous contextual expressions can limit their explanatory resolution in individual cases. Two people classified as introverted, for example, may respond differently to the same social encounter: one may experience threat and physiological arousal, while the other may remain quiet without distress. The classification alone does not identify the perceptual and emotional processes informing their responses. Contemporary personality research recognizes such within-person variation (Fleeson, 2001); the proposed biocognitive approach extends the inquiry to the contextual organization of biological responsiveness. A parallel limitation occurs in biological measurement. Two individuals of the same chronological age may exhibit different glycan profiles and immune-regulatory characteristics. Neither the psychological classification nor chronological age sufficiently specifies the individual's organization. The resulting need for differentiation is both ontological, concerning how responsiveness is constituted, and epistemological, concerning how that responsiveness can be investigated.

The clinical advantage of operationally differentiated biocognitive orientations lies in their capacity to guide more discriminating idiographic investigation. Rather than relating broad psychological classifications to composite biological outcomes, the investigator can examine specific perceptual and emotional orientations alongside differentiated biological measurements. The relevant question is not simply whether an orientation is present or whether its measured

magnitude changes, but whether its contextual enactment is accompanied by identifiable biological responses. Two individuals may exhibit comparable biocognitive profiles while demonstrating different patterns of biological responsiveness. Conversely, the same individual may enact a particular orientation under different contextual conditions without reproducing an identical biological response. Within the bioinformational framework, these possibilities suggest that biological responsiveness must be investigated in relation to the contextual organization of the encounter rather than inferred from the nominal identity of an orientation.

A further distinction concerns the operational continuity of a biocognitive orientation across culturally differentiated contexts. Gratitude, defined in the biocognitive model as *the graceful acceptance of what is received without the need for reciprocity*, retains its operational referent whether enacted within collectivist or individualist cultural ecologies. Culture may organize different interpersonal circumstances, expectations, and cost–value relationships through which gratitude becomes relevant, without requiring its operational definition to change. We propose that culturally differentiated affordances may therefore permit enactment of an operationally consistent orientation while producing different patterns of individual responsiveness. Functionally comparable psychoneuroimmunological processes may emerge across these contexts, but such continuity must be investigated rather than presumed. This distinction permits cross-cultural comparison without treating cultural variation as irrelevant or assuming biological equivalence.

An important consequence is that biological responsiveness need not be generalized to be scientifically meaningful. Psychological and social conditions have been associated with immune and inflammatory regulation, including pathways involving stress-related appraisal and inflammatory signaling (Slavich & Irwin, 2014). Such findings establish a relevant empirical foundation but do not imply that every biocognitive orientation influences the same biological

pathways or that its cultivation produces uniformly favorable effects. The idiographic question concerns biological selectivity: which processes exhibit measurable variation under particular contextual conditions, which remain comparatively stable, and whether the relationships among those processes change over time. A selective response may reveal an aspect of individual biological organization that would remain obscured if investigation were restricted to a global measure of improvement.

Selectivity, however, must not be confused with benefit. A measurable biological change does not necessarily establish improved regulation, just as the absence of change does not necessarily indicate a failure of responsiveness. The functional significance of a response depends on the biological process being measured, its relationships with other processes, and the conditions under which the response occurs. Consequently, idiographic investigation requires distinguishing the magnitude and direction of a biological change from its interpretation within the individual's broader biological organization. This distinction is particularly relevant when composite biomarkers summarize multiple processes whose constituent measurements may follow different trajectories.

Previous centenarian research provides precedents for individualized investigation. Wong et al. (2014) employed qualitative examinations to explore the contextual circumstances and psychological well-being of exceptionally long-lived individuals, while Hutnik et al. (2016) examined centenarian life histories to identify patterns of resilience and emotional adaptation. Merino et al. (2023) investigated psychological characteristics and resources that may distinguish centenarians. These studies provide precedents for investigating individual histories, psychological resources, and contextual differences in exceptional longevity, rather than direct evidence of within-person covariation between operationally differentiated biocognitive

orientations and biological markers. The proposed biocognitive idiographic model extends this direction by examining whether differentiated biological responses can be investigated alongside operationally defined orientations within the same individual over time.

Immunoglobulin G (IgG) glycosylation provides a promising biological domain for this investigation. Glycan patterns vary with chronological age and are associated with immune function and inflammatory regulation (Krištić et al., 2014; Gudelj et al., 2018). GlycanAge summarizes selected aspects of these patterns in a biological-age estimate, but the composite cannot reveal every underlying biological difference. An idiographic approach can examine which available glycan measurements and derived indices change, which remain comparatively stable, and whether different components exhibit distinguishable trajectories. The previously described Generosity intervention (Martinez, 2026e) illustrates the heuristic potential of investigating selective responsiveness. Its principal contribution is not the magnitude of the observed change in composite biological age, but the preliminary differentiation between measures that changed and those reported as comparatively stable across the assessment occasions. This observed selectivity does not establish that cultivation modified a specific biological process. Rather, it raises questions about whether cultivation of a particular orientation may be accompanied by changes in identifiable biological processes rather than generalized modification of biological aging.

The individual's biological history introduces an additional epistemological distinction. Population biomarkers establish relationships between measured characteristics and reference distributions, whereas longitudinal idiographic investigation examines the continuity and modification of biological organization within a particular person. Biological history, in this framework, is not merely a chronological sequence of measurements. It is the developing organization of physiological responsiveness through which subsequent possibilities may become available,

maintained, or constrained. This is a theoretical proposition concerning historically constituted biological organization, not an inference that can be established from a small number of observations. Its methodological implication is that successive measurements should be interpreted in relation to the individual's preceding patterns, contextual circumstances, and emerging trajectories. The same intervention may therefore warrant different hypotheses across individuals, or within the same individual at different points in time.

The preliminary Generosity findings do not establish causality, a specific psychoneuroimmunological mechanism, or statistical covariance. Two assessment occasions are insufficient to determine within-person covariation, and unmeasured influences cannot be excluded. Their contribution is heuristic: they identify a selective pattern that can guide further idiographic investigation. Repeated measurements, additional targeted interventions, differentiated biological outcomes, and examination of alternative explanations could establish whether reproducible patterns of contextual responsiveness emerge. Case-based time-series methodology provides an established approach to examining repeated observations within individuals, including the temporal organization and reproducibility of measured changes (Borckardt et al., 2008). Such investigation need not depend exclusively on demonstrating an average effect across a population. Nomothetic findings remain valuable, but idiographic research can also advance through within-person reproducibility, contextual discrimination, and refinement of explanatory hypotheses.

The resulting methodological progression moves from contextual discrimination to selective biological responsiveness, from selective responsiveness to historically constituted individual trajectories, and from those trajectories to repeated idiographic investigation. Its objective is not to replace population biomarkers or to infer biological benefit from every measurable change, but

to determine whether reproducible relationships can be identified within the developing organization of an individual life. This provides an empirical direction for refining the bioinformational model while preserving the contextual coemergence of the processes under investigation.

Centenarian Consciousness and the Horizons of Longevity

All the Time in the World

During ethnographic interviews conducted as part of the development of the Centenarian Consciousness Index (CCI™), a centenarian was asked how he perceived time. He replied, “I have all the time in the world.” When asked, “What if you die tomorrow?” he responded, “Then that was all the time in the world.” The exchange illustrates a distinction between chronological finitude and perceived available time. Within Martinez's biocognitive Duration Theory (Martinez, 2026d), chronological time measures intervals but does not constitute lived duration. The centenarian's response acknowledged mortality without treating the anticipated end of life as a limitation on the sufficiency of his available time. His understanding of time was not contingent upon the number of years remaining but upon the duration available to be lived.

Clinical and ethnographic observations of centenarians suggest that many maintain orientations toward time and personal possibilities that diverge from culturally prescribed expectations of advanced age. Such observations raise a question that chronological measures alone cannot address: why do some individuals experience advancing age as a progressive restriction of possibilities while others continue to approach life without those anticipated limitations? The distinction directs attention toward the cultural referents through which aging is interpreted and lived duration is experienced.

Cultural Portals and the Boundaries of Aging

Within biocognitive theory, *cultural portals* refer to culturally assigned chronological categories, such as adolescence, middle age, and elderhood, that establish expectations about appropriate behavior and future possibilities. These expectations are reinforced through admonitions such as "Why are you dressing like a teenager?" or "Why return to school when you're ready to retire?" Such expressions illustrate how chronological categories acquire authority over behavior and personal aspirations. Cultural informing establishes the referents through which experience is contextualized, whereas cultural admonitions attempt to enforce their prescribed boundaries. Over time, these admonitions may become internalized, shaping what individuals perceive as appropriate or possible without requiring further external intervention.

Cultural Oldering, a biocognitive construct, describes culturally learned attributions concerning the passage of time as individuals grow older, including how those attributions may inform perceptions of aging, health, and future possibilities. The distinction becomes particularly relevant when examining individuals who do not organize their lives according to prevailing chronological expectations. *Individuation* involves divergence from collective cultural expectations without necessarily rejecting cultural belonging. *Portal-less living*, observed among many centenarians encountered in Martinez's preliminary ethnographic investigations, reflects a different orientation in which chronological admonitions have little governing authority. Rather than necessarily opposing cultural boundaries, these individuals appear to organize their possibilities without treating those boundaries as defining constraints. The distinction is not simply between conformity and rebellion, but between living in reference to prescribed chronological boundaries and living without assigning those boundaries decisive authority.

Retirement provides a familiar illustration of this idiographic variation. The same transition may be contextualized as withdrawal from meaningful activity or as an opportunity for renewed exploration. Neither interpretation is inherent in retirement itself; each reflects the referents through which the transition acquires meaning. Moreover, these alternatives are not confined to advanced age. Across the lifespan, culturally informed expectations may be examined and alternative referential orientations cultivated, allowing individuals to reconsider possibilities that chronological conventions might otherwise restrict. This raises a further question: how might such referents be identified without reducing the individual to conventional psychological classifications?

The CCI™: Identifying Referents Without Psychological Labels

The CCI™ approaches this question by examining eight culturally informed referents: Time, Aging, Health, and Self-Valuation, comprising the perceptual factors; and Gratitude, Generosity, Curiosity, and Admiration, comprising the emotional referents Its heuristic purpose is to characterize their idiographic configuration rather than assign predetermined psychological labels. Two referents are particularly relevant to the ethnographic observations. Time concerns perceived available time, while Self-Valuation concerns the relative allocation of value between self and others. Considered together, they provide a contextual basis for examining how individuals organize possibilities, interpersonal obligations, and the allocation of their perceived available time. Their interpretation depends on the overall factor configuration, including rankings, response magnitudes, and neutrality, rather than isolated scores. Consequently, the significance of a particular response emerges from its relationship to the individual's broader referential organization.

This attention to referential organization also invites examination of how individuals respond to particular CCI™ items. Across more than 700 administrations, a preliminary item-level observation indicates that “Volunteering to help others is difficult” has elicited a mean response latency of approximately 1.23 minutes, compared with approximately ten seconds for typical items. The measurement conditions and comparability of these response times require further examination before the difference can be treated as an established finding. Nevertheless, the observed difference in response processing may provide a useful direction for investigation without establishing its psychological cause. A related clinical encounter illustrates why such distinctions matter. When an individual questioned a relatively low CCI™ Generosity result by stating, “But I'm very generous,” further examination raised the possibility that generosity toward others was not accompanied by comparable generosity toward the self. The discrepancy did not justify concluding that the individual lacked generosity; rather, it prompted exploration of how generosity was allocated within that person's referential organization.

These observations illustrate the value of identifying culturally informed perceptual and emotional referents before imposing psychological explanations. The CCI™ provides a heuristic framework for examining how those referents are organized, while also opening questions about their relationship to embodied experience. If gratitude, generosity, and other emotional orientations are culturally contextualized rather than fixed psychological attributes, their cultivation becomes relevant to investigating how changes in referential organization may accompany biological processes.

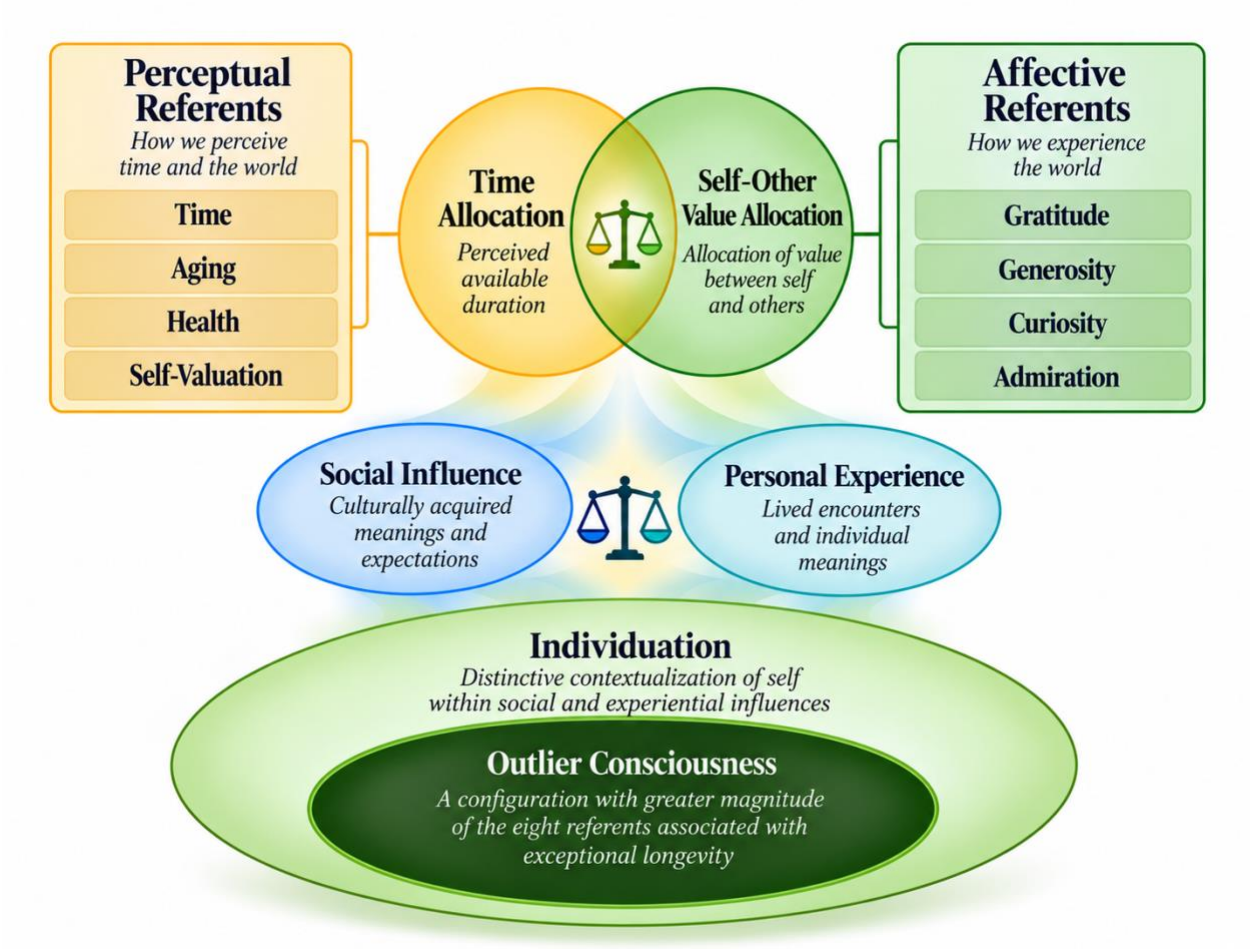

Figure 1. The eight referents of the Centenarian Consciousness Index (CCI™) describe how we perceive and emotionally experience the world. Time Allocation and Self–Other Value Allocation provide navigational referents through which we balance perceived available time and the value assigned to ourselves and others. These interact with the balance between social influence and personal experience, contributing to individuation—the distinctive integration of culturally acquired meanings and lived experience. Within this proposed framework, outlier consciousness represents a hypothesized configuration of greater magnitude across the eight referents whose relationship to exceptional longevity remains subject to further empirical investigation.

5.4. Gratitude, Generosity, and Embodiment

The relationship between culturally informed emotional orientations and embodiment has received increasing empirical attention. Algoe and Way (2014), for example, examined gratitude-related social bonding in relation to variation in the oxytocin-system gene CD38, while Kini et al. (2016) reported neural differences associated with a gratitude-writing intervention. Although neither

finding establishes a universal biological mechanism, both provide grounds for investigating emotional experiences as embodied processes rather than treating them exclusively as psychological classifications. Within an idiographic framework, the question extends beyond whether gratitude or generosity is present to how these orientations are contextualized, expressed, and cultivated by particular individuals.

The previously discussed Generosity–GlycanAge case study (Martinez, 2026e) offers a further illustration of this inquiry. Its observed association between cultivated generosity and changes in biological measures does not establish causality, but it raises questions that can be examined through longitudinal within-person investigations. Such investigations would allow changes in referential organization to be considered alongside measurable biological processes while preserving the distinction between observed associations and proposed mechanisms. Gratitude and generosity, in this context, are not isolated emotional variables but culturally informed orientations whose expressions may differ substantially across individuals. Their cultivation across the lifespan therefore provides an opportunity to investigate the relationships among cultural experience, referential organization, and embodiment.

6. Conclusion: The Individual as the Primary Unit of Longevity Science

Longevity research has identified genetic, metabolic, immunological, and environmental characteristics associated with exceptional survival. These population-level findings are indispensable, but identifying characteristics shared by centenarians is not equivalent to explaining how longevity is constituted within a particular life. Increasing the number of biomarkers or the precision of biological measurements does not necessarily resolve this explanatory insufficiency.

Population studies establish statistical regularities, whereas exceptional longevity is realized within individuals whose biological histories and contextual experiences cannot be reduced to those regularities. Nomothetic inquiry identifies what individuals share; idiographic inquiry investigates how those characteristics are uniquely organized within a particular life. The distinction is not between biological and psychological explanations, but between measuring the constituents of longevity and understanding their organization within the individual.

The central assertion of idiographic longevity is that the individual bioinformational field is the appropriate primary unit of inquiry for understanding how exceptional longevity is constituted and sustained. Biological processes, cultural informing, lived duration, and perceptual and emotional referents are not independent influences subsequently assembled into a person. They are contextually coemergent constituents of an embodied individual whose organization develops through a lifetime of experience. The idiographic meaning maker integrates these constituents into a gestalt that cannot be adequately explained by examining them separately. The meaning maker is not an additional component or an observer standing outside the biological organism, but the embodied individual whose contextualizing activity constitutes this meaningful whole. The bioinformational field therefore identifies more than the convergence of measurable processes; it identifies their idiographic integration.

The meanings constituted through this integration participate recursively in biological organization and expression. This is not a claim that meaning exists independently of biology or creates biological processes without physiological mediation. Rather, the meaning maker has biology, and that biology participates in the ongoing contextualization of experience. As contextual meanings change, the conditions under which biological processes become responsive may also change, while biological responsiveness itself participates in the subsequent organization of experience.

This reciprocal relationship does not establish that every change in meaning produces a corresponding biological effect; it identifies a theoretically consequential relationship requiring empirical investigation. Meaning-making and biological expression are therefore neither separate domains nor a one-directional causal sequence. They are constituents of a recursively organized, embodied process whose idiographic relationships constitute a central object of scientific inquiry. The ethnographic observations underlying the Centenarian Consciousness Index (CCI™) illustrate the importance of this distinction. The centenarian who declared, "I have all the time in the world," even when confronted with the possibility of dying the following day, expressed a meaning of available time that chronological age could not establish. Duration Theory distinguishes measured chronological intervals from lived duration, while observations of cultural portals and individuation reveal differences in how individuals contextualize aging and future possibilities. The CCI™ provides an operational means of investigating eight culturally informed perceptual and emotional referents without reducing individuals to predetermined psychological classifications. Their significance lies in their idiographic configuration rather than isolated scores. These referents provide dimensions through which aspects of the individual's meaning-making organization can be investigated.

The biological implications of this model require disciplined empirical investigation. Observations such as the previously discussed Generosity–GlycanAge case study identify relationships worthy of examination without establishing causal mechanisms. Longitudinal within-person research can investigate whether changes in contextual organization and CCI™ configurations accompany reproducible changes in differentiated biological measures, which biological processes remain comparatively stable, and under what circumstances these relationships emerge. Repeated observations and targeted interventions can further examine whether such patterns are reproducible

within individuals and whether proposed mechanisms withstand experimental scrutiny. Population research remains essential for comparison, replication, and generalization, but it cannot substitute for examining how processes are organized within particular lives. The objective is neither to construct a universal centenarian profile nor to treat every individual difference as a separate biological mechanism. It is to identify reproducible principles of idiographic organization through contextual discrimination and selective biological responsiveness while preserving the individual as the primary referent of investigation.

Centenarian status establishes that an individual has survived for at least a century; it does not explain how that longevity has been organized and lived. The search for a universal magic bullet overlooks the idiographic organization through which exceptional longevity is realized. This does not diminish the value of biological interventions; it establishes that no single intervention can provide a complete explanation of longevity within a particular life. Exceptional longevity must therefore be investigated not only through the biological characteristics associated with survival, but through the embodied meaning maker whose lived experience and biological organization are contextually coemergent. Within the proposed framework, the individual bioinformational field is not merely an additional variable in longevity research, but the primary unit of inquiry for investigating how exceptional longevity is organized and realized in a particular life. **The fundamental question of longevity science is not only what extends life, but who lives that life.**

References

Ader, R. (Ed.). (1981). Psychoneuroimmunology. Academic Press.

Ader, R., & Cohen, N. (1975). Behaviorally conditioned immunosuppression. Psychosomatic Medicine, 37(4), 333–340. https://doi.org/10.1097/00006842-197507000-00007

Algoe, S. B. (2012). Find, remind, and bind: The functions of gratitude in everyday relationships. Social and Personality Psychology Compass, 6(6), 455–469. https://doi.org/10.1111/j.1751-9004.2012.00439.x

Algoe, S. B., & Way, B. M. (2014). Evidence for a role of the oxytocin system, indexed by genetic variation in CD38, in the social bonding effects of expressed gratitude. Social Cognitive and Affective Neuroscience, 9(12), 1855–1861. https://doi.org/10.1093/scan/nst182

Borckardt, J. J., Nash, M. R., Murphy, M. D., Moore, M., Shaw, D., & O'Neil, P. (2008). Clinical practice as natural laboratory for psychotherapy research: A guide to case-based time-series analysis. American Psychologist, 63(2), 77–95. https://doi.org/10.1037/0003-066X.63.2.77

Chen, Y., Okereke, O. I., Kim, E. S., Tiemeier, H., Kubzansky, L. D., & VanderWeele, T. J. (2024). Gratitude and mortality among older US female nurses. JAMA Psychiatry, 81(10), 1030–1038. https://doi.org/10.1001/jamapsychiatry.2024.1687

Curtsinger, J. M., & Mescher, M. F. (2010). Inflammatory cytokines as a third signal for T cell activation. Current Opinion in Immunology, 22(3), 333–340. https://doi.org/10.1016/j.coi.2010.02.013

Ellis, G. F. R. (2012). Top-down causation and emergence: Some comments on mechanisms. Interface Focus, 2(1), 126–140. https://doi.org/10.1098/rsfs.2011.0062

Felten, D. L., Felten, S. Y., Carlson, S. L., Olschowka, J. A., & Livnat, S. (1985). Noradrenergic and peptidergic innervation of lymphoid tissue. The Journal of Immunology, 135(2 Suppl.), 755s–765s. https://doi.org/10.4049/jimmunol.135.2.755

Fisher, A. J., Medaglia, J. D., & Jeronimus, B. F. (2018). Lack of group-to-individual generalizability is a threat to human subjects research. Proceedings of the National Academy of Sciences, 115(27), E6106–E6115. https://doi.org/10.1073/pnas.1711978115

Fleeson, W. (2001). Toward a structure- and process-integrated view of personality: Traits as density distributions of states. Journal of Personality and Social Psychology, 80(6), 1011–1027. https://doi.org/10.1037/0022-3514.80.6.1011

Gibson, J. J. (1979). The ecological approach to visual perception. Houghton Mifflin.

Gudelj, I., Lauc, G., & Pezer, M. (2018). Immunoglobulin G glycosylation in aging and diseases. Cellular Immunology, 333, 65–79. https://doi.org/10.1016/j.cellimm.2018.07.009

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. PLOS Medicine, 7(7), e1000316. https://doi.org/10.1371/journal.pmed.1000316

Hutnik, N., Smith, P., & Koch, T. (2016). Using cognitive behaviour therapy to explore resilience in the life-stories of 16 UK centenarians. Nursing Open, 3(2), 110–118. https://doi.org/10.1002/nop2.44

Kiecolt-Glaser, J. K., McGuire, L., Robles, T. F., & Glaser, R. (2002). Psychoneuroimmunology: Psychological influences on immune function and health. Journal of Consulting and Clinical Psychology, 70(3), 537–547. https://doi.org/10.1037/0022-006X.70.3.537

Kini, P., Wong, J., McInnis, S., Gabana, N., & Brown, J. W. (2016). The effects of gratitude expression on neural activity. NeuroImage, 128, 1–10. https://doi.org/10.1016/j.neuroimage.2015.12.040

Krištić, J., Vučković, F., Menni, C., et al. (2014). Glycans are a novel biomarker of chronological and biological ages. The Journals of Gerontology: Series A, 69(7), 779–789. https://doi.org/10.1093/gerona/glt190

Lam, N., Lee, Y., & Farber, D. L. (2024). A guide to adaptive immune memory. Nature Reviews Immunology, 24, 810–829. https://doi.org/10.1038/s41577-024-01040-6

Martinez, M. E. (2001). The process of knowing: A biocognitive epistemology. The Journal of Mind and Behavior, 22(4), 407–426.

Martinez, M. E. (2026a). A conceptual framework linking meaning-making, temporal experience, and biological aging. Biocognitive Monographs Series, BM-2026-09. Biocognitive Science Institute.

Martinez, M. E. (2026b). Changing the epistemology of spacetime: Toward a second-order science. Biocognitive Monographs Series, BM-2026-10. Biocognitive Science Institute.

Martinez, M. E. (2026c). Contextual relevance and the evolution of meaning: A biocognitive theory of epistemological complexity. Biocognitive Papers Series, No. 06. Biocognitive Science Institute.

Martinez, M. E. (2026d). Duration Theory: Distinguishing constituent, representation, and measure in scientific inquiry. Biocognitive Science Institute. [Publication details pending verification.]

Martinez, M. E. (2026e). Targeted cultivation of generosity associated with selective change in CCI™ Generosity factor and GlycanAge measures. Biocognitive Monographs Series, BM-2026-16. Biocognitive Science Institute. https://doi.org/10.13140/RG.2.2.34549.33762

Maturana, H. R., & Varela, F. J. (1980). Autopoiesis and cognition: The realization of the living. D. Reidel. https://doi.org/10.1007/978-94-009-8947-4

McClelland, D. C., & Kirshnit, C. (1988). The effect of motivational arousal through films on salivary immunoglobulin A. Psychology & Health, 2(1), 31–52. https://doi.org/10.1080/08870448808400343

Merino, M. D., Sánchez-Ortega, M., Elvira-Flores, E., & Mateo-Rodríguez, I. (2023). Centenary personality: Are there psychological resources that distinguish centenarians? Journal of Happiness Studies, 24, 2723–2745. https://doi.org/10.1007/s10902-023-00700-z

Molenaar, P. C. M. (2004). A manifesto on psychology as idiographic science: Bringing the person back into scientific psychology, this time forever. Measurement: Interdisciplinary Research and Perspectives, 2(4), 201–218. https://doi.org/10.1207/s15366359mea0204_1

Rose, G. (1985). Sick individuals and sick populations. International Journal of Epidemiology, 14(1), 32–38. https://doi.org/10.1093/ije/14.1.32

Slavich, G. M., & Irwin, M. R. (2014). From stress to inflammation and major depressive disorder: A social signal transduction theory of depression. Psychological Bulletin, 140(3), 774–815. https://doi.org/10.1037/a0035302

Windelband, W. (1894). Geschichte und Naturwissenschaft [History and natural science]. Academic address, Strasbourg. [Historical source; edition and translation to be verified.]

Wong, W.-C. P., et al. (2014). The well-being of community-dwelling near-centenarians and centenarians in Hong Kong: A qualitative study. BMC Geriatrics, 14, Article 63. https://doi.org/10.1186/1471-2318-14-63

World Health Organization. (2025). World report on social determinants of health equity. https://www.who.int/publications/i/item/9789240107588