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A unified framework integrating psychology and geography

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We do not live in a vacuum. Everything humans do, think and feel is embedded within geography, which itself is interpreted, understood and modified by humans. Although it is thus conceptually obvious that psychology and geography need one another to fulfil their mandates, integrating them has been empirically challenging. To remedy this, we propose the unifying Geographical–Psychological Interactionist Framework. This framework features three axes (that is, geography, psychology, and geography–psychology interactions). Each axis hosts overarching classes (for example, human, physical and spatial geographical variables) and specific instances thereof (for example, climate and distance). As such, our framework provides: (1) a systematic taxonomy of the general interplay between geography and psychology; (2) a precise vocabulary with which to categorize specific interactions; and (3) a straightforward tool to inspire concrete and testable hypotheses. We conclude by positioning our conceptual framework in relation to existing theories and discuss next steps towards an interdisciplinary future at the nexus of psychology and geography.

There can be no complete account of psychology (the study of mind and behaviour[1]) without geography, and there can be no complete account of geography (the study of places and relationships between people and their environments[2]) without psychology. That is, human psychology is fundamentally shaped by geography, through the physical and sociocultural environments in which our thoughts, feelings and behaviours unfold, and geography is fundamentally shaped by psychology, through the many ways in which humans interpret, understand and change their physical and sociocultural environments. While psychologists classify, describe and explain human behaviour, cognitions and emotions, geographers classify, describe and explain the features of environments in which these behaviours, cognitions and emotions occur. Yet, neither has a widely accepted conceptual framework that integrates both. To bridge the gap, we advance the holistic Geographical–Psychological Interactionist Framework (hereafter, Geo–Psych Interactionist Framework), which provides: (1) a systematic taxonomy of the connections between geography and psychology; (2) a precise vocabulary with which to locate and describe the specific links between geography and psychology; and (3) a heuristic tool to guide research on many yet-to-be explored connections.

Previous work at the nexus of psychology and geography

The realization that psychology and geography are closely intertwined is hardly new: historians and philosophers studied how geographical features relate to attitudes, cognitions and behaviours long before psychology existed as an academic discipline[3]. Formal academic exploration of the links between geography and psychology began in the early twentieth century[4,5] and accelerated with the development of environmental psychology and behavioural geography in the late 1960s and early 1970s[6–8]. Despite this illustrious history, calls for greater research integration from both sides (for example, refs. 9–11) have largely gone unheeded and have rarely yielded lasting interdisciplinary connection (for excellent reviews, see refs. 12,13). Recently, however, there has been

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Table 1 | Comparison of the study of geography in psychology and the study of psychology in geography

	Geography in psychology	Psychology in geography
Central research questions	How do psychological phenomena vary across space? How do environmental factors shape the psychological composition of a place? What are the macro-level consequences of spatial differences in psychological phenomena?	How do humans subjectively perceive and organize their environments? How do psychological structures and processes give rise to spatial patterns?
Explanatory focus	Use non-psychological variables (for example, distance or economic conditions) to explain the conceptualization, composition, causes and/or consequences of spatial patterns in psychological variables (for example, personality or attention)	Use psychological variables (for example, personality or attention) to explain the conceptualization, composition, causes and/or consequences of spatial patterns in non-psychological variables (for example, economic conditions or distance)
Analytical focus	Moving from the disaggregate, individual level to the aggregate, environmental level	Moving from the aggregate, environmental level to the disaggregate, individual level
Typical methods	Multilevel modelling in which geographical features at the environmental level predict psychological features at the individual level Spatial aggregation of large-scale survey or text data to map geographical distributions of psychological characteristics and explain macro-level outcomes	Laboratory and field experiments to collect behavioural data and elucidate intrapersonal cognitive processes in the perception of geography Use of spatially aggregated psychological characteristics to explain geographical variation in social, economic and political outcomes
Predominant academic parent disciplines	Personality psychology, social psychology and cultural psychology	Behavioural geography, economic geography and environmental psychology

increasing recognition within psychology that environmental contexts are central, rather than tangential, to behaviours, thought processes and emotional experiences[14–17]. This has coincided with the big data revolution, as well as the availability of large-scale geo-tagged psychological data and diverse, fine-grained environmental metrics[18,19]. Similarly, new sub-strands of human, economic and political geography have been (re) discovering the importance of psychology for understanding spatial processes and human behaviours[20–22]. Together, these developments have inspired notable research activity and theorizing at the intersection of geography and psychology. Although the resultant theories are often persuasive (we spotlight several below and discuss how they converge, compare and contrast with the conceptual framework we are proposing here), they have typically been put forward by either geographers or psychologists—rarely, if ever, by both. As such, the adoption of any given theoretical model in this space is usually restricted to the discipline of origin. This has contributed to the evolution of two distinct—and in many ways disparate—research streams that we refer to as the study of geography in psychology and the study of psychology in geography.

The study of geography in psychology

Originating in psychology, the study of geography in psychology draws from geography in two important ways. First, it examines the influence of geographical variables on psychological variables. Second, it has begun to study psychology at the aggregate, spatial level, which is the general default in geography, rather than the disaggregate, individual level, which is the general default in psychology. Typical research questions include: how does the presence of mountains[23], oceans[24] or mild temperatures[25] influence residents' personalities; how does happiness vary across the USA[26]; and what are the political, economic, social and health-related implications of regional differences in personality trait mean levels[27,28]?

The study of psychology in geography

By contrast, originating in geography, the study of psychology in geography draws from psychology in two important ways. First, it examines the influence of psychological variables on geographical variables. Second, it has begun to study geography at the disaggregate, individual level, which is the general default in psychology, rather than at the aggregate, spatial level, which is the general default in geography. Typical research questions here include: how do individuals form cognitive maps of their physical environment[29,30]; and how does perceived cognitive and social distance—versus objectively measured, physical distance—affect innovation rates[31]?

Marrying the two research streams

Despite being rooted in distinct parent disciplines, paradigms and methods, the studies of geography in psychology and psychology in geography share substantial overlap in terms of the central research questions they pursue and would appear to naturally gravitate towards each other (Table 1). Both seek to study spatial patterns of human activity and explain: (1) how; (2) where; and (3) why these spatial patterns exist; and (4) what consequences they have. For example, both geographical psychologists[27,32,33] and economic geographers[34,35] have begun to study how regional differences in psychological phenomena affect political, economic, social and health-related macro-level outcomes. As such, there is good reason to expect the two research streams to converge organically, giving rise to an interdisciplinary field that combines the best of both worlds.

Instead, the studies of geography in psychology and psychology in geography have evolved into distinct fields with largely insular literatures, separate conferences and different methodologies. Even when researchers from both fields study the same questions, there is little cross-disciplinary reading and collaboration[3,12], constituting a status quo characterized by empirical overlap in the absence of theoretical and conceptual integration (for noteworthy exceptions, see refs. 36–38). This is a missed opportunity at best and an epistemological threat at worst.

In light of this, we argue that an overarching framework is needed to integrate theory and practice from geography and psychology and to organize existing research and guide future research[39]. Such a framework would need to be broad enough to incorporate the breadth and depth of the multidisciplinary base on which it rests, but also specific enough to inspire concrete research questions and hypotheses[12,40]. Failure to establish and operate within such overarching frameworks is already a pervasive problem in psychology and is partly responsible for the fragmented research landscape and widespread replication crisis[40]. This might be an especially fatal problem in the multidisciplinary context at hand where—inferring from the past century—hopes for geography and psychology to naturally gravitate towards a unified, cumulative science in the absence of an integrative framework are bound to be disappointed. To bridge the gap, here we propose the Geo–Psych Interactionist Framework.

The Geo–Psych Interactionist Framework

The Geo–Psych Interactionist Framework (Fig. 1) comprises three core dimensions that are visually represented along its three axes: psychological variables (*x* axis), geographical variables (*y* axis) and the

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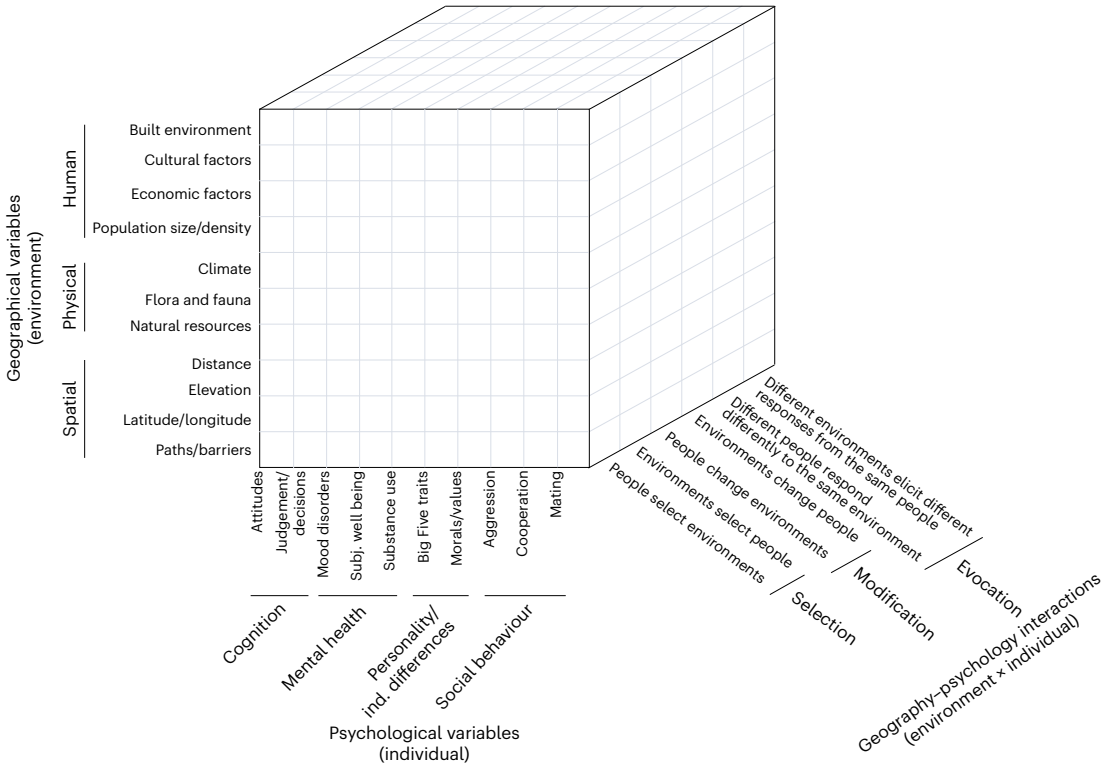

Fig. 1 | The Geo–Psych Interactionist Framework. The *x* axis shows the psychological variables, settled at the individual level. The *y* axis shows the geographical variables, settled at the environmental level. The *z* axis shows the geography–psychology interactions specifying the concrete type of interplay between environment and individual. Note that specific instances of overarching classes for geographical and psychological variables (for example, climate as an instance of physical geographical variables) are illustrative, rather than exhaustive. Ind., individual; subj., subjective.

person–environment interactions that connect them (*z* axis). As such, the dimensions are not conceptually orthogonal. Rather, the third axis (geography–psychology interactions) is a mechanistic explanation of the interplay between the first two axes[41] (that is, psychological variables and geographical variables). Each axis encompasses a comprehensive set of overarching classes of variables or interactions and an illustrative (that is, non-exhaustive) set of specific instances of these classes. In selecting the classes, we drew from scholarship across geography and psychology, to maximize coverage and representation within both disciplines while also seeking to keep the overall complexity of the model manageable to achieve broad appeal and utility. Reflecting the composition of the interdisciplinary research team that developed it, our interactionist framework puts geography and psychology on equal footing. We conceptualize the relationship of psychology and geography as mutually constitutive, departing from more disciplinarily bound accounts that tend to use one discipline as a mere instrument to explain the other (as discussed in ref. 15).

Turning to its specific architecture, the Geo–Psych Interactionist Framework features four broad classes of psychological variables: (1) cognitive variables, such as attitudes, judgement and decision-making, that capture central thought processes that humans engage in; (2) mental health variables, such as subjective well-being, mood disorders and substance abuse, that capture core aspects of psychological flourishing and maladjustment; (3) personality and individual differences variables, such as the 'Big Five' traits, morals and personal values, that capture relatively stable, characteristic ways of being that distinguish humans from one another; and (4) social behaviour variables, such as cooperation, aggression and mating, that capture central forms of human interactions with other humans.

Next, the model features three broad classes of geographical variables: (1) human variables, such as demographic, economic, political and cultural factors (including built environments), that capture aspects of human activity and influence manifesting as environmental properties; (2) physical variables, such as climate, flora and fauna and natural resources, that capture aspects of natural environments not primarily created by humans; and (3) spatial variables, such as distance, elevation and barriers, that describe spatial relationships between objects and events, regardless of their nature. We note that some phenomena can be conceptualized as either geographical or psychological factors, depending on the level at which they are considered. For instance, personality traits, such as openness, or social cognitions, such as racial bias, can operate both as an individual property of humans (that is, a psychological variable) and as a collective property of places and regions (that is, a geographical variable). Notably, previous research has shown that regional personality and regional bias do not merely represent an aggregation of individual-level scores. Rather, they constitute emergent phenomena that: (1) reflect the culture of a region[34,42,43] (that is, the practices, values and social institutions that distinguish an area[44]); (2) have unique outcomes that differ from their individual-level counterparts[45,46]; and (3) affect residents' behaviours[47], cognitions[48] and emotions[49] independent of an individual's personal traits and social cognitions.

Finally, our model features three primary types of person–environment interaction, each of which is further broken down into two specific variants, depending on whether the presumed causal force in the process is psychological (and thus bearing on geography) or geographical (and thus bearing on psychology): (1) evocation, which describes processes wherein the same people respond differently to different environments (that is, geography is the presumed causal force) or different people respond differently to the same environment (that is, psychology is the presumed causal force); (2) modification, which describes processes wherein environments change people (that is, geography is the presumed causal force) or people change environments (that is, psychology is the presumed causal

force); and (3) selection, which describes processes wherein environments select people (that is, geography is the presumed causal force) or people select environments (that is, psychology is the presumed causal force). We note that an important distinction between evocation and modification lies in their time specificity and context specificity. That is, evocation refers to the elicitation of temporary, situation-dependent changes that will revert once individuals leave the environment that evoked them, whereas modification refers to the manifestation of lasting, situation-independent changes that will persist even after individuals leave the environment in which they experienced or enacted change.

Capitalizing on this architecture, the Geo–Psych Interactionist Framework serves a dual purpose. On the one hand, it is designed to be an overarching descriptive framework that allows scholars to catalogue and summarize research at the intersection of geography and psychology in a structured, systematic manner, much like a periodic table. On the other hand, it functions as a straightforward blind spot detector that identifies unstudied connections between geography and psychology and helps researchers to derive new, testable hypotheses, much like a hypothesis generator. In what follows, we will zoom in on both of these aims.

Research systematization

We submit that using these three axes as a coordination system, researchers will be able to catalogue and categorize most—and hopefully all—research at the nexus of geography and psychology. As an illustration, Table 2 synthesizes and systematizes 40 findings from the extant empirical literature according to the organizing principles stipulated by the framework. In choosing these examples, we strove to represent a diverse array of geographical variables, psychological variables, person–environment interactions, research designs, authors and study populations so as to demonstrate the model's ability to easily accommodate a wide range of geographical–psychological research.

Hypothesis generation

The Geo–Psych Interactionist Framework aims to help to organize past and present research at the intersection of geography and psychology. However, the framework is more than merely an advanced file drawer. Its basic architecture can also be harnessed to guide future research. That is, the framework aims to function as a blind spot detector that can direct researchers to as-yet unexplored linkages between geography and psychology and help them to generate hypotheses that tackle—and close—empirical gaps in the literature. As an illustration, Table 3 exhibits ten concrete, novel and testable hypotheses about specific but currently unstudied links between geographical and psychological variables and the interactionist processes that connect them. In choosing these examples, once again, we sought to represent a diverse and non-overlapping range of empirical questions to showcase the model's ability to inform directions in each part of the geographical–psychological research spectrum.

Juxtaposition and integration with existing models

We believe that the Geo–Psych Interactionist Framework offers an innovative, versatile and principled map for thinking about how geography and psychology influence each other. At the same time, we are aware that we are not launching this conceptual framework into an empty space, but rather into a complex and rich landscape already populated with various theoretical models. To dismiss or ignore these theories and models would be antithetical to our goal of fostering an integrated, cumulative science at the nexus of geography and psychology[40,50]. Instead, we believe the interactionist framework's ability to fruitfully engage with—and integrate principles from—all of these diverse theoretical approaches is a litmus test of its utility as a unifying framework.

The Geo–Psych Interactionist Framework itself is committedly agnostic and intentionally refrains from imposing a single specific theoretical lens to guide hypothesis generation. As such, although we hope that the framework will serve scholars from all backgrounds equally in identifying empirical blind spots, we do not anticipate—or even hope—that it will lead all of them to derive the same predictions. In fact, we strive for broad compatibility with diverse mid-range and meta-theories within both psychology and geography, including, but not limited to, those reviewed below. This broad compatibility should—and hopefully will—result in differential, and at times contradictory, predictions. We consider this not a weakness but an explicit strength of our conceptual framework, which will promote strong inference through the testing of multiple competing hypotheses[51–53]. By design, testing multiple alternative hypotheses elicits thoroughness, buffers against self-serving cognitive biases and shifts the empirical emphasis from seeking confirmatory evidence to seeking contradictory evidence[53–55]. The framework could therefore spur on adversarial collaborations, wherein scientific opponents join forces to conduct an unbiased empirical test of their competing theories, which may in turn lead to enhanced theoretical consolidation, integration and refinement[56,57]. Thus, we hope our framework will help to integrate and catalyse—rather than obfuscate—theoretical developments in the field. In the following, we consider several prominent theoretical models at the intersection of geography and psychology and highlight how our conceptual framework relates to each of them.

Human–environment relations

Starting at least as long ago as the nineteenth century, geography as the study of "Earth as the home of humanity"[22] has often been interpreted to mean the study of "human–environment relations". The environment here refers to the natural environment—the physical environment not directly created by human actions. Various approaches have conceptually modelled human–environment relations in terms of one of three broad theoretical frameworks[58]. Although there is no single and unified academic discourse about it, environmental determinism posits that the physical environment exerts a strong and unmediated influence on human affairs. A prominent example of this is the claim that terrain and climate (related to altitude, barriers, currents, latitude, water bodies and so on) directly induce variations in human traits such as industriousness and creativity. Popular in the nineteenth and early twentieth century, environmental determinism has long been rejected within the discipline of geography. By stark contrast, cultural determinism/autonomy posits that the physical environment is a static backdrop for human activity, which can not only occur independent of physical factors such as climate but also substantially changes physical environments. According to this view, cultural and economic history and human agency are the main drivers of human activity. Finally, various flavours of human–environment interactionism, which is currently the most widely endorsed of the three frameworks in human geography, avoid single-factor explanations of human activity by recognizing that the physical environment constrains but does not absolutely determine human cultural and economic activities (possibilism), or that the physical environment makes some human activities more or less likely without absolutely dictating them (probabilism). Consistent with that, the Geo–Psych Interactionist Framework similarly avoids single-factor explanations of human activity and strong forms of determinism, whether genetic, cognitive or environmental, thus clearly expressing a flavour of human–environment interactionism. At the same time, our model is more detailed and specific about the mechanisms underlying these interactions. It especially presents a richer and more developed conceptualization of the role psychological variables have in the interaction.

Geography as the study of spatial relations

In the twentieth century, some geographers argued that the discipline should be closer to the sciences, such as biology, than to the humanities,

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Table 2 | Illustration of systematization of extant geographical-psychological research findings through the Geo–Psych Interactionist Framework

Geographical variable (class: variable)	Psychological variable (class: variable)	Mechanism (class: type)	Reference	Summary	Geographies covered
Human: built environment	Cognition: attitudes	Modification: people change environments	Ref. 81	Urban planners engage in public space regeneration to decrease fear of crime	Chile
Human: built environment	Personality/ individual differences: Big Five traits	Modification: people change environments	Ref. 82	Individuals design and decorate their living spaces to express and match their personalities	USA
Human: built environment	Mental health: positive and negative affect	Evocation: different environments elicit different responses from the same people	Ref. 83	Urban design interventions to increase green infrastructure boost individual affective well-being and this effect is especially pronounced in high-income areas	Chile
Human: cultural factors	Personality/ individual differences: Big Five traits	Evocation: different environments elicit different responses from the same people Modification: environments change people Selection: people select environments	Ref. 71	Experience sampling showed that: (1) individual personality predicted where people spent their time (for example, extraverted people were more likely to be at cafés and friends' houses); (2) places where people spent time elicited personality expressions matching situational cues and affordances of these places (for example, greater momentary extraversion when in cafés and friends' houses); and (3) places where people spent their time predicted lasting shifts in their personality (for example, people who generally spent more time in cafés and at friends' houses increased their general extraversion levels)	USA
Human: economic factors	Personality/ individual differences: morals/values	Modification: environments change people	Ref. 84	Growing up in an area with high economic adversity causally shapes long-term attitudes, such that adult individuals believe in more government intervention in jobs, are less progressive on gender issues and are less likely to support the Conservative Party	UK
Human: economic factors	Personality/ individual differences: morals/values	Evocation: different people respond differently to the same environment	Ref. 85	A randomized field experiment showed that neighbourhood-level exposure to wealth inequality drives support for wealth redistribution among individuals with a lower socioeconomic status	South Africa
Human: economic factors	Cognition: judgement/ decisions	Modification: environments change people	Ref. 86	Correlational and experimental analyses across 131 countries, 50 US states and over 300 Mechanical Turk workers showed that exposure to ambient economic hardship led to increased support for death penalties (versus imprisonment) by reducing the willingness to risk repeated offences	131 countries; 50 US states
Human: economic factors	Mental health: subjective well-being	Selection: environments select people	Ref. 87	Data across 18 annual measurements from the British Household Panel Survey showed that more psychologically distressed individuals were more likely to move from less deprived neighbourhoods to more deprived neighbourhoods, probably due to a lack of alternatives	UK
Human: economic factors Human: cultural factors	Personality/ individual differences: Big Five traits	Selection: people select environments Modification: environments change people	Ref. 88	Tracking 199 US cities over 9 years, this study found that rising housing costs and the concomitant increased availability of amenities boosted city-level openness both by attracting a disproportionate share of highly open newcomers and by raising openness levels among existing residents	USA
Human: economic factors	Personality/ individual differences: Big Five traits	Selection: people select environments Modification: environments change people	Ref. 89	Longitudinal analyses and simulations run on the Household, Income and Labour Dynamics in Australia Survey suggested that individuals high in openness and extraversion were especially likely to move to more affluent neighbourhoods and that living in affluent neighbourhoods boosted personal agreeableness and openness	Australia
Human: population size/ density	Cognition: attitudes	Evocation: different environments elicit different responses from the same people	Ref. 90	An experimental study found that exposure to high versus low population density cues led consumers to hold more positive attitudes towards luxury brands	USA
Human: population size/ density	Personality/ individual differences: morals/values	Evocation: different environments elicit different responses from the same people Modification: environments change people	Ref. 91	A combination of online experiments and archival survey research found that people who imagined living in a small community and people who lived in small communities around the world exhibited a greater concern for their reputation	65 countries

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Table 2 (continued) | Illustration of systematization of extant geographical-psychological research findings through the Geo–Psych Interactionist Model

Geographical variable (class: variable)	Psychological variable (class: variable)	Mechanism (class: type)	Reference	Summary	Geographies covered
Human: population size/ density	Social behaviour: cooperation	Evocation: different people respond differently to the same environment	Ref. 92	Experimental evidence showed that population density diminishes cooperation, but only among people who perceive lower social status or decreased resource availability	Singapore
Human: population size/ density	Mental health: mood disorders	Evocation: different people respond differently to the same environment	Ref. 93	A longitudinal study following 1,224 Finnish adults found that residency in densely populated, urban places (versus sparsely populated, rural places) was related to reduced depressive symptoms in individuals carrying the T/T or T/C genotype of the T102C polymorphism of *HTR2A*, but not in individuals carrying the C/C genotype	Finland
Human: population size/ density	Mental health: mood disorders	Modification: environments change people	Ref. 94	Functional magnetic resonance imaging data across three independent experiments demonstrated that living and growing up in densely populated urban areas leads to neural differences in social stress processing that are in turn linked to mood and anxiety disorders	Germany
Human: population size/ density	Mental health: substance use	Modification: environments change people	Ref. 95	Within- and between-person analyses of a prospective cohort study of over 3,000 young Finns found that people living in more densely populated areas were more likely to smoke and consume alcohol	Finland
Human: population size/ density	Social behaviour: mating	Evocation: different environments elicit different responses from the same people	Ref. 96	Correlational studies and experiments established that high population densities promote slower life history strategies, including greater long-term mating orientations, later marriage age, greater parental and educational investment and greater future orientation	Up to 223 geopolitical regions; 50 US states
	Cognition: judgement/ decisions	Modification: environments change people			
Human: population size/ density	Personality/ individual differences: Big Five traits	Selection: people select environments	Ref. 97	A study of nearly 20,000 Japanese adults observed that those high in openness were disproportionately more likely to choose to move to the Tokyo metropolitan area	Japan
Human: economic factors					
Human: cultural factors					
Physical: climate	Social behaviour: aggression	Evocation: different environments elicit different responses from the same people	Ref. 98	Over five South Korean summers, researchers observed that increasing temperatures consistently prompted rises in violent crime	South Korea
Physical: climate	Social behaviour: aggression	Evocation: different environments elicit different responses from the same people	Ref. 99	A field study in Phoenix, Arizona found a linear relationship between climatic discomfort and interpersonal hostility, such that on hotter days people were more likely to honk at other drivers	USA
Physical: climate	Cognition: judgement/ decisions	Evocation: different environments elicit different responses from the same people	Ref. 100	Nearly a decade of criminal arrest and prosecution data from Texas showed that when ruling on hot days, judges dismiss fewer cases, levy higher fines and issue longer prison sentences	USA
Physical: climate	Cognition: judgement/ decisions	Evocation: different people respond differently to the same environment	Ref. 101	In response to wildfire smoke, residents of high-income neighbourhoods were more likely to search for information on health protection, stay at home and be unhappy than residents of low-income neighbourhoods	USA
	Mental health: subjective well-being				
Physical: climate	Personality/ individual differences: Big Five traits	Modification: environments change people	Ref. 25	Large-scale analyses in China and the USA revealed that individuals who grew up in regions with more clement temperatures scored higher on agreeableness, conscientiousness, emotional stability, extraversion and openness	China and USA
Physical: flora and fauna	Mental health: subjective well-being	Evocation: different people respond differently to the same environment	Ref. 102	Spending time in forests and on forest-related activities boosted subjective well-being, particularly for individuals from less forested areas and with lower social capital	Japan
Physical: flora and fauna	Mental health: mood disorders	Modification: environments change people	Ref. 103	A twin study observed that greater access to green space buffers against depression	USA

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Table 2 (continued) | Illustration of systematization of extant geographical-psychological research findings through the Geo–Psych Interactionist Model

Geographical variable (class: variable)	Psychological variable (class: variable)	Mechanism (class: type)	Reference	Summary	Geographies covered
Physical: flora and fauna	Mental health: subjective well-being	Evocation: different environments elicit different responses from the same people	Ref. 104	Harnessing more than 1 million experience sampling data points from over 20,000 British residents, this study showed that individuals' momentary subjective well-being is significantly and substantially higher in natural green spaces than in built-up urban environments	UK
Physical: flora and fauna	Mental health: subjective well-being	Modification: environments change people	Ref. 105	A longitudinal study tracking over 10,000 British residents from 1991 to 2008 found that individuals reported higher well-being and lower mental distress when living in urban areas with more green space	UK
Physical: natural resources	Cognition: judgement/ decisions	Evocation: different environments elicit different responses from the same people Modification: environments change people	Ref. 106	Field studies and experiments with three Iranian samples and correlational work across 82 countries demonstrated that being exposed to water scarcity gives rise to increased long-term orientation and decreased indulgence	Iran; 82 countries
Physical: natural resources	Cognition: judgement/ decisions	Modification: environments change people	Ref. 107	Han Chinese from China's rice-growing south exhibit greater holistic and interdependent thinking than Han Chinese from the country's wheat-growing north	China
Physical: natural resources Human: economic factors	Personality/ individual differences: Big Five traits Mental health: subjective well-being	Modification: environments change people	Ref. 108	Archival economic records and present-day psychological data demonstrated that the historical presence of large-scale coal-based industries in the UK and USA has led to decreased conscientiousness, emotional stability, extraversion and life satisfaction among residents of these areas today	UK and USA
Spatial: paths/ barriers Spatial: distance	Social behaviour: mating	Evocation: different environments elicit different responses from the same people	Ref. 109	An analysis of 2015 abortion data from 1,948 US counties across 27 states found that greater travel distances to abortion services negatively and linearly predicted abortion rates	USA
Spatial: distance	Social behaviour: cooperation Cognition: judgement/ decisions	Evocation: different environments elicit different responses from the same people	Ref. 110	In a laboratory study and field experiments across five countries, video conferencing instead of in-person interaction inhibited the production of creative ideas (while it did not affect more routine tasks)	Finland, Hungary, India, Israel, Portugal and USA
Spatial: distance	Social behaviour: mating	Modification: environments change people	Ref. 111	Field studies among semi-nomadic pastoralists in northwestern Namibia found that regional remoteness favoured the formation of small, densely connected sexual networks, which in turn accelerated the spread of sexually transmitted infections	Namibia
Spatial: distance	Mental health: subjective well-being	Modification: environments change people	Ref. 112	Data from the nationally representative German Socio-Economic Panel study showed that regional remoteness (that is, distance to the nearest regional centres) predicted individual loneliness	Germany
Spatial: distance	Personality/ individual differences: Big Five traits	Selection: people select environments	Ref. 113	Among residents of the remote Italian Aegadian islands off the northwest coast of Sicily, people who were relatively extraverted and open to experience were more likely to emigrate to the mainland	Italy
Spatial: distance	Personality/ individual differences: morals/values	Selection: people select environments	Ref. 114	A study of German-speaking Europeans reported that individuals who valued universalism and self-direction moved further away from their parents' home than those who valued self-protection, tradition, security and conformity	Austria, Germany and Switzerland
Spatial: distance	Personality/ individual differences: Big Five traits	Selection: people select environments	Ref. 115	Two field studies found that people low (versus high) on extraversion were more likely to spend unexpected free time in secluded, distant places	USA
Spatial: elevation	Personality/ individual differences: Big Five traits	Evocation: different people respond differently to the same environment	Ref. 24	Correlational and experimental studies consistently showed that introverted people were happier in mountainous areas, whereas extraverted people preferred flat and open areas, such as beaches	USA

Table 2 (continued) | Illustration of systematization of extant geographical-psychological research findings through the Geo–Psych Interactionist Model

Geographical variable (class: variable)	Psychological variable (class: variable)	Mechanism (class: type)	Reference	Summary	Geographies covered
Spatial: elevation	Personality/individual differences: morals/values	Modification: environments change people	Ref. 116	Individuals living in mountainous areas were more likely to endorse conservation values (that is, conformity, security and tradition) and less likely to endorse hedonism	USA
Spatial: latitude/longitude	Cognition: attitudes	Modification: environments change people	Ref. 117	A combination of historical observation studies, contemporary survey studies and mixed-method studies showed that intergroup differentiation (that is, distinguishing between we groups and they groups) and discrimination peaks at the Equator and fades towards the poles	90 pre-industrial societies and up to 222 contemporary countries

such as history. This idea had always made sense for physical geography, which is essentially Earth science for those biophysical components of our planet near the surface with direct implications for humans. It was subsequently advocated as appropriate for human geography, too. In his 1962 book *Theoretical Geography*, William Bunge codified a theoretical agenda for geography as a science, positing space and spatiality as a unifying framework for understanding both human and physical geography[59]. Regardless of the underlying phenomena on the Earth's surface, spatial patterns related to location, distance, connectivity, movement direction, barriers and so on lead to similar spatial processes, and at the same time are caused by similar spatial processes. For instance, the so-called first law of geography states that "everything is related to everything else, but closer things are more related"[60]: closer phenomena, whether physical or human, are more likely to interact and thus tend to be more similar. The Geo–Psych Interactionist Framework recognizes the important role of spatial relations in explaining various aspects of human psychology, but does not limit the mechanisms of environmental influences to spatial relations, nor does it make such relations strictly determinative.

Socioecological theory

Socioecological theory[15] has been a trailblazer in the application of an objectivist lens to the predominantly subjectivist discipline of psychology. It is similar to our framework in promoting questions about how diverse objective properties of humans' physical and sociocultural environments—rather than just the perception and construal thereof—influence behaviours, cognitions and emotions, and vice versa. Like our framework, socioecological theory adopts a broader conceptualization of the environment, including not only physical elements but also sociological forces, such as cultural and economic conditions. It also distinguishes three basic procedural approaches to examine relationships between humans and their environments: (1) association studies, which establish statistical relationships between particular ecological and psychological variables; (2) process studies, which identify psychological mediators underlying associations between ecology–psychology variable pairs; and (3) niche construction studies, which show how psychological variables can transform ecological variables. Socioecological theory does not specify particular classes of ecological or psychological variables, nor does it define the exact types of mechanisms assumed to underlie their interactions. Hence, to get the best of both worlds, researchers may adopt a socioecological mindset, use the Geo–Psych Interactionist Framework to survey the relevant literature, identify blanks and derive testable research questions with concrete mechanistic pathways, and then refer back to socioecological theory to select an appropriate research design.

The theory of the emergence, persistence and expression of geographic variation in psychological characteristics

This theory[61] is an influential mid-range theory of how geography at large shapes one specific psychological factor, namely, personality traits and their spatial variation. It differentiates between three core mechanisms (that is, ecological influence, sociocultural influence and selective migration). The framework we present here incorporates these three core mechanisms as manifestations of specific person–environment interactions (that is, selective migration → selection: people select environments; sociocultural influence → modification: environments (human) change people; and ecological influence → modification: environments (spatial/physical) change people). At the same time, our interactionist framework is broader than that of Rentfrow et al.[61] in that it is not restricted to a single class of psychological variables and it explicitly considers bidirectional influences between psychology and geography.

Latitudinal psychology

Latitudinal psychology[62,63] is an attempt at a broad, exhaustive framework placing thermal climate at the heart of the geographical variation that matters for psychology. It builds on the fact that climatic conditions vary as a function of latitude, as is reflected in the presence of substantial north–south differences, but less so of longitude, as is reflected in the relative absence of substantial east–west differences. Latitudinal psychology uses north–south gradients as a measure of climate to explain variation in multifarious psychological variables. Rather than competing with existing mid-range theories, such as pathogen prevalence theory[64,65], latitudinal psychology posits that such theories simply describe the proximate mechanisms that connect latitude and psychology (for example, by considering parasite stress as a direct consequence of thermal climate). By comparison, our broader framework highlights latitude as one of many natural and physical elements of geography that influence human psychology. More importantly, our framework calls attention to how psychological traits are affected not only by the natural environment, but also by anthropogenic cultural, economic and demographic factors, thus offering a more complete picture. Finally, our framework is more specific than latitudinal psychology by explicitly considering the bidirectional influences between environments and humans and specifying concrete person–environment interactions.

Behavioural ecology of cultural psychological variation

Sng and colleagues[66] offered a model of how cultural variations might be linked to dimensions commonly studied by biologically oriented behavioural ecologists (that is, density, disease, mortality likelihood, relatedness, resources and sex ratio). The behavioural ecology model proposes that humans, similar to other organisms, respond to key features of ecology in adaptive ways. Drawing from research on non-human animals, this model makes numerous predictions about how systematic variation in ecological conditions across human societies should lead to corresponding patterns of cultural variation. Consistent with this view, recent analyses suggest that ecological conditions can explain a substantial portion of the variation in

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Table 3 | Illustration of the generation of new geographical–psychological research hypotheses through the Geo–Psych Interactionist Framework

Geographical variable (class: variable)	Psychological variable (class: variable)	Mechanism (class: type)	Prediction and rationale
Human: cultural factors	Social behaviour: aggression	Selection: people select environments	Aggressive individuals may choose to move to environments where aggression is culturally valued as a legitimate strategy to achieve success and may move away from environments where aggression is culturally condemned as an antisocial behaviour.
Human: economic factors	Mental health: subjective well-being	Selection: environments select people	In environments with a high-pressure work culture, people who are psychologically well adjusted will probably survive and thrive, whereas those who are less stable and mentally healthy will be unlikely to last.
Human: cultural factors	Mental health: mood disorders		
Human: population size/density	Personality/individual differences: morals	Modification: environments change people	In densely populated places, there is no shortage of other people. At the same time, the social organization is more complex and ambiguous (as opposed to in sparsely populated places where one can know everybody else and to some degree rely on getting along with everybody else). In such environments, it appears more adaptive to emphasize individualizing moral foundations (that is, care and fairness) that protect one's personal rights versus binding moral foundations (that is, loyalty, authority and purity) that protect group rights.
Human: population size/density	Personality/individual differences: values	Modification: environments change people	Growing up in a dense and diverse urban area may make individuals more open to ethnic diversity through a combination of mere exposure and intergroup contact, and this may explain why existing correlational studies find that people in large cities are more cosmopolitan than rural dwellers.
Human: population size/density	Social behaviour: mating	Evocation: different people respond differently to the same environment	People interested in unrestricted mating may respond more favourably to densely populated, urban settings (where there are more potential mates and there is more anonymity) than those interested in monogamous relationships, who may instead prefer sparsely populated, rural settings (where there are fewer potential mates to disrupt marital bonds).
Human: population size/density	Social behaviour: affiliation	Evocation: different environments elicit different responses from the same people	People may act more extraverted indoors around kin and less extraverted outdoors around strangers.
Physical: climate	Cognition: judgement/decision-making	Selection: people select environments	Individuals who do not believe in climate change may continue to migrate to places that those who do believe in climate change are leaving (for example, the low-lying coastal areas of Florida or the desert southwestern USA).
Physical: flora and fauna	Social behaviour: cooperation	Modification: people change environments	People high in prosociality may apply the same altruistic, other-oriented approach they adopt towards humans towards their ecosystems. This could play out at the micro level (for example, gardening) and at the macro level (for example, petitioning or lobbying for greater ecological preservation) and may thus manifest in a well-cared-for environment in places where many prosocial people live.
Spatial: paths/barriers	Social behaviour: cooperation	Evocation: different environments elicit different responses from the same people	In highly walkable environments (that is, those that do not have a lot of barriers), people are more likely to frequently bump into each other, which may foster social connection, a sense of belonging and neighbourhood cohesion, which in turn can lead to a higher likelihood of fellow residents helping each other out.
Spatial: distance	Mental health: substance use	Evocation: different people respond differently to the same environment	Staying in remote, socially isolated locations is more likely to pose a challenge for extraverted individuals, whose interpersonal needs will not be met, than introverted individuals, who do not experience these needs in the first place. To the degree that it is a common human coping strategy to self-medicate through substance use (for example, alcohol or marijuana), extraverted individuals in remote locations should be expected to resort to this at a higher rate than introverted individuals.

human cultural tendencies[66–69]. While our Geo–Psych Interactionist Framework is compatible with, but not reliant on, an evolutionarily informed fitness maximization account of why the observed person–environment interactions should occur, the behavioural ecology perspective is directly predicated upon this perspective. Both models include overlapping dimensions, but the Geo–Psych Interactionist Framework covers a broader set of geographical features (human, physical, and spatial), while also providing a more nuanced and bidirectional understanding of the relationships between environmental and psychological factors.

Moving forward

The Geo–Psych Interactionist Framework represents an organizing framework that is conceptually and methodologically compatible with and often complementary to—a diverse array of theoretical perspectives while also maintaining unique strengths, such as its integrative breadth, mechanistic specificity and balanced and interdisciplinary approach to the interplay of geography and psychology. As such, it could serve as a unifying conceptual framework that brings geographers and psychologists together as equals, enabling and encouraging us to develop a shared vocabulary, marvel at our agreements, reckon with our disagreements and actively coalesce our research efforts into a joint scientific agenda. Finding a shared vocabulary is especially important at a time when many of the biggest challenges that humankind is facing—such as climate change, population growth/shrinkage and rapid urbanization—are at the nexus of geography and psychology[70].

Of course, there are multiple fruitful avenues for further advancement at this intersection and we hope others will join us in pursuing them. One promising direction comprises thematic expansions of the Geo–Psych Interactionist Framework, particularly the inclusion of activity and time. The inclusion of activity may take the form of harnessing the increasing proliferation of experience sampling methods and mobile sensing research to pinpoint how the specific use of environments affects how individuals relate to them (for example, whether bustling cities or grand libraries evoke the same reactions based on whether people visit them for business or pleasure, or to study or socialize, respectively[71–73]). The inclusion of time may take the form of zooming in on: (1) seasonal variation of geographical and psychological phenomena and their interplay[74,75]; (2) shifting influences of geographical factors on individuals as a function of their own age and generational membership[76]; and (3) historical patterns of stability and change in person–environment interactions through the study of archival records and texts that stretch back centuries or even millennia[3,68,77,78].

In addition to thematic expansion, methodological enhancement represents another important step forward. That is, future research should harness the integrative and generative nature of the Geo–Psych Interactionist Framework to move from verbal and descriptive theories to formalized and predictive models[40,79]. This is difficult, but it can be done—as illustrated by a recent landmark paper that developed a predictive model of prejudice based on 18 studies with over 5,000 participants[80].

Whether we take this work further in any or all of these directions or advance it in entirely different ways, progress will require us to transcend traditional disciplinary boundaries. Going from theoretical to practical research integration will be a big step, and it will be a step out of disciplinary siloes and comfort zones. As such, we fully anticipate that it will not only be rewarding but also challenging for geographers and psychologists to grapple with their own preconceived notions, approaches and methodologies—and each other. With the benefit of the fresh experience of having just written this Perspective as an interdisciplinary team composed, in equal parts, of psychologists and geographers, we maintain that doing this is not only important; it is imperative.

References

1. About APA: frequently asked questions about the American Psychological Association. *APA* https://www.apa.org/support/about-apa (2025).
2. Gallagher, S. M. & Downs, R. M. *Geography for Life: National Geography Standards* 2nd edn (National Council for Geographic Education, 2012).
3. Atari, M., Henrich, J. & Schulz, J. The chronospatial revolution in psychology. *Nat. Hum. Behav.* https://doi.org/10.1038/s41562-025-02229-y (2025).
4. Gulliver, F. P. Orientation of maps. *J. Geogr.* **7**, 55–58 (1908).
5. Trowbridge, C. C. On fundamental methods of orientation and "imaginary maps". *Science* **38**, 888–897 (1913).
6. Cox, K. R. & Golledge, R. G. *Behavioral Problems in Geography: A Symposium* (Northwestern Univ. Press, 1969).
7. Golledge, R. G. & Rushton, G. *Spatial Choice and Spatial Behaviour* (Ohio State Univ. Press, 1976).
8. Proshansky, H. M., Ittelson, W. H. & Rivlin, L. G. *Environmental Psychology: Man and His Physical Setting* (Holt, Rinehart and Winston, 1970).
9. Gärling, T. & Evans, G. W. *Environment, Cognition, and Action: An Integrated Approach* (Oxford Univ. Press, 1991).
10. Gärling, T. & Golledge, R. G. *Behavior and Environment: Psychological and Geographical Approaches* (North Holland, 1993).
11. Golledge, R. G. & Stimson, R. J. *Analytical Behavioural Geography* (Croom Helm, 1987).
12. Kitchin, R. M., Blades, M. & Golledge, R. G. Relations between psychology and geography. *Environ. Behav.* **29**, 554–573 (1997).
13. Oishi, S. & Graham, J. Social ecology: lost and found in psychological science. *Perspect. Psychol. Sci.* **5**, 356–377 (2010).
14. Meagher, B. R. Ecologizing social psychology: the physical environment as a necessary constituent of social processes. *Pers. Soc. Psychol. Rev.* **24**, 3–23 (2020).
15. Oishi, S. Socioecological psychology. *Annu. Rev. Psychol.* **65**, 581–609 (2014).
16. Rentfrow, P. J. & Jokela, M. Geographical psychology: the spatial organization of psychological phenomena. *Curr. Dir. Psychol. Sci.* **25**, 393–398 (2016).
17. Van de Vliert, E., Conway, L. G. & Van Lange, P. A. M. Enriching psychology by zooming out to general mindsets and practices in natural habitats. *Perspect. Psychol. Sci.* **18**, 1198–1216 (2023).
18. Ebert, T., Götz, F. M., Mewes, L. & Rentfrow, P. J. Spatial analysis for psychologists: how to use individual-level data for research at the geographically aggregated level. *Psychol. Methods* **28**, 1100–1121 (2023).
19. Rentfrow, P. J. Geographical psychology. *Curr. Opin. Psychol.* **32**, 165–170 (2020).
20. Bunnell, T., Ng, H. & Yeo, S. J. I. Re-engaging psychology for (more) human geographies of the future. *Geogr. Compass* **17**, e12673 (2023).
21. Garretsen, H. & Stoker, J. I. Economic geography meets psychology: motivation, results, design and agenda. *Curr. Res. Ecol. Soc. Psychol.* **4**, 100121 (2023).
22. Montello, D. R. *Handbook of Behavioral and Cognitive Geography* (Edward Elgar Publishing, 2018).
23. Götz, F. M., Stieger, S., Gosling, S. D., Potter, J. & Rentfrow, P. J. Physical topography is associated with human personality. *Nat. Hum. Behav.* **4**, 1135–1144 (2020).
24. Oishi, S., Talhelm, T. & Lee, M. Personality and geography: introverts prefer mountains. *J. Res. Personal.* **58**, 55–68 (2015).
25. Wei, W. et al. Regional ambient temperature is associated with human personality. *Nat. Hum. Behav.* **1**, 890–895 (2017).
26. Rentfrow, P. J., Mellander, C. & Florida, R. Happy states of America: a state-level analysis of psychological, economic, and social well-being. *J. Res. Personal.* **43**, 1073–1082 (2009).
27. Ebert, T. et al. Are regional differences in psychological characteristics and their correlates robust? Applying spatial-analysis techniques to examine regional variation in personality. *Perspect. Psychol. Sci.* **17**, 407–441 (2022).
28. Xu, L. et al. Does a small country have meaningful regional personality differences? The case of Estonia. *J. Personal.* https://doi.org/10.1111/jopy.13013 (2025).
29. Downs, R. M. & Stea, D. *Image and Environment* (Aldine Publishing Company, 1973).

30. Kitchin, R. & Freundschuh, S. *Cognitive Mapping: Past, Present, and Future* (Routledge, 2000).
31. Boschma, R. Proximity and innovation: a critical assessment. *Reg. Stud.* **39**, 61–74 (2005).
32. Peters, H. et al. Regional personality differences predict variation in early COVID-19 infections and mobility patterns indicative of social distancing. *J. Pers. Soc. Psychol.* **124**, 848–872 (2023).
33. Reimer, N. et al. Moral values predict county-level COVID-19 vaccination rates in the United States. *Am. Psychol.* **77**, 743–759 (2022).
34. Huggins, R. & Thompson, P. The behavioural foundations of urban and regional development: culture, psychology and agency. *J. Econ. Geogr.* **19**, 121–146 (2019).
35. Rodríguez-Pose, A. & Storper, M. Better rules or stronger communities? On the social foundations of institutional change and its economic effects. *Econ. Geogr.* **82**, 1–25 (2006).
36. Garretsen, H., Stoker, J. I., Soudis, D., Martin, R. L. & Rentfrow, P. J. Brexit and the relevance of regional personality traits: more psychological openness could have swung the regional vote. *Camb. J. Reg. Econ. Soc.* **11**, 165–175 (2018).
37. Garretsen, H., Stoker, J. I., Soudis, D., Martin, R. & Rentfrow, J. The relevance of personality traits for economic growth: making space for psychological factors. *J. Econ. Geogr.* **19**, 541–565 (2019).
38. Mewes, L. et al. Psychological openness and the emergence of breakthrough vs. incremental innovations: a regional perspective. *Econ. Geogr.* **98**, 379–410 (2022).
39. Hruschka, D. J., Medin, D. L., Rogoff, B. & Henrich, J. Pressing questions in the study of psychological and behavioral diversity. *Proc. Natl Acad. Sci. USA* **115**, 11366–11368 (2018).
40. Muthukrishna, M. & Henrich, J. A problem in theory. *Nat. Hum. Behav.* **3**, 221–229 (2019).
41. Kenrick, D. T., Neuberg, S. L., Cialdini, R. B. & Lundberg-Kenrick, D. E. *Social Psychology: Goals in Interaction* 7th edn (Pearson, 2020).
42. Calanchini, J. et al. in *Advances in Experimental Social Psychology* Vol. 66 (ed. Gawronski, B.) 281–337 (Academic Press, 2022).
43. Payne, B. K. & Hannay, J. W. Implicit bias reflects systemic racism. *Trends Cogn. Sci.* **25**, 927–936 (2021).
44. Lu, J. G., Benet-Martínez, V. & Wang, L. C. A socioecological–genetic framework of culture and personality: their roots, trends, and interplay. *Annu. Rev. Psychol.* **74**, 363–390 (2023).
45. Payne, B. K., Vuletich, H. A. & Lundberg, K. B. The bias of crowds: how implicit bias bridges personal and systemic prejudice. *Psychol. Inq.* **28**, 233–248 (2017).
46. Suliteanu, J., Ofosu, E. K., Domingues, A. P. & Hehman, E.Prejudice and stereotypes at regional and individual levels: related but distinct. *J. Pers. Soc. Psychol.* **128**, 807–820 (2025).
47. Ebert, T., Götz, F. M., Gladstone, J. J., Müller, S. R. & Matz, S. C. Spending reflects not only who we are but also who we are around: the joint effects of individual and geographic personality on consumption. *J. Pers. Soc. Psychol.* **121**, 378–393 (2021).
48. Schilling, M., Roulin, N., Obschonka, M. & König, C. J. Do you fake more because of your neighbors? A multi-level study on regional and individual predictors of faking intentions across the USA. *J. Bus. Psychol.* **36**, 193–209 (2020).
49. Stavrova, O. How regional personality affects individuals' life satisfaction: a case of emotional contagion? *J. Res. Personal.* **58**, 1–5 (2015).
50. Mischel, W. The toothbrush problem. *APS Observer* https://www.psychologicalscience.org/observer/the-toothbrush-problem (2008).
51. Chamberlin, T. C. The method of multiple working hypotheses. *Science* **15**, 92–96 (1890).
52. Meehl, P. E. Appraising and amending theories: the strategy of Lakatosian defense and two principles that warrant it. *Psychol. Inq.* **1**, 108–141 (1990).
53. Platt, J. R. Strong inference. *Science* **146**, 347–353 (1964).
54. Betini, G. S., Avgar, T. & Fryxell, J. M. Why are we not evaluating multiple competing hypotheses in ecology and evolution? *R. Soc. Open Sci.* **4**, 160756 (2017).
55. Cleeremans, A. Theory as adversarial collaboration. *Nat. Hum. Behav.* **6**, 485–486 (2022).
56. Ceci, S. J., Clark, C. J., Jussim, L. & Williams, W. M. Adversarial collaboration: an undervalued approach in behavioral science. *Am. Psychol.* https://doi.org/10.1037/amp0001391 (2024).
57. Kahneman, D. Experiences of collaborative research. *Am. Psychol.* **58**, 723–730 (2003).
58. Moran, E. F. & Brondízio, E. S. in *Human–Environment Interactions* Vol. 1 (eds Brondízio, E. S. & Moran, E. F.) 1–24 (Springer, 2013).
59. Bunge, W. *Theoretical Geography* (CWK Gleerup, 1962).
60. Tobler, W. R. A computer movie simulating population growth in the Detroit region. *Econ. Geogr.* **42**, 234–240 (1970).
61. Rentfrow, P. J., Gosling, S. D. & Potter, J. A theory of the emergence, persistence, and expression of geographic variation in psychological characteristics. *Perspect. Psychol. Sci.* **3**, 339–369 (2008).
62. Van de Vliert, E. & van Lange, P. A. M. Latitudinal psychology: an ecological perspective on creativity, aggression, happiness, and beyond. *Perspect. Psychol. Sci.* **14**, 860–884 (2019).
63. Van de Vliert, E. & van Lange, P. A. Latitudinal gradients as scientific tools for psychologists. *Curr. Opin. Psychol.* **32**, 43–46 (2020).
64. Fincher, C. L. & Thornhill, R. Parasite-stress promotes in-group assortative sociality: the cases of strong family ties and heightened religiosity. *Behav. Brain Sci.* **35**, 61–79 (2012).
65. Schaller, M. & Murray, D. R. Pathogens, personality, and culture: disease prevalence predicts worldwide variability in sociosexuality, extraversion, and openness to experience. *J. Pers. Soc. Psychol.* **95**, 212–221 (2008).
66. Sng, O., Neuberg, S. L., Varnum, M. E. W. & Kenrick, D. T. The behavioral ecology of cultural psychological variation. *Psychol. Rev.* **125**, 714–743 (2018).
67. Kenrick, D. T. & Gomez-Jacinto, L. in *Advances in Culture and Psychology* Vol. 4 (eds Gelfand, M. J. Chiu, C.-Y. & Hong, Y.-Y.) 78–123 (Oxford Univ. Press, 2014).
68. Varnum, M. E. W. & Grossmann, I. Cultural change: the how and the why. *Perspect. Psychol. Sci.* **12**, 956–972 (2017).
69. Wormley, A. S., Kwon, J. Y., Barlev, M. & Varnum, M. E. W. How much cultural variation around the globe is explained by ecology? *Proc. R. Soc. B* **290**, 20230485 (2023).
70. Abbiasov, T. et al. The 15-minute city quantified using human mobility data. *Nat. Hum. Behav.* **8**, 445–455 (2024).
71. Matz, S. C. & Harari, G. M. Personality–place transactions: mapping the relationships between Big Five personality traits, states, and daily places. *J. Pers. Soc. Psychol.* **120**, 1367–1385 (2021).
72. Aday, A. et al. The SAFE model: state authenticity as a function of three types of fit. *Pers. Soc. Psychol. Bull.* https://doi.org/10.1177/01461672231223597 (2024).
73. Harari, G. M. & Gosling, S. D. Understanding behaviours in context using mobile sensing. *Nat. Rev. Psychol.* **2**, 767–779 (2023).
74. Hohm, I., Wormley, A. S., Schaller, M. & Varnum, M. E. W.*Homo temporus*: seasonal cycles as a fundamental source of variation in human psychology. *Perspect. Psychol. Sci.* **19**, 151–172 (2024).
75. Hohm, I., O'Shea, B. A. & Schaller, M. Do moral values change with the seasons? *Proc. Natl Acad. Sci. USA* **121**, e2313428121 (2024).
76. Chopik, W. J. A space–time theory of psychological development. *Curr. Res. Ecol. Soc. Psychol.* **4**, 100085 (2023).
77. Atari, M. & Henrich, J. Historical psychology. *Curr. Dir. Psychol. Sci.* **32**, 176–183 (2023).

78. Varnum, M. E. W., Baumard, N., Atari, M. & Gray, K. Large language models based on historical text could offer informative tools for behavioral science. *Proc. Natl Acad. Sci. USA* **121**, e2407639121 (2024).
79. Smaldino, P. E. How to translate a verbal theory into a formal model. *Soc. Psychol.* **51**, 207–218 (2020).
80. Hehman, E. & Neel, R. Prejudice model 1.0: a predictive model of prejudice. *Psychol. Rev.* **131**, 1235–1265 (2024).
81. Navarrete-Hernandez, P., Luneke, A., Truffello, R. & Fuentes, L. Planning for fear of crime reduction: assessing the impact of public space regeneration on safety perceptions in deprived neighborhoods. *Landsc. Urban Plan.* **237**, 104809 (2023).
82. Gosling, S. D., Ko, S. J., Mannarelli, T. & Morris, M. E. A room with a cue: personality judgments based on offices and bedrooms. *J. Pers. Soc. Psychol.* **82**, 379–398 (2002).
83. Navarrete-Hernandez, P. & Laffan, K. The impact of small-scale green infrastructure on the affective wellbeing associated with urban sites. *Sci. Rep.* **13**, 9687 (2023).
84. McNeil, A., Luca, D. & Lee, N. The long shadow of local decline: birthplace economic adversity and long-term individual outcomes in the UK. *J. Urban Econ.* **136**, 103571 (2023).
85. Sands, M. L. & de Kadt, D. Local exposure to inequality raises support of people of low wealth for taxing the wealthy. *Nature* **586**, 257–261 (2020).
86. Williams, K. E., Votruba, A. M., Neuberg, S. L. & Saks, M. J. Capital and punishment: resource scarcity increases endorsement of the death penalty. *Evol. Hum. Behav.* **40**, 65–73 (2019).
87. Jokela, M. Does neighbourhood deprivation cause poor health? Within-individual analysis of movers in a prospective cohort study. *J. Epidemiol. Community Health* **69**, 899–904 (2015).
88. Götz, F. M. et al. Local housing market dynamics predict rapid shifts in cultural openness: a 9-year study across 199 cities. *Am. Psychol.* **76**, 947–961 (2021).
89. Jokela, M. Selective residential mobility and social influence in the emergence of neighbourhood personality differences: longitudinal data from Australia. *J. Res. Personal.* **86**, 103953 (2020).
90. Otterbring, T., Folwarczny, M. & Tan, L. K. L. Populated places and conspicuous consumption: high population density cues predict consumers' luxury linked brand attitudes. *Front. Psychol.* **12**, 728903 (2021).
91. Danielson, S. W., Stewart, E. & Vonasch, A. The morality map: does living in a smaller community cause greater concern for moral reputation? *Curr. Res. Ecol. Soc. Psychol.* **4**, 100120 (2023).
92. Tan, L. K., Li, N. P. & Tan, K. Cash, crowds, and cooperation: the effects of population density and resource scarcity on cooperation in the dictator game. *Evol. Hum. Behav.* **45**, 106581 (2024).
93. Jokela, M., Lehtimäki, T. & Keltikangas-Järvinen, L. The influence of urban/rural residency on depressive symptoms is moderated by the serotonin receptor 2A gene. *Am. J. Med. Genet. B Neuropsychiatr. Genet.* **144B**, 918–922 (2007).
94. Lederbogen, F. et al. City living and urban upbringing affect neural social stress processing in humans. *Nature* **474**, 498–501 (2011).
95. Airaksinen, J. et al. Neighbourhood effects in health behaviours: a test of social causation with repeat-measurement longitudinal data. *Eur. J. Public Health* **26**, 417–421 (2015).
96. Sng, O., Neuberg, S. L., Varnum, M. E. W. & Kenrick, D. T. The crowded life is a slow life: population density and life history strategy. *J. Pers. Soc. Psychol.* **112**, 736–754 (2017).
97. Yoshino, S. & Oshio, A. Personality and migration in Japan: examining the tendency of extroverted and open people to migrate to Tokyo. *J. Res. Personal.* **96**, 104168 (2022).
98. Heo, S., Choi, H. M., Lee, J. & Bell, M. L. A nationwide time-series analysis for short-term effects of ambient temperature on violent crime in South Korea. *Sci. Rep.* **14**, 3210 (2024).
99. Kenrick, D. T. & MacFarlane, S. W. Ambient temperature and horn honking. *Environ. Behav.* **18**, 179–191 (1986).
100. Behrer, A. P. & Bolotnyy, V. Heat and law enforcement. *PNAS Nexus.* **3**, pgad425 (2024).
101. Burke, M. et al. Exposures and behavioural responses to wildfire smoke. *Nat. Hum. Behav.* **6**, 1351–1361 (2022).
102. Takahashi, T. et al. Effects of forests and forest-related activities on the subjective well-being of residents in a Japanese watershed: an econometric analysis through the capability approach. *For. Policy Econ.* **139**, 102723 (2022).
103. Cohen-Cline, H., Turkheimer, E. & Duncan, G. E. Access to green space, physical activity and mental health: a twin study. *J. Epidemiol. Community Health* **69**, 523–529 (2015).
104. MacKerron, G. & Mourato, S. Happiness is greater in natural environments. *Glob. Environ. Change* **23**, 992–1000 (2013).
105. White, M. P., Alcock, I., Wheeler, B. W. & Depledge, M. H. Would you be happier living in a greener urban area? A fixed-effects analysis of panel data. *Psychol. Sci.* **24**, 920–928 (2013).
106. Harati, H. & Talhelm, T. Cultures in water-scarce environments are more long-term oriented. *Psychol. Sci.* **34**, 754–770 (2023).
107. Talhelm, T. et al. Large-scale psychological differences within China explained by rice versus wheat agriculture. *Science* **344**, 603–608 (2014).
108. Obschonka, M. et al. In the shadow of coal: how large-scale industries contributed to present-day regional differences in personality and well-being. *J. Pers. Soc. Psychol.* **115**, 903–927 (2018).
109. Thompson, K. M. J., Sturrock, H. J. W., Foster, D. G. & Upadhyay, U. D. Association of travel distance to nearest abortion facility with rates of abortion. *JAMA Netw. Open* **4**, e2115530 (2021).
110. Brucks, M. & Levav, J. Virtual communication curbs creative idea generation. *Nature* **605**, 108–112 (2022).
111. Hazel, A. & Jones, J. H. Remoteness influences access to sexual partners and drives patterns of viral sexually transmitted infection prevalence among nomadic pastoralists. *PLoS ONE* **13**, e0191168 (2018).
112. Buecker, S., Ebert, T., Götz, F. M., Entringer, T. M. & Luhmann, M. In a lonely place: investigating regional differences in loneliness. *Soc. Psychol. Pers. Sci.* **12**, 147–155 (2021).
113. Ciani, A. C. & Capiluppi, C. Gene flow by selective emigration as a possible cause for personality differences between small islands and mainland populations. *Eur. J. Pers.* **25**, 53–64 (2011).
114. Stieger, S. & Lewetz, D. Parent–child proximity and personality: basic human values and moving distance. *BMC Psychol.* **4**, 26 (2016).
115. Oishi, S. & Choi, H. Personality and space: introversion and seclusion. *J. Res. Pers.* **85**, 103933 (2020).
116. Stieger, S., Götz, F. M., Wilson, C., Volsa, S. & Rentfrow, P. J. A tale of peaks and valleys: sinusoid relationship patterns between mountainousness and basic human values. *Soc. Psychol. Pers. Sci.* **13**, 390–402 (2022).
117. Van De Vliert, E. The global ecology of differentiation between us and them. *Nat. Hum. Behav.* **4**, 270–278 (2019).

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