



Can we get human nature right?

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Few questions in science are as controversial as human nature. At stake is whether our basic concepts and emotions are all learned from experience, or whether some are innate. Here, I demonstrate that reasoning about innateness is biased by the basic workings of the human mind. Psychological science suggests that newborns possess core concepts of “object” and “number.” Laypeople, however, believe that newborns are devoid of such notions but that they can recognize emotions. Moreover, people presume that concepts are learned, whereas emotions (along with sensations and actions) are innate. I trace these beliefs to two tacit psychological principles: intuitive dualism and essentialism. Essentialism guides tacit reasoning about biological inheritance and suggests that innate traits reside in the body; per intuitive dualism, however, the mind seems ethereal, distinct from the body. It thus follows that, in our intuitive psychology, concepts (which people falsely consider as disembodied) must be learned, whereas emotions, sensations, and emotions (which are considered embodied) are likely innate; these predictions are in line with the experimental results. These conclusions do not speak to the question of whether concepts and emotions are innate, but they suggest caution in its scientific evaluation.

innateness | dualism | essentialism | concepts | intuitive psychology

Where does knowledge come from? How do abstract concepts such as “object” and “number” arise in humans? For instance, how do infants recognize that objects cannot move on their own, whereas agents can? How do we come to contrast good and bad, happy and sad?

These questions have preoccupied humans for millennia. One position attributes these notions to human nature (1), another to nurture (2). But despite advances in science and technology, modern psychological science still debates the question of innateness (3–12). The nature–nurture wars, it seems, just won’t go away (13, 14).

Here, I do not presume to settle the controversy. Instead, I explore why it is so difficult to resolve. Recent findings (15–20) suggest a novel explanation for the ceaseless intellectual battle: Our troubles with human nature arise from psychological biases that plague the human inquirer (21). To advance our grasp of human nature, we thus ought to take a hard look within ourselves. But, before we do so, let us first spell out what, exactly, is under debate in psychological science. Having clarified the scientific question, we will

then move to consider laypeople’s intuitions on the topic and their causes.

The Nature–Nurture Debate in Psychology

Like many other question in science, the roles of nature and nurture can be studied at multiple levels of analysis, ranging from genetics to the social sciences. Unsurprisingly, the analysis at the psychological level does not directly reduce to the level of genes (22).

In psychology, the nature–nurture debate has contrasted two competing hypotheses (14, 22–27). One asserts that our concepts and emotions are acquired by learning from experience (24, 26, 27). For example, to recognize that objects are solid, cohesive entities that move by contact, infants must observe many object launches and from these experiences tacitly extract some regularities based on general learning mechanisms (e.g., association or analogical reasoning). The alternative position asserts that some core psychological primitives (e.g., the cognitive primitive “object”) are available to us innately, without the need to learn them from experience (23, 28–31). This latter view predicts that newborn infants would have some

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expectations about what objects are and how they would move upon contact with other objects, even prior to having seen such collisions and the objects' trajectories (32).

To be clear, these two views are not mutually exclusive. For example, the fact that words (e.g., "dog") are learned from experience does not preclude the possibility that language structure is partly innate. The scientific task ahead, then, is not to decide between innateness and learning generally, but rather to detail which specific aspects of the human psyche must be learned and which others are innate.

But in the eyes of some, the innateness hypothesis is incoherent. Some researchers worry that notions such as "object" are ethereal (33), so they cannot possibly affect behavior, and their acquisition cannot be controlled by genes. Others reject the contrast between nature and nurture on the grounds that genes and the environment interact (24) so innateness is intractable, perhaps even meaningless (34, 35). However, these objections are ill-founded.

First, psychological concepts like "object" are not ethereal entities but units of information that are encoded by a physical medium (36–41). Much like genes are the carriers of hereditary information (42), the notion of "object" is carried by some physical signaling mechanism in the brain. While the full neural and genetic details are unknown that is not to say they do not exist, and that innateness cannot be studied scientifically. Just as Mendel unveiled the functional principles of inheritance nearly a century prior to the discovery of the structure of DNA, so too can one examine the innateness of concepts and emotions at the functional, psychological level.

Second, gene x environment interactions do not obviate the psychological question of innateness (13). If newborns do, in fact, possess an innate notion of "object," then, at the biological level, it likely arises from the interactions of genes and experience, just like the anatomy of their body (e.g., their five fingers). This interaction, however, does not provide a psychological explanation for how concepts like "object" arise; psychological innateness is not a synonym for "genes," nor does "learning" reduce to "environment" (13, 22, 23, 43). Yet, the question of psychological innateness is perfectly coherent. Just as it is entirely reasonable for a scientist to ask whether "having five fingers" is an inherited anatomical trait in humans (as opposed to, say, a scratch on the arm), so it is perfectly plausible to contrast between psychological traits that are possibly innate (e.g., the notion of an object) and ones that are clearly not (e.g., the English word for "dog"). In fact, rejecting the notion of psychological innateness obscures not only the role of nature but also of nurture (13).

Do We Get Human Nature Right?

The psychological question of "innateness," then, is perfectly well-defined, and it has been intensely studied. However, scientific consensus on this topic is nowhere in sight. Why is "innateness" such a difficult question? Could these difficulties arise, in part, from cognitive barriers that lie within the human psyche?

The possibility that cognitive barriers might impede scientific progress is not new, and it is not specific to reasoning about innateness. Scientists have long recognized that their conclusions could be tacitly swayed by general psychological biases, such as the experimenter expectancy effect [e.g., a bias to accept an expected outcome as true (44)], and they have taken steps to mitigate against them (e.g., double-blind designs). Biases can also arise from tacit intuitive theories about physics and biology (45);

these effects have been demonstrated in reasoning about topics such as evolution (46–49), impetus (50), and psychology (51, 52).

Here, I examine whether psychological biases could likewise cloud reasoning about psychological innateness. To be clear, the possibility that such biases exist says nothing about whether psychological traits are, in fact, innate. I certainly do not wish to suggest that, if people are biased, then psychological innateness is vindicated. But if such biases do sway our understanding of innateness, then we need to recognize them. To combat such tendencies, we ought to take a hard look within ourselves.

Laypeople's Intuitions about Innateness

To find out whether laypeople's reasoning about a scientific topic is biased, one would typically compare laypeople's understanding with the outcomes established by science. But when it comes to innateness, this is difficult to do, as the scientific community has not reached a consensus on the nature–nurture debate. Certainly, one cannot cry foul simply because people land on one's unfavorable side of the innateness debate; as noted, its true victor is unknown.

To shed light on laypeople's innateness intuitions, we will thus adopt a different strategy. Rather than evaluating the veracity of laypeople's conclusions about innateness (i.e., as a putative cause of human behavior), we can ask them to predict how participants would respond in specific circumstances (i.e., to predict human behavior itself). For example, one could present people with descriptions of published psychological experiments (complete with methods and rationale) and invite them to predict the outcomes: How would naïve participants (such as young infants and remote hunter-gatherers) respond to novel stimuli they have never encountered before?

Here, the scientific facts are well-established (i.e., it is well known how newborns respond in specific settings), so these facts offer a benchmark for assessing human intuitions. If people believe these traits are innate, then they might expect them to emerge even when learning is not possible. To the extent that laypeople's judgments systematically diverge from the scientific facts, a psychological bias seems likely. Results show that such divergence indeed exists, and it is quite striking.

People assume that emotional facial expressions can be recognized spontaneously, in advance of experience (15, 16). For example, they predict that newborns prefer happy faces to angry ones (15); research does not support this intuition (53). Laypeople are further convinced that a hunter-gatherer can spontaneously recognize Westerners' emotional facial expressions (16). The scientific evidence here is mixed, as some studies indicate they can (12, 54–57) and others that they cannot (11, 58–60). To be clear, these null results do not demonstrate that emotional facial expressions, let alone emotions per se, are fully learned (and there are reasons to suspect they are not (61–66)). However, for laypeople, the controversy is settled. Laypeople maintain that emotional facial expressions are universal and that they emerge at birth (15, 16).

Interestingly, when it comes to abstract ideas (propositions, e.g. "objects are cohesive," and concepts, e.g. "object" and "number"), laypeople's intuitions are markedly different (15, 17, 18). Consider number, for example. Can newborns recognize that four lights and four tones share the same abstract number? Experiments to answer these questions have been conducted, and the results are resoundingly affirmative (67). Laypeople, however, contend that infants will fail (15). In their (erroneous) estimation, these notions do not arise before the second year of life (18).

Moreover, when participants are asked to indicate whether these ideas are innate or not (and innateness is defined as in *The Nature–Nurture Debate in Psychology*), they insist they are not (15, 18), but assert that emotions are (16). Whether these conclusions are true is controversial, but as we will shortly see (in *The Line of Evidence*), the logic that supports them is demonstrably faulty.

Laypeople, then, hold strong intuitions about human nature, and their attitudes bifurcate for “hot emotions” and “cold ideas.” Emotions, people believe, are innate, whereas ideas must be learned. How do such attitudes arise?

It’s a Perfect Cognitive Storm

Several previous proposals have sought to explain laypeople’s innateness intuitions. One possibility is that people reject innateness because they might be worried that it promotes social discrimination (23). People could also deny innateness because they consider infants to be inert, or because they fixate on their own learning experiences at school (18). Finally, people could reject innateness because they believe that what they know arises solely from three sources (their sensations, inferences, and communications with others), so they see no need to consider an additional innate origin (68).

While all these factors could contribute to our innateness intuitions, they are insufficient to explain them. Indeed, each of these proposals explains only half of what needs explaining. They account for why people shy away from innateness. But as shown above, laypeople’s intuitions bifurcate for emotions and ideas. The challenge, then, is to explain why it is that we reject innate ideas, but embrace innate emotions.

New research (15–17, 19, 20) traces these intuitions to a psychological dissonance. The dissonance arises from the collision between two fundamental psychological principles: intuitive dualism and essentialism (21). Both principles are intuitive (unlike the philosophical doctrines that share those names), they operate entirely “under the hood,” even in small-scale societies (69–72), in children (69, 70, 73, 74), and, possibly, in infants (75–78). However, they demonstrably meddle with our understandings of the physical (50), natural (45–47), and social worlds (79, 80), and, critically, of ourselves (19, 21).

Consider the first suspect, essentialism. A large literature suggests that laypeople believe that living things are what they are because of their inborn essence (81–84). When children consider biological inheritance (e.g., why is the puppy brown, like its mother?), they reason that the offspring acquires a tiny piece of matter from its biological parents (73). Similarly, children (83) and infants (76) believe that an animal’s essence resides in its insides, centered in its body (85), and possibly linked to some bodily substance (e.g., blood) (86, 87). This suggests that, per essentialism, innate traits must be firmly embodied (85, 88–90).

People, however, are also intuitive dualists (75)—they tacitly consider the mind as being distinct from the body (17, 70, 91–97). For example, children and adults believe that the mind can leave the body of one creature and transfer into another (70, 93), and that ideas persist after death, despite the body’s demise (17, 94). Per intuitive dualism, then, ideas are disembodied (17, 21).

Now, if, per essentialism, innate traits must be in the body, whereas per intuitive dualism, ideas are disembodied (in the mind), then intuitively ideas cannot be innate (see Fig. 1). Intuitive dualism and essentialism thus collide to form a perfect cognitive storm. Our innateness intuitions could be its casualties.

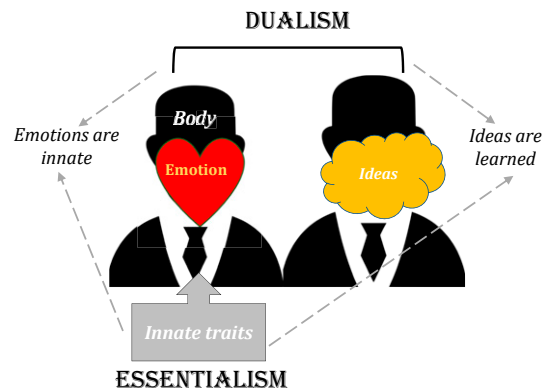


Fig. 1. Laypeople’s intuitions about innateness.

The Line of Evidence

The dissonance between intuitive dualism and essentialism explains why emotions and ideas elicit such conflicting reactions. The divergence, I argue, arises because emotions are perceived as firmly embodied, whereas ideas are not.

The possibility that any psychological traits would be perceived as embodied might appear curious, as overall, the psyche certainly seems more ethereal than the body. But compared with each other, some psychological traits seem more embodied than others. Emotions, actions, and sensations seem to be anchored in the body: We believe we hear “with our ears,” walk “with our feet,” and express our emotions on our faces and internally (one’s “nervous stomach”), but for ideas (e.g., what is an object?) the link to the body (brain) seems tenuous.

Experimental results indeed show that laypeople strongly link emotions (e.g., “anger”) and sensorimotor traits (e.g., walking) to the body; they believe they are likely to “show up” in a brain scan and to transfer to a duplicate of one’s body (16, 17). By contrast, ideas (e.g., “number,” “agents have goals”) are perceived as relatively disembodied, less detectable in the brain (17), and less amenable to transfer if the body is duplicated (17), but as more likely to persist without the body in the afterlife (17, 94). So, altogether, ideas seem disembodied relative to affective and sensorimotor traits.

Now, since our innateness intuitions are governed by essentialism, and since essentialism requires that innate traits be embodied, it follows that our innateness intuitions depend on our intuitions about embodiment. Emotions fit the “essentialist bill,” as people perceive them as embodied [e.g., they can be seen in the face (16)]. Essentialism, then, should lead us to view emotions as innate. But ideas (e.g., number, object, “agents have goals”) are perceived as disembodied (courtesy of intuitive dualism), so by the same logic people should reject innate ideas.

Critically, each of these biases arises from presumptions about the mind, body, and innateness, and these presumptions are false. Science shows that cognition resides in the brain (contrary to intuitive dualism), and that embodiment doesn’t imply innateness or immutability (contrary to essentialism). But once these false premises are set, our innateness intuitions follow syllogistically. It is thus no wonder that people project them broadly—even when they consider creatures about which they know little (animals or aliens)—just as the results show (15, 17).

These same principles further predict that people should be positively inclined to assume innateness for any embodied psychological trait. Sensations and motor actions are a case in

point—people, recall, believe that we see “with our eyes” and move “with our legs,” so one would expect laypeople to be positively biased to consider sensorimotor traits as innate. Indeed, they are so inclined (17).

Moreover, since innateness intuitions depend on embodiment, and since embodiment is a matter of degree (happiness is linked to one’s smile, but it’s less obvious where jealously might lie), innateness intuitions ought to vary accordingly—the stronger the perceived embodiment of a trait, the stronger its perceived innateness; this, too, is in line with our experimental findings (16, 17). Although ideas (the “contents” of cognition) seem decidedly ethereal, the aptitudes and mechanisms that engender and store them (e.g., intelligence and memory) could well be amenable to some embodiment (e.g., memory might be likened to a “container”; intelligence might be likened to a “thinking muscle”). It is thus conceivable that people would consider intelligence as innate (98) while still denying innate ideas (15, 17, 18).

Finally, the dissonance theory not only explains the innateness storm but it also predicts how to mitigate it or even head it off altogether by tampering with its engines. If we could convince people that the mind and the body are one and the same, that should attenuate their intuitive dualism and increase their innateness intuitions. Offering them evidence that abstract ideas affect the brain (i.e., ideas are embodied) should similarly satisfy their intuitive essentialism, also increasing their innateness intuitions. Both predictions are borne out (17, 19, 99).

Whether or not our intuitive conclusions (e.g., “ideas aren’t innate”) are false is difficult to ascertain. To reiterate, scientists are still actively debating these questions. Nonetheless, two conclusions seem clear. First, laypeople’s predictions about specific human behaviors (e.g., whether newborns can predict the trajectories of objects) are at odds with psychological studies. Second, the logic that drives those predictions is faulty, inasmuch as it rests on the erroneous presumptions that 1) some psychological states are disembodied and 2) embodied states are innate. Accordingly, our innateness intuitions are biased—they cannot be trusted.

Is Empiricism Innate?

Lila Gleitman, the renowned language acquisition researcher, quipped that empiricism is innate. Empiricism, here, refers to the belief that knowledge arises by learning from experience. Gleitman, then, correctly predicted that human reasoning about the origins of knowledge is biased, adding the twist that the bias is itself innate.

The present results cannot evaluate this claim, as they are obtained solely from Western adults (but see ref. 18), yet several considerations suggest that these biases could arise in humans more generally.

First, intuitive dualism and essentialism—the two engines of our perfect cognitive storm—have each been documented in

small-scale societies, even in people who explicitly reject these beliefs (70–72). Second, intuitive dualism is implicated in beliefs about the afterlife, which are pervasive across cultures (100). Third, intuitive dualism and, possibly, essentialism, might be rooted in the core knowledge of young infants. To be clear, it is unlikely that intuitive dualism per se is innate, as it is unclear what evolutionary advantage it confers. Nonetheless, dualism and essentialism principles could well arise from core cognitive mechanisms that manifest in early infancy, and they are plausibly adaptive. In particular, intuitive dualism could emerge from the conjunction of two systems of core knowledge—one system guiding a newborn’s understanding of objects and their physical interactions (4, 28, 101) and another guiding an infant’s understanding of the minds of agents (31, 102). Essentialism, in turn, could be informed, in part, by infants’ early understanding that agents differ from inanimate objects (103, 104), and that they must have “insides” (76).

Whether intuitive dualism and essentialism are universal and whether their roots are innate is uncertain. Moreover, even if we were innately equipped with the storm’s two “engines,” there is no guarantee that these forces would always collide. These indeterminacies, however, do not undermine the significance of these biases.

The nature–nurture debate runs deep throughout Western intellectual history. So, even if these innateness biases are strictly Western their repercussions are profound, and they may not be confined to laypeople. Inasmuch as scholars are humans, they too are at risk (18). So, regardless of whether our innateness intuitions are innate, these presumptions ought to be heeded.

Other Unsolved Crimes and Mysteries

Moving beyond innateness, these results suggest that intuitive dualism and essentialism shape the stories we tell about our psyches. Since these two principles are mutually incompatible, we should expect them to elicit predictable biases in other aspects of our self-understanding.

And indeed, the principles we have invoked to explain laypeople’s innateness intuitions can also account for their irrational fascination with the brain (20, 105), their prejudices about psychiatric as opposed to cognitive disorders [e.g., depression (20) vs. dyslexia (106)], and their puzzling attitudes about the “true self” (19) and the afterlife (17, 21, 100). In each case, laypeople’s intuitions are predicted by the tension between intuitive dualism and essentialism.

Our troubles with innateness, then, seem to arise from a broader syndrome of self-myopia. These multiple false stories about human nature suggest that we, the storytellers, are blind to who we are (21). Becoming aware of our intuitive biases might allow us to rein them in.

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