Hypocognitive Mind:
How Lacking Conceptual Knowledge Blinds Us to Everyday Objects and Social Privilege

by

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Dedication

To Dad, who introduced me to arts and literature.

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Abstract

This dissertation examines *hypocognition*, a phenomenon in which people lack cognitive or linguistic representations of concepts to describe ideas or interpret experiences. Chapter 1 presents a theoretical review of hypocognition and its implications for perception, affect, and behavior. Drawing from the cross-cultural and expertise literatures, I describe how hypocognition impoverishes one's mental world, leaving cognitive deficits in recognition, explanation, and remembering while fueling cultural chauvinism and social conflict. Chapter 2 empirically demonstrates the cognitive consequences of hypocognition. In six studies, I show how hypocognition degrades identification, recognition, and memory of fundamental information in one's living environment. Chapter 3 explores the social implications of hypocognition. Eight studies point to hypocognition as a cognitive blind spot underlying the invisibility of one's social privilege and denial of discrimination. Chapter 4 discusses future directions and explores whether hypocognition can be motivated, where it originates, and its implications with regard to public health and sustainability. I end with a caution against going too far to reduce hypocognition and risking its opposite, *hypercognition*—overapplying a familiar concept to circumstances where it does not belong.

Chapter 1 Introduction to Hypocognition

In 1806, entrepreneur Frederic Tudor sailed to the island of Martinique with a precious cargo. He had harvested ice from frozen Massachusetts rivers and expected to make a tidy profit selling it to tropical customers. There was only one problem: the islanders had never seen ice. They had never experienced a cold drink, never tasted a pint of ice cream. Refrigeration was not a celebrated innovation, but an unknown concept. In their eyes, there was no value in Tudor's cargo. His sizable investment melted away unappreciated and unsold in the Caribbean heat (Weightman, 2003).

Tudor's ice tale contains an important point about human affairs. Often, human fate rests not on what people know but what they fail to know. Often, life's outcomes are determined by *hypocognition*.

What is hypocognition? If you don't know, you've just experienced it.

Hypocognition, a term introduced to modern behavioral science by anthropologist Robert Levy, means the lack of a linguistic or cognitive representation for an object, category, or idea (R. I. Levy, 1973; Wu & Dunning, 2018a, 2018b). The Martinique islanders were hypocognitive because they lacked a cognitive representation of refrigeration. But so are we hypocognitive of the numerous concepts that elude our awareness. We wander about the unknown terrains of life as novices more often than experts, complacent about what we know and oblivious to what we miss.

In financial dealings, almost two-thirds of Americans are hypocognitive of compound interest, unaware of how much saving money can benefit them and how quickly debt can crush

them (Lin J. et al., 2016). In health, a full third of people suffering from Type II diabetes remain hypocognitive of the illness. They fail to seek needed treatment—despite recognizing blurry vision, dry mouth, frequent urination—because they lack the underlying concept that would unify the disparate warning signals into a single alarm (Cowie et al., 2006). In keeping up with sustainable living, people buy food more in line with their environmental preferences only after the conceptual distinction between sun- and oil-based foods is made clear to them (Lakoff, 2010).

People's finite conceptual horizons are a pervasive and powerful constraint on how they make sense of the world. These horizons represent the hard boundaries of where people's possible interpretation of their circumstances can go and define the finite channels into which their understanding is funneled. To be sure, what each individual person knows is considerable, but it pales against the entire landscape of concepts that are possible to know. The typical 20-year-old English speaker knows the equivalent of 42,000 dictionary entries, with the number rising to 48,000 by age 60 (Brysbaert, Stevens, Mandera, & Keuleers, 2016). Webster's Third New International Dictionary, however, contains roughly 470,000 entries; the second edition of the Oxford English Dictionary contains over 600,000. Add to that concepts from other languages that fail to translate to English: A recent emotion lexicography listed 216 untranslatable words related just to the concept of "well-being" from non-English languages (Lomas, 2016). Thus, what each individual knows is merely a narrow slice of concepts, ideas, and analyses that humanity has developed to comprehend the world that they inhabit.

Hypocognition, a concept with a robust intellectual life in linguistics and anthropology, has much to say about psychological life. If people base their interpretations of circumstances and situations upon readily available cognitive frameworks (Park, 2010), the frameworks one

does not have limit the scope of which understandings are possible. Hence, making sense of how people make sense of the world entails knowing the possible interpretations not available to them. In this theoretical overview, I explore how hypocognition affects meaning construction and steers thought and action as people navigate their social worlds. I detail the social and cognitive consequences of being hypocognitive and describe the phenomenology of people afflicted with hypocognition.

History and Relevance to Psychology

The notion of hypocognition was introduced to modern behavioral science by the anthropologist Robert Levy (1973) in his classic field study of the Society Islands in Tahiti. Levy documented a peculiar observation: Tahitians expressed no grief when they suffered the loss of a loved one. They fell sick. They sensed strangeness. Yet, they could not articulate grief, because they had no concept of grief in the first place. Tahitians, in their reckoning of love and loss and their wrestling with death and darkness, suffered not from grief, but a hypocognition of grief.

With regard to psychological functioning, I take being hypocognitive as the absence of being *schematic* for a concept (Neisser, 1976). As traditionally defined, schemata are knowledge structures that represent, organize, and make sense of the features of people, places, objects, and events encountered by the social perceiver. Schemata contain not only the features needed to identify an instance of an object, but also all its associations to other ideas, events, and actions to which the concept may be relevant (Minsky, 1975; Rumelhart, 1981). That is, the schema contains elaborations detailing how a concept connects to other concepts a person may possess. For example, a schema for *psychological stress* may contain not only the symptoms needed to recognize stress, but also ideas about what causes or explains stress, what stress may cause in

turn, and common responses for managing or reducing it. To be hypocognitive about psychological stress would be to have none or only a sparse collection of these associations.

Examples of Hypocognition

To be sure, people may still experience some fragmentary or vague aspects of the concepts of which they are hypocognitive, such as Levy's (1973) Tahitians who felt diffuse somatic signs of sickness or strangeness when experiencing grief. Even the two-dimensional beings in Flatland can experience spheres as expanding and contracting circles as the spheres pass through their two-dimensional world. Either group, however, will not attain the full experience of the concept or connect it to other concepts. Rather, they come away with a crude understanding and an impoverished experience of the concept.

In the behavioral science literature, one sees evidence for impoverished experience among the hypocognitive. What they see in an instance of a concept—if they see it at all—is different from what people more familiar and knowledgeable with the concept see or experience. Examples come from two different areas of psychology.

The Psychology of Expertise

Identifying instances. What novice sees is often quite different from what an expert experiences (M. Chi, 2006). Novices lack meaningful schemata to aid recognizing instances of a category and thus miss things. For example, novice physicians are not as good at identifying abnormalities in lung X-rays as their more knowledgeable counterparts. They recognize three fewer findings per film, miss more subtle cues of pathology, and notice fewer relationships among those cues (Lesgold et al., 1988). Similarly, although novice physicians were equally good at seeing key events on a record of physiological function as experts, they saw fewer

secondary events and were less successful distinguishing clinically relevant readings from simple artifacts (Alberdi et al., 2001).

In addition, when interpreting a situation, novices lack the penumbra of background associations that experts connect to their experiences. Novices see only that which is explicitly there, that is, the exogenous properties of a stimulus. In physics, for example, novices fail to recognize the deep structure inherent in physics problems—the representation most relevant to problem-solving (M. T. H. Chi, Feltovich, & Glaser, 1981; Fincher-Kiefer, Post, Greene, & Voss, 1988). Given a selection of problems and asked to group them, novices—hypocognitive to underlying concepts—sort them based on more superficial features, such as whether the problem involves pulleys or inclined planes. Experts will sort the problems according to underlying principles of physics that the problems suggest, such as conservation of energy. That is, they bring crucial endogenous associations to the task, associations generated internally upon seeing the stimulus. This discrepancy is also seen in medicine (Groen & Patel, 1988), engineering (Moss, Kotovsky, & Cagan, 2006), and mathematics (Silver, 1979).

Further, when trying to identify and distinguish letters from the Arabic alphabet, novices fail to have access to non-visual, endogenous associations that experts bring to bear in recognition and interpretation, such as the brushstrokes needed to create the letters as well as their meaning and sound. Novices see only the exogenous, physical characteristics of the letters. Thus, when making judgments about whether pairs of letters are identical, novices are slower and less accurate than their more expert peers, and 50% of the difference in speed and 10% of that in accuracy are explained by non-visual associations available to experts but not to novices (Wiley, Wilson, & Rapp, 2016).

Memory. Missing those schematic associations also prompts novices to have worse memory than experts. Chess novices recall non-random positions of chess pieces at a rate only one-fourth of that of experts (Chase & Simon, 1973). Novice baseball fans recall fewer balls and strikes after listening to a baseball game than do experts, because they lack the schemata to aid their memory (Chiesi, Spilich, & Voss, 1979). Likewise, novices to air flight recall air traffic control recall messages less accurately than do expert pilots (Morrow, Menard, Stine-Morrow, Teller, & Bryant, 2001).

Cross-cultural psychology

Examples of hypocognition abound in cross-cultural psychology as well. Different cultures often bring disparate notions to their interpretation of the same situation. What they experience, therefore, can be quite different.

Color. The ability to distinguish between shades of blue depends on the underlying linguistic representation of colors that one's language affords. Whereas English has one generic concept for the color blue, distinct linguistic representations of light versus dark blue exist in Russian (*goluboy* versus *siniy*; Winawer et al., 2007), Greek (*ghalazio* versus *ble*; Thierry, Athanasopoulos, Wiggett, Dering, & Kuipers, 2009), Turkish (*mavi* versus *lacivert*; Özgen & Davies, 1998), Korean (*yeondu* versus *chorok*; Roberson, Pak, & Hanley, 2008), and Japanese (*ao* versus *mizuiro*; Athanasopoulos, Damjanovic, Krajciova, & Sasaki, 2011). Deprived of these finer-grained color concepts, native English speakers are not only slower, but less accurate, at discerning different shades of blue than speakers of languages with more granular linguistic distinctions (Winawer et al., 2007).

Nonetheless, English speakers can perceive differences among broader color categories (e.g., blue versus green) not apparent to other cultural groups. English has 11 basic color terms.

Others, such as the Berinmo hunter-gathers in Papua New Guinea or the Himba nomads in southern Africa, have only five. The objective vision of the Berinmo and the Himba is just as good as that among English speakers; however, they show poorer perceptual judgment and more memory confusion for colors that English-speakers place into distinct categories (Davidoff, Davies, & Roberson, 1999; Roberson, Davies, & Davidoff, 2000).

Numbers. Cultures also vary widely in the degree to which they are hypocognitive of numerical representations. On one end of the spectrum, the Pirahã tribe of Amazonia have only a "one-two-many" counting system. Unable to entertain numerical concepts beyond two, the Pirahã fail to enumerate exact numbers of three items or more (Gordon, 2004). They can recognize which bundles of objects are more numerous, but fail to recall which bundle is larger once removed from sight (Frank, Everett, Fedorenko, & Gibson, 2008).

Emotion. People experience emotions as situated conceptualizations within the bounds of their knowledge (Barrett, 2006). Just as the Tahitians suffer from hypocognition of sorrow (R. I. Levy, 1973), Ilongots of the Philippines (Rosaldo, 1980) and the Pintupi of aboriginal Australians (Morice, 1978) cannot elucidate feelings of guilt; the Kaluli of Papua New Guinea (Schieffelin, 2005) and the Xhosa of South Africa (Cheetham & Cheetham R.J., 1976) fail to articulate feelings of depression; and the Machiguenga of Peru (Johnson, Johnson, & Baksh, 1986) lack the lexicon for anxiety.

English speakers are of no exception. They may have an approximate sense of *liget* (Ilongot) as anger, but not fully capture the subtleties and elaborations it entails, such as exuberance in aggressive acts and in the perspiration of hard work. They may come to understand *lajja* (Odia) as feelings of shame, but miss the totality of its meaning as manifested through self-control, moral responsibility, and social hierarchy (Parish, 1991). They may

understand grief, but have little understanding for *mo'emo'e*, or feelings of loneliness tinged with a "sense of the uncanny" commonly felt among Tahitians (R. I. Levy, 1973). Hypocognitive of the emotions as felt by cultural insiders, people cannot fully appreciate the richness of emotional terrains foreign to their own (Wierzbicka, 1999).

One distinct example is the concept of *amae*, the ability to "depend and presume upon another's love or bask in another's indulgence." *Amae* has no linguistic equivalent in non-Japanese cultures (Doi, 1992). As best translated, it refers to a pleasant emotion elicited when someone makes an inappropriate request of another individual. Both the person making and the one receiving the request feel the emotion, but the latter is more likely to experience a greater sense of *amae* because they recognize the inappropriate nature of the demand being asked. Although *amae* can be experienced to some extent (e.g., asking a cousin to help with a paper, knowing he has his own exam to study for; Niiya, Ellsworth, & Yamaguchi, 2006) or partially captured by close equivalents ("mardy"; Lewis & Ozaki, 2009), non-Japanese-natives are nonetheless hypocognitive of its many facets and nuances in meaning.

Qualitative research highlights its complex nature. Consider the following account by a Japanese woman about her male acquaintance's wife: One day, the wife begged for her help in translating a letter into English. Despite the woman's reluctance, the wife further insisted that the woman make a trip to her house and bring the letter in person. "Well, it turned out that the letter she wrote was a love letter for someone whom she's having an affair with," said the Japanese woman with little surprise. "It was definitely *amae* because somehow, even though she knew that I knew her husband, she expected that I wouldn't tell him about her affair" (Behrens, 2004, p. 21).

To foreign ears, such intricacies in relationship entanglement and expected dependency may sound befuddling, strange, or pathological: Why would the wife not simply ask someone else to conduct the translation? Yet, to Japanese listeners fluent with *amae*, the wife's action speaks volumes: by presuming the woman's loyalty and confidence, the dallying wife indulges in their mutual secrecy, fosters a closer bonding, and reinforces social harmony (B. Bower, 2004).

Overview

The above chapter provided a theoretical overview of hypocognition adapted from my original paper "Hypocognition: Making sense of the landscape beyond one's conceptual reach" (Wu & Dunning, 2018a) and article "Unknown unknowns: The problem of hypocognition" (Wu & Dunning, 2018b). Subsequent chapters in this dissertation include empirical studies explore the cognitive and social consequences of hypocognition (Chapters 2 and 3) and a discussion of future directions (Chapter 4).

Chapter 2 empirically demonstrates the cognitive consequences of hypocognition. Six studies revealed that hypocognition degrades retention of fundamental information in everyday living. Hypocognitive participants reported encountering instances of a concept less often than those who knew the concept (Study 1). They failed to discern the presence and encode the frequency of objects for which they were hypocognitive, such as American participants when observing exotic fruits (Studies 2A & 3) and alphabetic letters rendered as unfamiliar symbols (Studies 2B & 5). Hypocognition occurs across cultures: British participants tracked the frequency of Asian dumplings less accurately than Chinese participants, who tracked the frequency of cheese less accurately than the British (Study 4). Lacking an underlying concept impedes remembering even when verbal labels are present (Study 5). Finite channels of conceptual knowledge impose a powerful constraint on what people identify, recognize, and

remember in their everyday environment. The concepts that people lack impoverish their experience with the world (Wu & Dunning, 2019).

Chapter 3 explores the social consequences of hypocognition. The U.S. faces deep social divides, with socially dominant group members failing to acknowledge privilege and minimizing the hardships that subordinate groups endure. In 8 studies, I explore hypocognition as a cognitive factor underlying the invisibility of social privilege. I argue that advantaged social groups suffer from hypocognition, in which people fail to have a cognitive representation of privilege and have little of the cognitive architecture needed to recognize the disadvantages experienced by non-privileged groups. Right-handers generated fewer handedness-related hassles relative to left-handers (Study 1). Men, compared to women, generated fewer instances of gender discrimination, recalled fewer items of self-protection against assault from a presented list, and showed poorer recall and recognition of gender discrimination examples from a video (Studies 2a-2c). Whites, relative to Blacks, generated fewer racial discrimination instances and recalled fewer such instances from a presented list (Studies 3a-3b). Whites also generated fewer racial discrimination instances and reacted more slowly to discriminatory behavior relative to Asians (Study 4). Hypocognition, in turn, predicted group asymmetries in attitudes regarding acknowledging social privilege and stating that discrimination still exists. Study 5 tested an intervention to reduce hypocognition. After watching a TEDx talk in which a transgender woman described her discrimination experience living as female and acknowledged the male privilege she once had, both men and women showed increased awareness of male privilege and gender discrimination. Findings suggest that the invisibility of one's own social privilege need not solely reflect identity-defensive motivations, but may also stem from cognitive deficits blinding the socially privileged to inconveniences they do not experience (Wu & Dunning, 2020).

Chapter 4 explores future directions and discusses whether hypocognition can be motivated, where it originates, its implications with regard to public health and sustainability, and its opposite, *hypercognition* (i.e., overapplying a familiar concept to circumstances where it does not belong). This chapter is in part adapted from my article "Hypocognition is a censorship tool that mutes what we can feel" (Wu, 2020).

Chapter 2 Cognitive Consequences: How Hypocognition Confines Perception and Memory

Show Americans an apple—they experience it not as a mottled red blob with a hard surface, but immediately as an apple. They know without effort that an apple crunches, tastes sweet, can be baked into a pie, and grows on trees. It is an instance of a category for which they possess rich conceptual knowledge (Grill-Spector & Kanwisher, 2005). However, a durian—a fruit common in Southeast Asia—evokes no such cognitive or linguistic representation. It is experienced as no more than a yellow, thorny, aromatic oddity evoking no conceptual knowledge to guide its identification.

The impoverished experience of a durian reflects an instance of hypocognition, a state in which people lack a cognitive or linguistic representation of a concept, category, or idea (Wu & Dunning, 2018a, 2018b). To be hypocognitive of an object is to lack its conceptual knowledge, which can include its name, defining features, and importantly, all associations surrounding it.

Memory for Instances of Encounter

In this chapter, I examine whether hypocognition, or lack of conceptual knowledge, has an impact on what people retain in memory, and in particular, the deficits in memory for instances and frequency of encounter. I focus on these cognitive consequences not only because they are fundamental tasks of remembering, but also because memory for frequency of encounter has been shown to be a generally robust skill. Retaining information about events and objects of encounter, and in particular noting how frequently they appear in the environment, is a skill where people show consummate performance, even when it is not a task they have been explicitly asked to do (Hasher & Chromiak, 1977; Hasher & Zacks, 1979, 1984). Moreover,

memory for frequency has been shown to be resilient against variables that should degrade it. People's accuracy at registering frequency of encounter withstands individual variations in age, education, individual differences in ability, or cognitive functioning. It is also not influenced by recency or duration of presentation, practice at task, feedback about performance, explicit instructions to track frequency, the express intent to do so, or whether the task instruction involves gist versus verbatim memory (Hasher & Zacks, 1984; Zacks & Hasher, 2002).

I hypothesize that hypocognition would degrade people's performance at identifying objects of encounter and the frequency with which they had encountered them. To remember instances of encounter with an object, one has to have the conceptual knowledge of what the object is in the first place. Otherwise, one remains hypocognitive and will show deficit in registering the presence or tracking the frequency of an instance or object, regardless of how robust these skills may be in general. This idea is reminiscent of Bartlett's (1932) classic work on memory reconstruction, in which he had British participants read and retell a Canadian aboriginal legend about a war of the ghosts to a new set of participants, who then reproduced the legend for another set of participants, and so on. Retellings of the legend showed distortions of input materials into details consistent with the schema British participants had, as well as omissions of schema-inconsistent details that were culturally unfamiliar (for more recent research questioning these classic observations, see Kintsch & Greene, 1978; Mandler & Johnson, 1977; Zangwill, 1972). It is also reminiscent of classic social cognitive work on schematic processing (Minsky, 1975; Rumelhart, 1981; Schank & Abelson, 1977), in that having conceptual knowledge (i.e., a schematic knowledge structure of a concept or category) influences cognitive performance. However, unlike classic work, which focused primarily on how schema inspired intrusions, distortions, and mistakes in memory (J. B. Black, Turner, & Bower, 1979;

Brewer & Treyens, 1981), I emphasize how having conceptual knowledge is crucial for promoting accuracy in retention of basic information about the environment.

Distinguishing Hypocognition from Related Notions

In defining the term hypocognition, I also clarify what it is not. By hypocognition, I refer to a paucity of conceptual knowledge of and associations to a category. I do not mean simply failing to have a name or label for it. The name of a category is part of conceptual knowledge, not a substitution of conceptual knowledge. To be told of the name of the Japanese emotion *amae* is to know something about the concept, but it does not mean that someone understands the emotion to the full and nuanced extent a person from Japan might.

As such, I distinguish hypocognition from other linguistic notions. Some readers may associate this discussion of hypocognition with the linguistic relativity hypothesis (Whorf, 1956). However, whereas the linguistic relativity hypothesis focuses on how language constrains human thought, I aim to show how deficits in cognitive representations—which can take place independent of language—affect identification, recognition, and retention of information. Hypocognition speaks to a deficit in conceptual knowledge rather than a poverty of words. Hypocognition is not the mere absence of a verbal label. Knowing a label may help facilitate knowledge of a category, but the two processes do not entirely overlap (Lupyan, 2008). Humans and animals have been shown to acquire and have concepts even in the absence of verbal labeling (Astley & Wasserman, 1998; Druks & Shallice, 2000; Zentall, Wasserman, & Urcuioli, 2014).

Overview of Studies

In six studies, I examined the cognitive consequences of hypocognition for retaining information of encounter and its frequency. I hypothesize that people who are hypocognitive

would show greater errors in reporting whether they have encountered a phenomenon or object (Studies 1-2) and how many times they have encountered it (Studies 3-5). In particular, participants who lacked familiarity with a concept would report encountering fewer instances of it in their daily environment (Study 1). They would less accurately recognize the presence versus absence of an object of which they are hypocognitive, compared to objects for which they have conceptual knowledge (Studies 2A-2B).

In addition, what participants retained in memory would differ based on cultural experience. Participants would commit more errors in tracking the frequency of objects absent or rare in their cultural experience, relative to more culturally familiar ones (Studies 3-4).

Finally, Study 5 disentangled the effects of hypocognition (lacking conceptual knowledge) from any effects due to simply lacking a label for a category. I predict that lacking conceptual knowledge would impair frequency encoding even when verbal labeling is present. That is, having a label for an object may aid remembering to some extent (Lupyan, 2008), but not as much as having full conceptual knowledge attached to the object.

Study 1: Conceptual Knowledge and Reports of Encounter

I first explored a general question: Is there a relationship between lacking conceptual knowledge and failures to recall instances of experiencing it? I predicted that participants who were hypocognitive would report fewer encounters with instances of a concept over the past two weeks compared to participants who knew the concept. Participants were asked to review their last two weeks to report how many times they had encountered many types of experiences involving concepts that they may or may not have previously known. Some of the concepts were abstract or academic in nature (e.g., *benevolent sexism*, experiencing sexism that is framed as a positive experience), some were more sensory (e.g., *vocal fry*, speaking in a frayed or creaky

tone). I hypothesized that knowledge of a concept facilitates identifying and remembering instances of it, and so those familiar with concepts would report a greater number of encounters with them than those who not familiar.

Method

Three hundred and two U.S. Americans (45.4% female; M_{age} = 35.02, *SD* = 10.92, range = 20 to 75; 78.8% non-Hispanic white) were recruited via TurkPrime (Litman, Robinson, & Abberbock, 2017).

Participants were presented with 20 novel concepts. The concepts were compiled from neologisms (e.g., *egosurf:* to boost one's ego by searching for one's own name on Google or other search engines; Adams & Lloyd, 1983; Pinker, 2007; Skurnick, 2015) and terminologies devised by academics (e.g., *benevolent sexism*; Glick & Fiske, 1996). The concepts covered a range of topical areas including psychology (e.g., *imposter syndrome*), linguistics (e.g., *vocal fry*), finance (e.g., *bangst*), modern technology (e.g., *figital*), social media (e.g., *vaguebooking*), and sensory experiences (e.g., sight: *pareidolia*; sound: *uptalk*; smell: *sillage*; touch: *shoeburyness*) (see Appendix A for definitions of all novel concepts).

Participants were first asked if they had heard of each concept. They were then presented with the definition and examples (e.g., quotes, pictures, sound clips) of the concept. If participants answered yes to having heard of the concept, they were asked if this was the definition they had in mind. Participants were categorized as knowing the concept only if they indicated having heard of the concept *and* having the correct definition. Next, participants were asked how many times they noticed or experienced instances of the concept over the past 2 weeks (0 = 0 time, 1 = 1 time, 2 = 2 times, 3 = 3 times, 4 = 4 times, 5 = times, 6 = 6-7 times, 7 = 8-10 times, 8 = 11-14 times, 9 = 15-20 times, 10 = more than 20 times).

Results

I predicted that participants would report fewer encounters with the concepts of which they were hypocognitive compared to concepts of which they had knowledge. To address this prediction, I conducted a linear mixed model analysis (Judd, Westfall, & Kenny, 2017) predicting the number of encounters each participant reported for each concept from the fixed effect of concept knowledge (unknown = -0.5, known = +0.5) and the random effects of participant (random intercept, random slope for knowledge) and concept (random intercept, random slope for knowledge).

As predicted, participants who were hypocognitive of a concept reported experiencing fewer instances of it over the past two weeks (M = 2.13, SE = .04, 95% confidence interval [2.06, 2.20]) compared to those who knew the concept (M = 2.96, SE = .12, [2.73, 3.18]), b = .82, SE = .14, $t(78.85) = 5.92$, $p < .001$, [.53, 1.10] (see Figure 1 for a depiction of reported frequencies of encountering each concept).

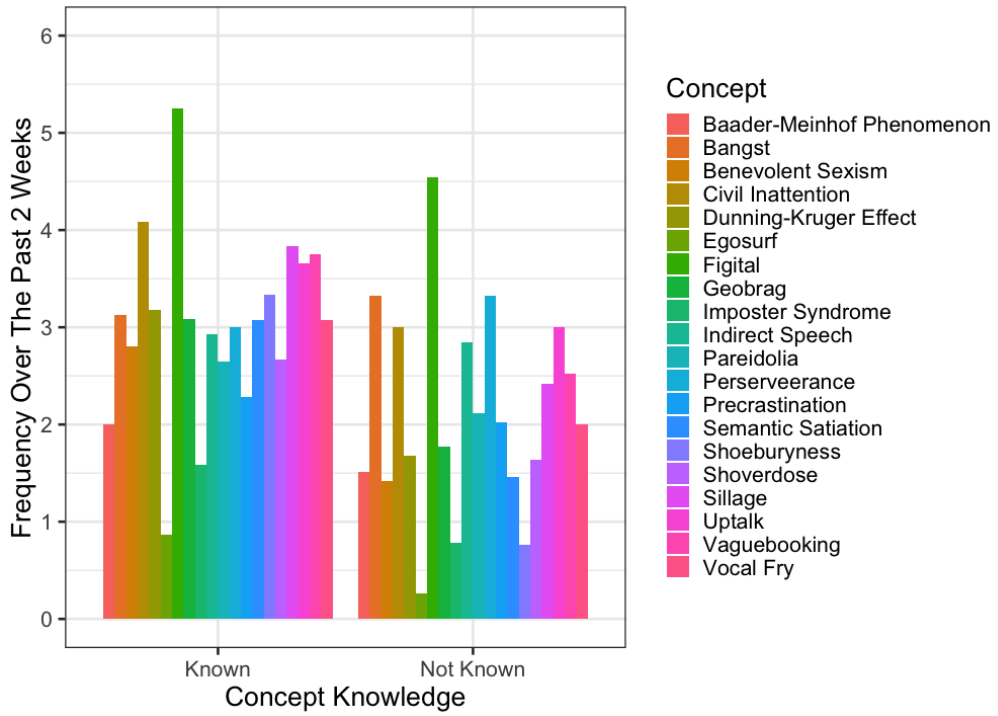


Figure 1. Frequency of experiencing instances of a known versus unknown concept over the past two weeks.

Study 2A: Recognition of Common Versus Exotic Fruits

Study 1 suggested that hypocognition interfered with identifying instances of a concept. However, the true frequency with which participants encountered instances of the concepts is unclear, and hence, the accuracy of their reports of encounter. The correlational nature of Study 1 also left open an alternative explanation: participants who reported not knowing a concept might have been those to whom instances of the concept rarely occurred, and the disproportionate frequency with which they experience such instances could have primed a lack of awareness of the underlying concept.

Study 2A addressed these limitations by examining whether hypocognition would impede accurate recognition while ensuring the same amount of exposure to culturally familiar versus unfamiliar objects. I showed American participants a basket containing common and exotic fruits. I predicted that, in a subsequent task to discriminate between fruits displayed versus not

displayed, participants would be less accurate in recognizing culturally unfamiliar fruits of which they are hypocognitive, compared to familiar fruits.

Method

Two hundred and twelve U.S. Americans (48.6% female; M_{age} = 36.90, *SD* = 10.66, range = 22 to 68; 73.6% non-Hispanic white) were recruited via TurkPrime.

Participants imagined strolling around a fruit festival and coming upon a basket of fresh fruits. There was no mention of a memory task. They were then presented with the fruit basket for 10 seconds (Figure 2). The basket contained 5 familiar fruits (set I: orange, banana, strawberry, pineapple, watermelon; or set II: apple, lemon, pear, cherry, grapes) and 5 unfamiliar fruits (set I: mamey sapote, lychee, breadfruit, rambutan, salak; or set II: durian, custard apple, mangosteen, longan, bayberry). Participants were randomly assigned to one of the two fruit sets. Next, participants completed a two-minute numerical distraction task, counting backwards by 3 in writing from the number 5486.

Afterwards, participants were presented with a list of fruit pictures (different from those previously displayed) representing all 10 familiar fruits (5 previously displayed, 5 not displayed) and 10 unfamiliar fruits (5 previously displayed, 5 not displayed). Participants were asked to indicate their level of certainty regarding whether they have previously seen each of the fruits (1 = *this fruit definitely was not there* to 6 = *this fruit definitely was there*).

Following the recognition task, participants indicated if they knew each fruit, and if so, were asked to identify each fruit (coded 0 = failed to correctly identify/did not know the fruit, 1 = correctly identified/knew the fruit). They also rated the extent to which they were familiar with each fruit (1 = *not at all familiar* to 7 = *very familiar*).

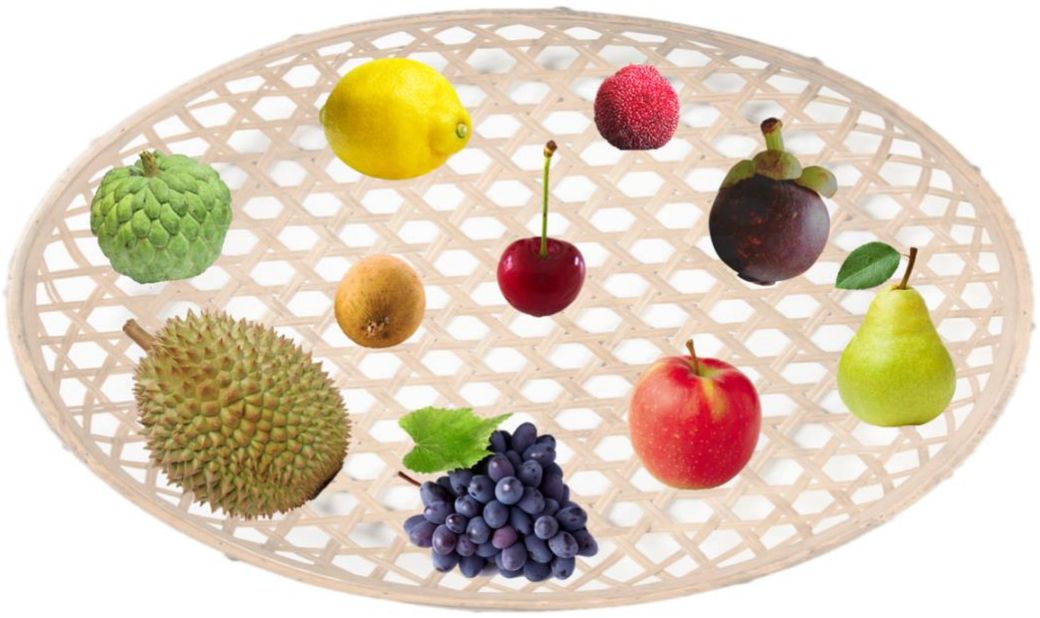


Figure 2. An example of the fruit basket displayed containing culturally familiar and unfamiliar fruits.

Results

Manipulation checks. I assessed participants' knowledge of and familiarity with the familiar and unfamiliar fruits. To examine fruit knowledge, I formed composite scores by calculating the proportion of "know" responses for each of the four categories: familiar fruits displayed, unfamiliar fruits displayed, familiar fruits not displayed, and unfamiliar fruits not displayed. I then conducted a general linear mixed model predicting knowledge from the fixed effects of fruit familiarity (unfamiliar = -0.5, familiar = +0.5), display condition (not displayed = -0.5, displayed = +0.5), fruit set (set I = -0.5, set II = +0.5), their interactions; and the random effect of participant (random intercept; random slope for familiarity). To examine fruit familiarity, I conducted a linear mixed model with the same fixed effects and a maximal random effects structure (see Supplemental Online Materials for additional detail on random effects specification).

Participants were more likely to know a familiar fruit (M = .98, SE = .01, [.96, .99]) than an unfamiliar one (M = .05, SE = .01, [.04, .06]), b = .92, SE = .01, t(210.28) = 108.46, p < .001, [.91, .94]. Participants also rated themselves as more familiar with a familiar fruit (M = 6.71, SE = .03, [6.64, 6.77]) than an unfamiliar fruit (M = 2.25, SE = .03, [2.19, 2.31]), b = 4.45, SE = .19, t(31.92) = 22.88, p < .001, [4.06, 4.85]. Note that key effects were largely consistent across nuisance factors (e.g., set, order) throughout Studies 2 to 4.

Recognition. I next examined whether unfamiliarity (versus familiarity) with a fruit impaired recognition accuracy via two different analyses. First, I conducted a linear mixed model analysis predicting recognition from the fixed effects of fruit familiarity, display condition, fruit set, their interactions; and the random effects of participant (random intercept, random slopes for familiarity, display condition, and their interaction) and fruit (random intercept, random slope for display condition). The analysis revealed that participants were more likely to report seeing a displayed fruit (M = 4.29, SE = .04, [4.22, 4.37]) than an undisplayed fruit (M = 2.57, SE = .04, [2.49, 2.65]), b = 1.72, SE = .17, t(27.16) = 9.94, p < .001, [1.37, 2.08].

This main effect was qualified by an expected interaction with familiarity, b = .88, SE = .31, t(16.91) = 2.85, p = .011, [.23, 1.52]. For familiar fruits, participants were more likely to recognize one that was displayed to them compared to one that was not ($M_{\text{Displayed}}$ = 4.82 versus $M_{\text{Undisplayed}}$ = 2.66), b = 2.16, SE = .24, z = 9.03, p < .001, [1.57, 2.75]. However, this recognition accuracy was diminished for unfamiliar fruits ($M_{\text{Displayed}}$ = 3.76 versus $M_{\text{Undisplayed}}$ = 2.48), b = 1.28, SE = .22, z = 5.75, p < .001, [.73, 1.84].

A signal detection analysis confirmed that participants were more inaccurate in recognizing unfamiliar than familiar fruits. In particular, I calculated two independent measures from signal detection theory: sensitivity (d'), the ability to distinguish previously displayed fruits

from non-displayed foils; and response bias (*c*), the threshold for answering "the fruit was there" or "the fruit was *not* there" regardless of display condition (Stanislaw & Todorov, 1999). For each index, I conducted a linear mixed model with the fixed effects of fruit familiarity, fruit set, their interactions; and the random intercept of participant. Analyses revealed that participants showed less sensitivity toward recognizing unfamiliar (*d*' = .79) than familiar fruits (*d*' = 1.38), *b* = .58, *SE* = .07, *t*(210) = 8.58, *p* < .001, [.45, .71]. They also showed greater bias towards *not* seeing the unfamiliar fruits (*c* = .24) compared to familiar fruits (*c* = -.15), *b* = -.39, *SE* = .05, *t*(210) = -8.61, *p* < .001, [-.48, -.30].

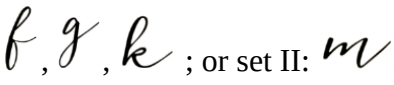
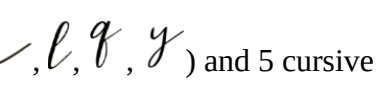
Study 2B: Recognition of Familiar Versus Unfamiliar Symbols

Study 2A demonstrated that hypocognition impeded recognition of fruits for which U.S. Americans lacked conceptual knowledge. However, one could argue that the unfamiliar fruits included in Study 2A were perceptually less salient than the familiar fruits, thus producing the recognition deficits I attributed to hypocognition. Thus, Study 2B took the same visual stimuli and rendered them either familiar or unfamiliar by taking cursive alphabetic letters and showing them to participants in a mix of upright (familiar) and rotated/flipped (unfamiliar) positions. I predicted that participants would be less accurate in recognizing the stimuli when rendered as unfamiliar symbols than in the form of familiar letters.

Method

Two hundred and seventy-two U.S. Americans (60.7% female; M_{age} = 38.42, *SD* = 12.16, range = 18 to 74; 79.0% non-Hispanic white) were recruited via TurkPrime. I prescreened for participants whose first language is English to ensure proficiency in comprehending English letters.

Participants imagined coming across a sheet of paper with a set of symbols drawn on it.

There was no mention of a memory task. They were then presented with the symbols for 10 seconds (Figure 3). The symbols were 5 cursive letters in their usual orientation (set I:  ,  ; or set II: ) and 5 cursive letters rotated or flipped so as to be rendered unrecognizable (set I:  ; or set II: ). Participants were randomly assigned to one of the two symbol sets. Within each set of 10 letters, participants were randomly assigned to one of the two rotation orders: first 5 letters regular + second 5 letters rotated or flipped; or first 5 letters rotated or flipped + second 5 letters regular. Next, participants completed the same numerical distraction task as in Study 2A.

Afterwards, participants were presented with a list of symbol pictures representing all 10 regular letters (familiar symbols: 5 previously displayed, 5 not displayed) and 10 rotated or flipped letters (unfamiliar symbols: 5 previously displayed, 5 not displayed). Pictures of symbols used in the recognition task were different from those in the previously displayed paper image to prevent memory based on superficial features such as curviness. Participants were asked to indicate their level of certainty regarding whether they have previously seen each of the symbols (1 = *this symbol definitely was not there* to 6 = *this symbol definitely was there*).

Following the recognition task, participants indicated if they knew each symbol (coded 0 = failed to correctly identify/did not know the symbol, 1 = correctly identified/knew the symbol). They also rated the extent to which they were familiar with each symbol (1 = *not at all familiar* to 7 = *very familiar*).

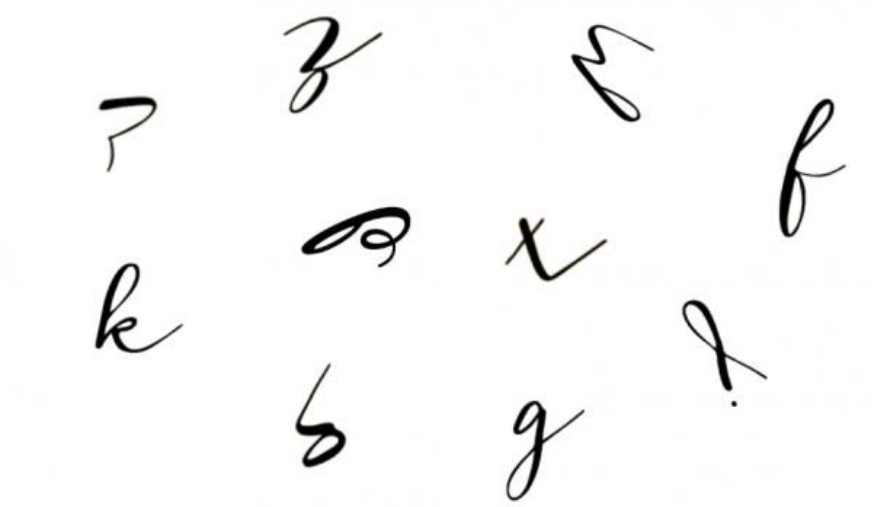


Figure 3. An example of the familiar and unfamiliar cursive symbols displayed.

Results

Manipulation checks. To examine symbol knowledge and symbol familiarity, I conducted similar linear mixed models as in Study 2A, with the additional fixed effect of rotation order (rotation order I = -0.5, rotation order II = +0.5; see Supplemental Online Materials for detail on model specification). Participants were more likely to know symbols in a familiar orientation (M = .92, SE = .01, [.91, .94]) than in an unfamiliar orientation (M = .12, SE = .01, [.11, .14]), b = .80, SE = .01, $t(268) = 61.35$, $p < .001$, [.78, .83]. Participants also rated themselves to be more familiar with symbols in a familiar orientation (M = 6.21, SE = .04, [6.14, 6.28]) than in an unfamiliar orientation (M = 2.81, SE = .04, [2.74, 2.88]), b = 3.41, SE = .20, $t(33.07) = 17.30$, $p < .001$, [3.01, 3.81].

Recognition. I examined recognition accuracy using mixed model analyses similar to those in Study 2A. Participants were more likely to report seeing a displayed symbol (M = 3.70, SE = .03, [3.64, 3.76]) than an undisplayed symbol (M = 3.02, SE = .03, [2.96, 3.08]), b = .68, SE = .10, $t(21.68) = 6.76$, $p < .001$, [.48, .87]. This effect was qualified by the orientation of the

symbol, b = .50, SE = .13, t(19.25) = 3.79, p = .001, [.24, .76]. Participants more accurately identified symbols oriented as familiar, upright letters when they were displayed versus not displayed ($M_{\text{Displayed}}$ = 3.80 versus $M_{\text{Undisplayed}}$ = 2.87), b = .93, SE = .11, z = 8.79, p < .001, [.67, 1.18]. However, this recognition accuracy worsened when the symbols were oriented as unfamiliar, rotated letters ($M_{\text{Displayed}}$ = 3.59 versus $M_{\text{Undisplayed}}$ = 3.18), b = .43, SE = .13, z = 3.22, p = .001, [.10, .75].

Signal detection analyses confirmed these findings. Participants showed less sensitivity toward recognizing symbols that were unfamiliar (d' = .26) than familiar (d' = .58), b = .32, SE = .05, t(268) = 5.95, p < .001, [.21, .42]. There was no difference in bias (c = .07 vs. .10), b = .04, SE = .04, t(268) = .92, p = .359, [-.04, .11].

Study 3 Encoding Frequency of Common and Exotic Fruit

Study 3 moved from recognizing an object's mere presence to tracking its frequency of encounter, a task on which people typically show remarkable performance despite circumstances that should interfere with it (Hasher & Chromiak, 1977; Hasher & Zacks, 1979; R.T. Zacks, Hasher, Alba, Sanft, & Rose, 1984). I showed American participants common and exotic fruits one at a time, varying the frequency at which each fruit occurred from 0 to 4 times. I expected that Americans would be less accurate in encoding the frequency of culturally unfamiliar fruits for which they have no concept, compared to familiar ones.

Method

One hundred and ninety-six U.S. Americans (52.6% female; M_{age} = 35.98, SD = 10.52, range = 18 to 70; 66.3% non-Hispanic white) were recruited via TurkPrime.

To test for automatic frequency encoding, I adopted a classic paradigm by Hasher & Chromiak (1977). Participants were presented with familiar and unfamiliar fruit pictures one at a

time, with each picture appearing for 3 seconds. No fruit names were shown. Participants were asked to try to remember the fruits. The instruction made no explicit mention of their frequency.

The fruit list comprised 34 pictures, with the first and last 5 pictures serving as buffers to absorb primacy and recency effects along with 24 critical pictures of fruits. The critical fruits consisted of 6 familiar fruits (Set I: apple, orange, lemon; Set II: coconut, strawberry, banana) and 6 unfamiliar fruits (Set I: durian, mangosteen, custard apple; Set II: mamey sapote, santol, longan). Within each fruit set, each fruit occurred 0, 2, or 4 times. For fruits that occurred 2 or 4 times, no successive repetition was allowed (i.e., a picture of an apple must be followed by a picture other than an apple). In addition, different pictures of the same fruit were used, so participants saw any particular picture of a fruit only once. To vary the combinations of individual fruits and the frequencies at which they occur, I randomly assigned participants to one of three frequency order conditions following a Latin square design (Table 1).

Table 1 Fruit Familiarity x Fruit Set x Frequency Order x Actual Frequency Design

Fruit Familiarity (Within-Subject)	Set (Within-Subject)	Order (Between-Subject)	Actual Frequency (Within-Subject)		
			0 Time	2 Times	4 Times
Familiar	Set I	Order I	Apple	Orange	Lemon
		Order II	Orange	Lemon	Apple
		Order III	Lemon	Apple	Orange
	Set II	Order I	Coconut	Strawberry	Banana
		Order II	Strawberry	Banana	Coconut
		Order III	Banana	Coconut	Strawberry
Unfamiliar	Set I	Order I	Durian	Mangosteen	Custard Apple
		Order II	Mangosteen	Custard Apple	Durian
		Order III	Custard Apple	Durian	Mangosteen
	Set II	Order I	Mamey Sapote	Santol	Logan
		Order II	Santol	Logan	Mamey Sapote
		Order III	Logan	Mamey Sapote	Santol

Following the serial presentation, participants were asked to estimate the number of times

they saw each fruit. A picture (rather than the name) of each fruit was displayed. The picture of each fruit shown in the frequency estimation phase differed from any pictures of the fruit shown in the serial presentation phase.

Results

Estimated frequency. Were participants more inaccurate in remembering fruits for which they lacked conceptual knowledge? I subjected participants' frequency estimates to a linear mixed model that included the fixed effects of fruit familiarity (unfamiliar = -0.5, familiar = +0.5), actual frequency (0, 2, 4 times), fruit set, frequency order, all interactions; and the random effects of participant (random intercept; random slopes for actual frequency, familiarity, and their interaction).

Based on the above model, I conducted two forms of analyses to measure frequency accuracy (Naveh-Benjamin & Jonides, 1986). The first measure is the slope (*b*) of the function that regresses estimated frequency on actual frequency (0-4 times as a continuous variable). The closer the slope is to 1, the more sensitive participants are to variations in frequency. The second measure is the absolute magnitude of frequency estimates at each level of actual frequencies (0, 2, 4 times as discrete levels of a categorical variable). The closer the frequency estimates are to actual frequencies, the more accurate participants are in their absolute estimates (see Supplemental Online Materials for model specification).

***Sensitivity to frequency*.** Overall, participants were relatively sensitive to the varying frequencies at which each fruit appeared, $b = .58$, $SE = .02$, $t(195) = 29.98$, $p < .001$, [.54, .62]. However, this sensitivity was impaired for unfamiliar fruits, as indicated by a significant actual frequency x familiarity interaction, $b = .07$, $SE = .02$, $t(195) = 3.25$, $p = .001$, [.03, .11]. Participants were worse at discriminating among actual levels of frequency at which unfamiliar

fruits occurred (b = .55, SE = .02, z = 25.56, p < .001, [.50, .59]) compared to familiar fruits (b = .61, SE = .02, z = 28.36, p < .001, [.56, .66]).

Magnitude of frequency estimates. Overall, participants underestimated the frequency of unfamiliar fruits (M = 1.64, SE = .03, [1.58, 1.69]) compared to familiar fruits (M = 1.81, SE = .03, [1.75, 1.86]), b = .17, SE = .04, t(195) = -4.74, p < .001, [.10, .24] (Figure 4).

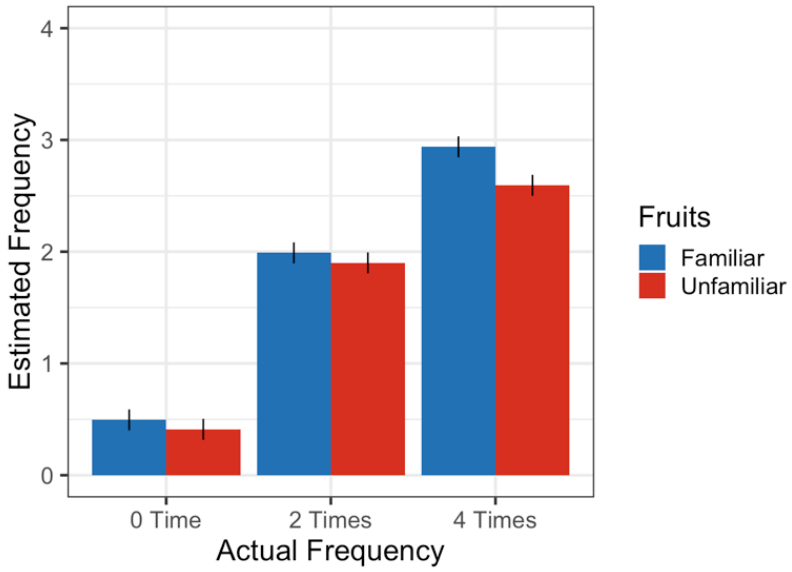


Figure 4. Estimated frequency of familiar versus unfamiliar fruits.

Study 4 Encoding Frequency of Cheese & Dumplings: Cross-Cultural Evidence

In Study 3, participants failed to track exotic fruits as accurately as common fruits. However, one could again argue that particular features of the unfamiliar fruits, not hypocognition itself, impeded frequency accuracy. Thus, in Study 4, I took two sets of objects—cheeses and dumplings—and compared their frequency estimates across two cultures that differ in which type of food is familiar. Numerous cheeses are consumed by the British, but not the Chinese; various dumplings make up a major portion of Chinese cuisine, but not British diet.

Regarding hypocognition, I propose that dumplings are as hypocognized in British culture as cheeses are in Chinese culture.

I then replicated Study 3, showing British and Chinese participants cheeses and dumplings at varying frequencies and asking them to estimate the frequency at which each food item occurred. I predicted that British participants would be less accurate in tracking the frequency of dumplings than cheese, whereas Chinese would show the opposite pattern.

Method

One hundred and eighty-nine U.K. citizen of European descent (66.7% female; M_{age} = 40.17, *SD* = 12.99, range = 18 to 80) were recruited nationwide via Prolific Academic, a U.K.-based crowdsourcing platform (Palan & Schitter, 2018). Two hundred and twelve adults from mainland China (48.6% female; M_{age} = 33.99, *SD* = 8.07, range = 20 to 64) were recruited nationwide via Sojump, a China-based online survey platform.

Participants followed the same procedure as in Study 3. They were presented with a mix of cheese and dumpling pictures serially, with the first and last 5 pictures serving as buffers and 24 pictures of critical food items in the middle. The critical foods consisted of 6 types of cheese (Set I: blue cheese, brie, cheddar; Set II: feta, parmesan, Swiss) and 6 types of dumplings (Set I: shui jiao, potsticker, shumai; Set II: wonton, har gow, soup dumpling). Within each food set, each food item occurred 0, 2, or 4 times (Table 2).

Table 2 Culture x Food Familiarity x Food Set x Frequency Order x Actual Frequency Design

Culture (Between-Subject)	Food Familiarity (Within-Subject)	Set (Within-Subject)	Order (Between-Subject)	Actual Frequency (Within-Subject)		
				0 Time	2 Times	4 Times
British	Familiar (Cheese)	Set I	Order I	Blue Cheese	Brie	Cheddar
			Order II	Brie	Cheddar	Blue Cheese
			Order III	Cheddar	Blue Cheese	Brie
		Set II	Order I	Feta	Parmesan	Swiss
			Order II	Parmesan	Swiss	Feta
			Order III	Swiss	Feta	Parmesan
	Unfamiliar (Dumplings)	Set I	Order I	Shui Jiao	Potsticker	Shumai
			Order II	Potsticker	Shumai	Shui Jiao
			Order III	Shumai	Shui Jiao	Potsticker
		Set II	Order I	Wonton	Har Gow	Soup Dumpling
			Order II	Har Gow	Soup Dumpling	Wonton
			Order III	Soup Dumpling	Wonton	Har Gow
				0 Time	2 Times	4 Times
Chinese	Familiar (Dumplings)	Set I	Order I	Shui Jiao	Potsticker	Shumai
			Order II	Potsticker	Shumai	Shui Jiao
			Order III	Shumai	Shui Jiao	Potsticker
		Set II	Order I	Wonton	Har Gow	Soup Dumpling
			Order II	Har Gow	Soup Dumpling	Wonton
			Order III	Soup Dumpling	Wonton	Har Gow
	Unfamiliar (Cheese)	Set I	Order I	Blue Cheese	Brie	Cheddar
			Order II	Brie	Cheddar	Blue Cheese
			Order III	Cheddar	Blue Cheese	Brie
		Set II	Order I	Feta	Parmesan	Swiss
			Order II	Parmesan	Swiss	Feta
			Order III	Swiss	Feta	Parmesan

Next, participants were asked to estimate the number of times they saw each food item. Following frequency estimation, participants indicated if they knew each of the cheese and dumplings, and if so, were asked to identify each food item (coded 0 = failed to correctly identify/not know the food item, 1 = correctly identified/knew the food item). They also rated the extent to which they were familiar with each of the cheese and dumplings (1 = *not at all familiar* to 7 = *very familiar*).

Results

Manipulation checks. I assessed U.K. and Chinese participants' knowledge of and familiarity with the types of cheese and dumplings presented in the study. To examine cultural difference in food knowledge, I conducted a generalized linear mixed model with a binomial distribution. The model included the fixed effects of culture (U.K. = -0.5, Chinese = +0.5), food type (cheese = -0.5, dumpling = +0.5), their interaction; and the random effects of participant (random intercept, random slope for food type) and individual food item (random intercept). To examine cultural difference in food familiarity, I conducted a linear mixed model with the same fixed and random effects as above.

Cultures differed in their knowledge of cheese and dumplings, as indicated by a significant culture x food type interaction, $b = 12.05$, $SE = .50$, $z = 24.22$, $p < .001$, [11.02, 13.07]. U.K. participants were more likely to correctly identify cheese than dumplings, $b = -5.60$, $SE = .55$, $z = -10.12$, $p < .001$, [-6.96, -4.24]; whereas Chinese participants were more likely to correctly identify dumplings than cheese, $b = 6.44$, $SE = .55$, $z = 11.73$, $p < .001$, [5.09, 7.79]. The two cultures also differed in their familiarity with cheese and dumplings, $b = 5.44$, $SE = .18$, $t(396.19) = 31.04$, $p < .001$, [5.09, 5.78]. U.K. participants were more familiar with cheese ($M = 4.22$, $SE = .05$, [4.12, 4.32]) than dumplings ($M = 2.01$, $SE = .05$, [1.91, 2.11]), $b = -2.21$, $SE = .26$, $z = -8.52$, $p < .001$, [-2.84, -1.57]; whereas Chinese participants were more familiar with dumplings ($M = 5.54$, $SE = .06$, [5.42, 5.65]) than cheese ($M = 2.31$, $SE = .06$, [2.19, 2.42]), $b = 3.23$, $SE = .27$, $z = 11.86$, $p < .001$, [2.56, 3.90].

Estimated frequency. I examined whether British and Chinese participants were more inaccurate at tracking the frequency of culturally unfamiliar foods compared to familiar ones. I conducted similar linear mixed models as in Study 3, with the additional fixed effect of culture.

***Sensitivity to frequency variation*.** Participants across cultures showed impaired

sensitivity towards tracking the frequency of culturally unfamiliar foods, as indicated by a significant actual frequency x familiarity interaction, b = .15, SE = .01, t(786.9) = 10.47, p < .001, [.12, .18]. In particular, British participants were worse at discriminating among actual levels of frequency at which dumplings occurred (b = .21, SE = .02, z = 12.05, p < .001, [.17, .25]) compared to cheese (b = .40, SE = .02, z = 18.76, p < .007, [.35, .46]), as indicated by an actual frequency x familiarity interaction, b = .19, SE = .02, z = 9.32, p < .001, [.15, .24]. Chinese showed lessened sensitivity towards the frequencies of culturally unfamiliar (versus familiar) foods as well, b = .10, SE = .02, z = 5.39, p < .001, [.06, .15], tracking cheese less accurately (b = .30, SE = .02, z = 18.34, p < .001, [.36, .46]) than dumplings (b = .41, SE = .02, z = 20.05, p < .001, [.26, .34]).

Magnitude of frequency estimates. Participants across cultures underestimated the frequency at which the culturally unfamiliar foods appeared relative to familiar foods, b = .24, SE = .03, t(395) = 7.91, p < .001, [.18, .29]. This underestimation was significant for British participants (b = .09, SE = .04, z = 2.17, p = .030) as well as for Chinese (b = .38, SE = .04, z = 9.22, p < .001) (Figure 5).

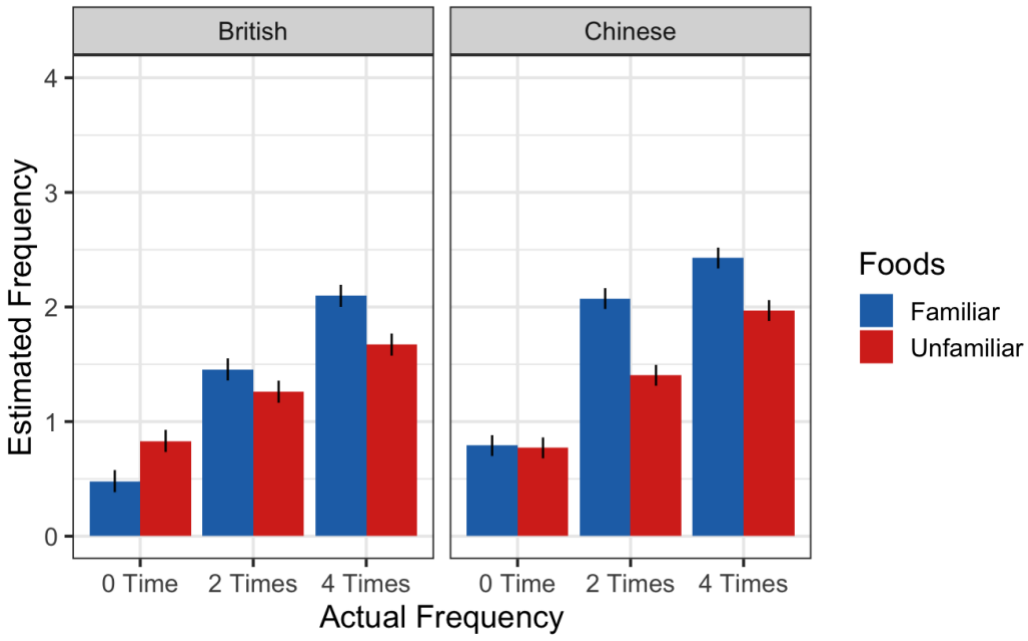


Figure 5. Estimated frequency of culturally familiar versus unfamiliar foods.

Study 5 Knowing a Concept versus Having a Label

Studies 1-4 demonstrated that hypocognition degrades the ability to recognize, identify, and remember instances and frequency of a concept. However, one might ask whether these results are due to hypocognition or simply lacking a verbal label for the objects shown. Cognitive psychological research has demonstrated that having a verbal label for an object or category can help improve memory (Anderson & Bower, 1972). Even when the label is nonsensical, it can provide an associative cue to be accessed at the time of encoding and, to a certain extent, facilitate subsequent recall (Klatzky & Rafnel, 1976; Lupyan, Rakison, & McClelland, 2007). In addition, having two modalities of coding (e.g., a visual image and a verbal label) aids memory more than having just one (Paivio, 1991; Paivio & Csapo, 1971). Hence, it could be that one has a verbal label for “apple” but not “durian” when seeing the pictures of these fruits, and the mere lack of labeling—rather than of underlying associations—leads to worse recognition, encoding,

and retention.

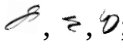
Study 5 aimed to disentangle the effect of not knowing a concept (hypocognition) from that of not having a verbal label for it. I proposed that lacking an underlying concept for an object—even when verbal labeling is present—still impairs frequency encoding.

To show this effect, I began by taking the cursive alphabetic letters from Study 2B and rotated/flipped them to render them unrecognizable. I then used the frequency encoding paradigm in Studies 3-4, showing participants the unfamiliar symbols at varying frequencies and asking them to estimate the frequency at which each symbol occurred. In the No Label/Concept condition, each symbol was displayed with no accompanying auditory label. In the Label condition, each symbol was displayed with a nonsensical auditory label, such that participants would be hypocognitive of the conceptual knowledge of letters underlying the displayed symbols despite having verbal labels for such symbols. In the Concept condition, each symbol was displayed with an auditory label carrying conceptual knowledge. I predicted that participants will be the least accurate in tracking the frequency of symbols accompanied by no labels or concepts. More importantly, they would also be less accurate in tracking the frequency of symbols accompanied by nonsensical labels as compared to when they were accompanied by labels that bring underlying conceptual knowledge.

Method

Seven hundred and two U.S. Americans (38.9% female; M_{age} = 36.52, *SD* = 10.62, range = 19 to 82; 68.1% non-Hispanic white) were recruited via TurkPrime.

Participants followed a similar procedure as in Studies 3 and 4. They were presented with unfamiliar symbol pictures representing cursive letters rotated or flipped (similar stimuli as in Study 2B) serially, with the first and last 5 pictures serving as buffers and 24 pictures of critical

symbols in the middle. The critical symbols consisted of 12 symbols (Set I:  ; Set II: ; Set III:  ; Set IV:). Within each symbol set, each symbol item occurred 0, 2, or 4 times (see Supplemental Online Materials for detail on study design and frequency order assignment).

During the serial presentation phase, participants were randomly assigned to one of three labeling conditions (Table 3). In the No Label/Concept condition, each symbol picture was displayed with no accompanying sound. In the Label condition, each symbol picture was displayed with an accompanying nonsensical sound label (e.g., was accompanied by the sound "ree"). In the Concept condition, each symbol picture was displayed with an accompanying sound label that brought conceptual knowledge to the stimulus (e.g., was accompanied by the sound "queue", as how the letter q sounds). Six native English-speaking research assistants (3 male, 3 female) articulated sounds for each symbol. I ensured that within each labeling condition, no repeating symbol was accompanied by the same voice.

Table 3 Labeling Condition x Symbol Set x Frequency Order x Actual Frequency Design

Labeling Condition (Between-Subject)	Set (Within-Subject)	Order (Between-Subject)	Actual Frequency (Within-Subject)		
			0 Time	2 Times	4 Times
No Label/Concept	Set I	Order I			
		Order II			
		Order III			
	Set II	Order I			
		Order II			
		Order III			
	Set III	Order I			
		Order II			
		Order III			
	Set IV	Order I			
		Order II			
		Order III			

			0 Time	2 Times	4 Times
Label	Set I	Order I	 (sound: ”ree”)	 (sound: ”fu”)	 (sound: ”gop”)
		Order II	 (sound: ”fu”)	(sound: "gop")	(sound: ”ree”)
		Order III	(sound: "gop")	(sound: ”ree”)	(sound: ”fu”)
	Set II	Order I	(sound: ”zad”)	(sound: ”nej”)	(sound: ”mip”)
		Order II	(sound: ” nej”)	(sound: ” mip”)	(sound: ”zad”)
		Order III	(sound: ” mip”)	(sound: ”zad”)	(sound: ” nej”)
	Set III	Order I	(sound: ”biu”)	(sound: ”wii”)	(sound: ”ho”)
		Order II	(sound: “wii”)	(sound: ”ho”)	(sound: ”biu”)
		Order III	(sound: ”ho”)	(sound: ”biu”)	(sound: ”wii”)
	Set IV	Order I	(sound: ”lop”)	(sound: ”ma”)	(sound: ”eh”)
		Order II	(sound: ”ma”)	(sound: ”eh”)	(sound: ”lop”)
		Order III	(sound: ”eh”)	(sound: ”lop”)	(sound: ”ma”)

			0 Time	2 Times	4 Times
Concept	Set I	Order I	(sound: ”q”)	(sound: ”m”)	(sound: ”v”)
		Order II	(sound: ”m”)	(sound: ”v”)	(sound: ”q”)
		Order III	(sound: ”v”)	(sound: ”q”)	(sound: ”m”)
	Set II	Order I	(sound: ”s”)	(sound: ”t”)	(sound: ”b”)
		Order II	(sound: ”t”)	(sound: ”b”)	(sound: ”s”)
		Order III	(sound: ”b”)	(sound: ”s”)	(sound: ”t”)
	Set III	Order I	(sound: ”d”)	(sound: ”n”)	(sound: ”a”)
		Order II	(sound: ”n”)	(sound: ”a”)	(sound: ”d”)
		Order III	(sound: ”a”)	(sound: ”d”)	(sound: ”n”)
	Set IV	Order I	(sound: ”g”)	(sound: ”f”)	(sound: ”i”)
		Order II	(sound: ”f”)	(sound: ”i”)	(sound: ”g”)
		Order III	(sound: ”i”)	(sound: ”g”)	(sound: ”f”)

Following the serial presentation, participants were asked to estimate the number of times they saw each symbol.

Results

Estimated frequency. I conducted two a priori contrasts. First, I examined whether participants were more inaccurate at tracking the frequency of unfamiliar symbols with no label/concept relative to those accompanied by either labels or concepts (contrast I: No Label/Concept = -0.5, Label = +0.25, Concept = +0.25). Next, I examined whether participants were more inaccurate at tracking the frequency of unfamiliar symbols accompanied by mere labels relative to those accompanied by labels that bring underlying conceptual knowledge (contrast II: No Label/Concept = 0, Label = -0.5, Concept = +0.5). I conducted similar linear mixed models as in Studies 3 and 4, with the additional fixed effect of labeling condition (see Supplemental Online Materials for model specification).

***Sensitivity to frequency variation*.** Participants showed impaired sensitivity towards tracking the frequency of unfamiliar symbols with no label/concept, as indicated by a significant actual frequency x contrast I (no label/concept versus label/concept) interaction, $b = .10$, $SE = .02$, $t(693.0) = 4.32$, $p < .001$, [.06, .15]. In particular, participants were worse at discriminating among actual levels of frequency of symbols accompanied by no label/concept ($b = .12$, $SE = .02$, $z = 6.08$, $p < .001$, [.08, .17]) compared to symbols accompanied by either labels or concepts ($b = .20$, $SE = .02$, $z = 11.44$, $p < .001$, [.16, .24]).

However, merely having a label for an unfamiliar symbol did not aid remembering as well as having conceptual knowledge of the symbol. Participants showed impaired sensitivity towards tracking the frequency of unfamiliar symbols accompanied by nonsensical labels, as indicated by a significant actual frequency x contrast II (label versus concept) interaction, $b = .05$, $SE = .02$, $t(693.0) = 2.28$, $p = .023$, [.01, .08]. In particular, participants were worse at discriminating among actual levels of frequency of symbols accompanied by nonsensical labels

(*b* = .18, *SE* = .02, *z* = 8.75, *p* < .001, [.13, .22]) compared to symbols accompanied by labels bringing conceptual knowledge (*b* = .22, *SE* = .02, *z* = 11.08, *p* < .001, [.17, .27]).

Magnitude of frequency estimates. Overall, participants underestimated the frequency of symbols accompanied by no label/concept (*M* = 1.48, *SE* = .01, [1.45, 1.50]) compared to those accompanied by either labels or concepts (*M* = 1.25, *SE* = .02, [1.21, 1.29]), *b* = .31, *SE* = .08, *t*(121.16) = 3.92, *p* < .001, [.15, .46] (Figure 6).

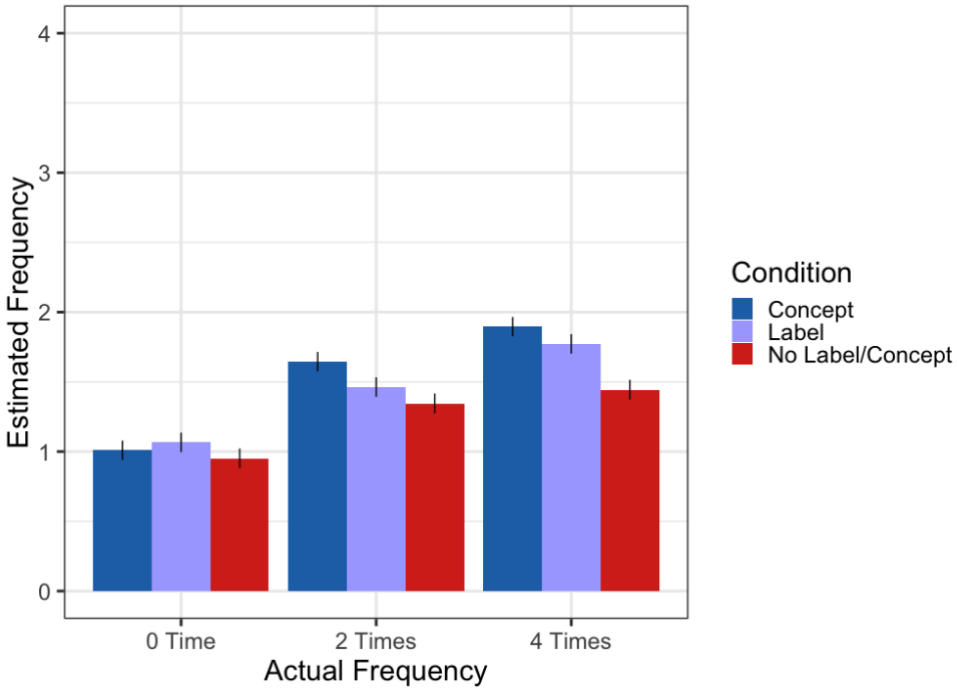


Figure 6. Estimated frequency of unfamiliar symbols accompanied by labels with conceptual information, nonsensical labels, or no label/conceptual information.

Discussion

Across six studies, participants hypocognitive of a category showed impairments in tracking encounters with instances of that category. Participants lacking conceptual knowledge reported experiencing fewer instances in daily life of the concept compared to people more familiar with the concept (Study 1), whether the concept be abstract or sensory in nature. In

subsequent studies, when presented with familiar and exotic objects, participants achieved less accuracy in identifying and tracking the frequency of objects that lay outside the typical experience of their culture, such as Americans encountering exotic fruits (Studies 2A & 3) and alphabetic letters rotated away from their usual visual orientation (Studies 2B & 5). The same pattern emerged among Britishers encountering Asian dumplings, and Chinese participants exposed to examples of cheese (Study 4). Each cultural group better tracked the frequency of foods common in their culture than they did the objects hypocognized in their culture.

Going Beyond Absence of Verbal Labeling

Classic literature in anthropology describes the notion of hypocognition through accounts of Tahitians who lacked the conception of grief and thus having an impoverished experience of it (R. I. Levy, 1973). I extended this notion beyond anthropological discussions, introducing a broader framework highlighting the role of impoverished conceptual knowledge in impairing cognitive processing of fundamental information, such as frequency of encounter.

However, the work does leave a question. Is hypocognition just not having a word, or label, to describe something? The findings suggest not. Hypocognition is a lack of conceptual knowledge, and lacking conceptual knowledge and lacking verbal labeling are two independent processes (Lupyan, 2008; Lupyan & Thompson-Schill, 2012). In Study 5, even when verbal labeling of rotated cursive letters was present, lacking the culturally-familiar concept deprived people of the penumbra of cognitive associations to each letter that impaired performance. This result echoes recent developments in emotion research, which demonstrate that emotion words do not influence emotion perception unless they match concepts that are culturally meaningful. For example, one study found that Himbia participants showed impairment perceiving Western

emotions, even when English translations were provided, because they lacked the underlying emotion categories (Gendron, Roberson, van der Vyver, & Barrett, 2014).

In this way, these findings also clarify the definition of hypocognition: One can have a linguistic label for a phenomenon, yet still have impoverished experiences of it. Americans may be told about the Japanese emotion *amae*, or be elicited to experience fragmentary aspects of it (Niiya et al., 2006), but they would come away with an incomplete experience and a nebulous understanding. Similarly, people can throw around buzzwords such as "sustainability" or "White privilege", yet stay hypocognitive of them and have little cognitive representation of what either term entails (Kho, 2014; Wu & Dunning, 2019, 2020). On the other hand, one can lack a label for a concept, yet have the conceptual knowledge for it. Animals respond to categories of sight and smell without having names for such categories (Astley & Wasserman, 1998). Aphasic patients can have an encyclopedic understanding of an object without having a label for it (Druks & Shallice, 2000). In these cases, they are not considered hypocognitive, even though there is no word to describe what they sense.

That said, having a label can aid cognitive processing to a certain extent. Some research has shown that even having a non-sensical label can provide an associative cue and facilitate encoding to some degree (Klatzky & Rafnel, 1976; Lupyan et al., 2007). Indeed, Study 5 did show that when provided with non-sensical auditory labels of rotated letters, participants tracked them more accurately than having neither labeling nor concept. Nevertheless, it is important to note that their encoding during a state of hypocognition (with verbal labeling) still proved to be inferior than encoding when having verbal labeling carrying conceptual knowledge.

Absence of Schema and Retention of Information

This work also carries implications for classic work on the role of schema on cognition. Classic work on schemata, particularly efforts from social psychology, almost exclusively focused on how schemata distorted memory and made people less accurate (J. B. Black et al., 1979; Brewer & Treyens, 1981). In reaction, critics of schema theory noted a lack of theory for how schema may aid accuracy in cognitive functioning (Alba & Hasher, 1983). Although schema theory accounted for distortions in remembering (Anderson & Bower, 1973; G. H. Bower, Black, & Turner, 1979; Brewer & Treyens, 1981), it often failed to focus on how schema might support rich and accurate memory traces for complex events.

The studies provide partial evidence for the accuracy account of schema, such that participants indeed showed notable accuracy in tracking the presence (Studies 1-2) and frequency (Studies 3-5) of events and objects with which they had conceptual knowledge. However, I highlight a precondition for such accuracy: a conceptual framework has to be in place. In absence of the conceptual knowledge contained in a schema, people showed deficits in their fundamental retention of information—a deficit in an ability shown in past literature to be invariable across numerous cognitive variables (Hasher & Zacks, 1984).

There is room, however, for further study about how people might remember instances of encounter that lie outside their conceptual knowledge. Debates about schema theory point to mixed evidence regarding the retention of schema-inconsistent information. While there is much agreement on whether the presence of a schema can lead to memory distortion, disagreements arise on what happens when there is an absence of a schema (Thorndyke & Yekovich, 1980). Many schema models suggest that schema-inconsistent information would fade from memory (Brewer, 2000). However, other variations of schema models pose the alternative possibility that

schema-consistent elements may blend into a homogenous background, whereas schema-inconsistent elements stand out and lead to heightened recall (e.g., Davidson & Hoe, 1993).

Along these lines, further work may show that events or objects that are hypocognized may stand out as more distinctive than those consistent with one's existing conceptual knowledge, and thus facilitate recall. However, findings thus far across studies show the opposite, such that hypocognition depletes retention of information, rather than sharpening its distinctiveness and heightening recall. Thinking through the potential fate of hypocognized categories in memory might be a profitable avenue for future research.

Finally, findings highlight a theoretical connection between the cultural psychological literature and the research on expertise. Individually, people are much like novices rather than experts when they observe and encode objects beyond their conceptual landscape, perceiving superficial attributes while missing the endogenous associations (M. T. H. Chi, Glaser, & Rees, 1982). They may still observe some aspects of the experience, but the experience is often crude and fragmentary. Culturally, the differing collections of concepts that cultural communities accrue over time provide a sufficient set of expertise for how people should navigate ways of living (Oyserman, 2017), but it renders a person inexpert once they step outside of the community.

Therein lies the irony of experiencing a culture foreign to one's own. As people venture outside of their familiar cultural milieu in an earnest attempt to gain new experiences, how much of their experience is one that the mind never registers? Like the oddities of a durian an American might come to experience, how much of people's experience with foreign cultures comprise of hazy fragments they struggle to comprehend, peculiar segments distorted through their own conceptual lens, unwitting blunders they commit yet fail to recognize?

Chapter 3 Social Consequences: Hypocognition and the Invisibility of Social Privilege

A slew of police killings in 2020 involving the deaths of George Floyd, Ahmaud Arbery, and Breonna Taylor brought to light the pervasiveness of systemic racism and everyday threat Black Americans face ("George Floyd updates: 10th night of protest follows somber memorial," 2020; Gupta, 2020). However, whereas a majority of Black Americans perceive racial discrimination in daily life, fewer than half of White Americans agree with such perception (Parker, Horowitz, & Mahl, 2016). On views of White privilege, a whopping 92% of Blacks report that Whites benefit from social advantages that Blacks lack, whereas only 46% of Whites think similarly (Oliphant, 2017). A similar attitudinal chasm has widened between genders. According to a 2017 Pew report, women report personally experiencing discrimination twice as often as men. However, whereas 41% of women acknowledge that men have easier lives than women, only 28% of men agree (Menasce Horowitz, Parker, & Stepler, 2017).

Why do people from dominant social groups perceive less privilege in their lives than that perceived by people from subordinate groups? I propose that dominant social groups suffer from *hypocognition*, or the lack of a cognitive or conceptual representation, of social privilege (Wu & Dunning, 2018a, 2018b, 2020). They are largely ignorant of the advantages they enjoy as dominant social groups in society or of disadvantages endured by other groups. Their knowledge of privilege is more fragmentary or impoverished than that held by other groups. Hence, they fail to acknowledge their privilege not necessarily because they actively deny it, but because they have little conception of what it is. As a consequence, they lack the cognitive architecture to identify, understand, and remember social privilege and its instantiations.

Hypocognition as a Cognitive Account of Privilege Blindness

Common approaches to studying privilege blindness focus on motivation, such that people from advantaged social groups minimalize discrimination and actively deny their social privilege out of defensive motivations to maintain innocence of self-image (Unzueta & Lowery, 2008). This motivational account asserts that social privilege is not invisible. Rather, people are well aware of the advantages their social identity entails and engage in a process of intentional "cloaking" of that privilege (Phillips & Lowery, 2018).

I acknowledge that people may engage in intentional blindness to assuage guilt and minimize discomfort when confronted with their privilege. However, I highlight a cognitive deficit that occurs prior to motivational defense. Members of dominant social groups, including well-intentioned individuals, often fail to acknowledge their privilege because social privileges are often invisible to those who have them. If one does not know what the concept of privilege entails or the everyday burdens carried by non-privileged groups, one cannot acknowledge that the absence of such burdens is an advantage they have.

I term the absence of cognitive representation of privilege the *hypocognition* of privilege (Wu & Dunning, 2020). To be hypocognitive of an idea is to lack its conceptual knowledge, including its instantiations, defining features, and their accompanying associations (Wu & Dunning, 2018a, 2019). In cognitive psychological terms, socially dominant group members lack a schema for privilege, a knowledge structure that organizes such information and that aids in cognitive processing of experience (Bartlett, 1932; Neisser, 1976).

To be hypocognitive of social privilege is to have an impoverished experience of what one's privilege confers. For example, no one will have difficulty recognizing a school desk, a pair of scissors, a spiral notebook, a guitar, or a can opener. However, a left-hander may readily

identify the theme of what those objects represent: items commonly designed for right-handers which present daily inconveniences for left-handers. Such a theme would remain unrecognized among right-handers. Right-handers would have little schema of the category represented by objects that pose difficulties for left-handers and hence, not be aware of the privilege their handedness entails.

A hypocognition approach to examining the invisibility of social privilege resonates with research on the *Marley hypothesis*, which focuses on a cognitive account in explaining group asymmetries in recognizing discrimination. The Marley hypothesis states that it is the ignorance of historical reality that underlies White Americans' dismissal of systemic racism (Nelson, Adams, & Salter, 2013), and simply learning about the history of housing discrimination helps boost perception about the prevalence of racism (Bonam, Nair Das, Coleman, & Salter, 2019).

Privilege as the Absence of Disadvantages

Social privilege is defined as the rights or advantages people of the dominant social groups enjoy based on their group membership (L. L. Black & Stone, 2005), but social privilege is as much about the absence of inconveniences as the presence of advantages. Women's studies scholar Peggy McIntosh likened privilege to an invisible knapsack of "special provisions, maps, passports, codebooks, visas, clothes, tools, and blank checks" (Mcintosh, 1989). Yet, many examples of the advantages in the invisible knapsack include "*not* being followed while shopping" and "*not* being made aware that one's shape or body odor will be taken as a reflection on one's race". This absence of daily hassles is crucial to what underlies the invisibility of social privilege.

In examining the hypocognition of privilege, I highlight the routine inconveniences and discrimination instances to which dominant social groups are oblivious. I operationalize

hypocognition as failure to generate, recall, recognize, or react to hassles or discrimination borne by non-privileged social groups.

In 8 studies, I examine the hypocognition of handedness advantage (Study 1), male privilege (Studies 2a-2c), and White privilege (Studies 3a-4) and hypothesize that right-handers, men, and Whites are hypocognitive of the disadvantages experienced by left-handers, women, and non-Whites. I measure hypocognition by looking for its signatures in cognitive performance. If socially advantaged participants lack a cognitive structure (i.e., schema) for privilege, they should perform worse than disadvantaged counterparts in generating, remembering, and efficiently classifying instances of it (Barsalou, 1983; Neisser, 1976). These socially dominant groups will come up with fewer examples of discrimination or daily hassles, recall fewer instances from a list previously presented to them, and react more slowly to whether such instances are discriminatory. Hypocognition, in turn, will predict group differences in acknowledging the privilege that dominant groups enjoy and the extent of discrimination experienced by subordinate groups.

I end with an intervention to reduce hypocognition (Study 5) by showing a TEDx talk of a transgender woman recounting her experience living as a man versus a woman. I predict that replenishing conceptual knowledge of male privilege will help increase awareness of privilege and perception of discrimination.

Study 1 Hypocognition of Handedness Advantage

I first explored hypocognition of advantage due to handedness. Unlike gender or racial privilege, this advantage taps into a domain not embroiled in social or political contention. By examining handedness advantage, I provide a general cognitive demonstration of how privilege is more hypocognized among advantaged groups, testing whether right-handers were unable to

generate as many handedness-related hassles as left-handers. I further predicted that this hypocognition would mediate group difference in awareness of any handedness advantage and perception of handedness discrimination.

Procedure and Measures.

Five hundred participants (M_{age} = 39.31, 54.0% female, 75% non-Hispanic White) were recruited from the TurkPrime crowdsourcing platform. I worked with the TurkPrime panel service to prescreen and sample as many left-handers as right-handers as possible. The final sample consisted of 334 right-handers and 166 left-handers.

Participants were asked to write down as many instances of hassles or inconveniences experienced by left-handers in everyday living as they could. These could be instances of difficulty when using particular objects or tools or dealing with unfavorable perceptions or remarks. Two research assistants coded the number of handedness-related hassles generated by each participant (κ = .92). Discrepancies among coders were resolved through discussion. Participants also filled out two attitudinal measures. They rated their awareness of handedness advantage (e.g., "Right-handed people have it easier than left-handed people"; α = .84), a measure adapted from the White Privilege Attitudes Scale—White Privilege Awareness subscale (1 = *strongly disagree* to 6 = *strongly agree*) (Pinterits, Poteat, & Spanierman, 2009). They also indicated how much right-handers and left-handers are or were subject to discrimination in the United States in each of the decades from 1950s to 2010s (1 = *not at all* to 10 = *very much*) (Norton & Sommers, 2011).

Results.

Handedness-related hassles. I performed a Poisson regression predicting the number of handedness-related hassles listed from handedness (left-handed = -0.5, right-handed = +0.5),

given that the number of hassles is a count variable. Right-handers generated fewer instances of handedness-related hassles (M = 3.57, SE = .10) than left-handers (M = 5.72, SE =.19), b = -.47, SE = .04, z = -10.84, p < .001.

Privilege awareness and discrimination perception. Right-handers were also less aware of their handedness advantage (M = 2.77, SE = .08) than left-handers (M = 3.70, SE = .12), $t(498) = 6.44$, p < .001, d = .61.

Regarding perceived discrimination, I computed difference scores (discrimination for left-handers – discrimination for right-handers) for the each of the seven decades. I subjected the discrimination difference scores to a 2 handedness (right-handed vs. left-handed) x 7 decades (1950s thru 2010s) mixed-design ANOVA. Overall, right-handed participants perceived less discrimination against left-handers (relative to right-handers) (M = 1.71, SE = .12) than left-handed participants (M = 3.31, SE = .17), $F(1, 498) = 56.86$, p < .001, η_{p2} = .10. This perceptual gap narrowed over the decades, as indicated by a significant handedness x decade interaction, $F(1.75, 871.71) = 56.85$, p < .001, η_{p2} = .10. Even so, simple effects analyses showed that group difference in perceived discrimination was still significant for each of the seven decades, bs > .38, $t(498)$s > 2.12, ps < .035.

Mediation. Hypocognition among right-handers (versus left-handers) mediated group difference in acknowledging handedness advantage. Specifically, the lack of handedness hassles generated by right- (versus left-) handers predicted their lower awareness of handedness advantage (indirect effect = -.22, 95% CI [-.32, -.14]) (Figure 7).

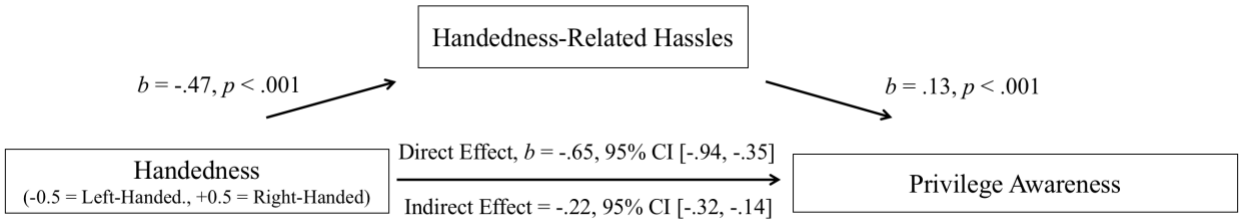


Figure 7. Simple mediation model for the effect of handedness on privilege awareness via the number of handedness-related hassles generated.

I then examined whether the number of listed hassles mediated the relationship between handedness (left-handed = -0.5, right-handed = +0.5) and perceiving the extent of discrimination faced by left-handers relative to right-handers (discrimination difference score) while including the moderating effects of decade (1950s to 2010s = -3, -2, -1, 0, 1, 2, 3). The lack of handedness hassles generated by right- (versus left-) handers predicted their lower perception of handedness discrimination (indirect effect = -.29, 95% CI [-.47, -.14]) (Figure 8).

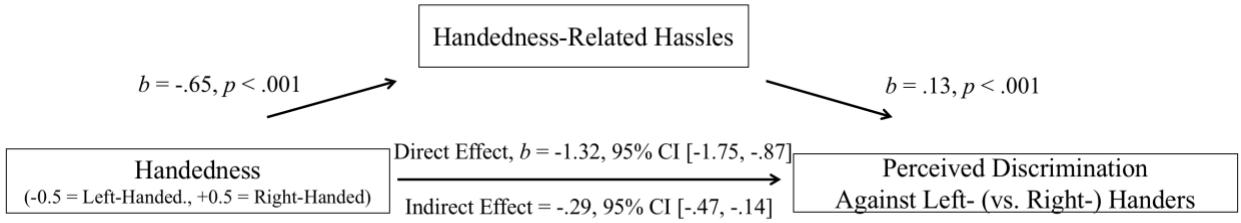


Figure 8. Mediation model for the effect of handedness on perceived discrimination via the number of handedness-related hassles generated, controlling for the moderating effects of decade.

Study 2a Hypocognition of Male Privilege: Generation of Discrimination Instances

Studies 2a-2c extended my examination to male privilege. Study 2a conceptually replicated Study 1 and operationalized hypocognition as whether men were unable to generate as many gender discrimination instances as women. I predicted that this hypocognition would

mediate gender difference in awareness of male privilege and perception of gender discrimination.

Procedure and Measures

Two hundred and seventy participants (M_{age} = 36.53, 53.7% female, 80.4% non-Hispanic White) were recruited from TurkPrime, of which 145 were women and 125 were men.

Participants followed a similar procedure as in Study 1 and wrote down instances of gender discrimination experienced by women in everyday living, which were coded by two research assistants (κ = .96). Participants rated their awareness of male privilege (α = .84; 1 = *strongly disagree* to 6 = *strongly agree*) (Pinterits et al., 2009) and how much men and women are or were subject to discrimination in the United States from 1950s to 2010s (1 = *not at all* to 10 = *very much*) (Norton & Sommers, 2011).

Results

Unless otherwise specified, I performed similar analyses as in Study 1 throughout the rest of the studies.

Discrimination instances. Men generated fewer instances of gender discrimination (M = 4.66, SE = .19) than women (M = 6.49, SE = .21), b = -.33, SE = .05, z = -6.27, $p < .001$.

Privilege awareness and discrimination perception. Men were less aware of male privilege (M = 3.72, SE = .12) than women (M = 4.19, SE = .10), $t(268) = 3.05$, p = .002, d = .37. Men also perceived less discrimination against women (relative to men) (M = 4.10, SE = .26) than women (M = 4.85, SE = .24), $F(1, 268) = 4.38$, p = .037, η_{p2} = .02. This perceptual gap held across decade, as indicated by a non-significant gender x decade interaction, $F(1.69, 452.06)$ = .80, p = .430, η_{p2} = .003.

Mediation. Hypocognition among men (versus women) mediated gender difference in acknowledging male privilege and perceiving the extent of discrimination faced by women (relative to men). Specifically, the lack of discrimination instances generated by men (versus women) predicted their lower awareness of male privilege (indirect effect = -.17, 95% CI [-.28, -.08]) and lower perception of gender discrimination across decades (indirect effect = -.56, 95% CI [-.88, -.30]).

Study 2b Hypocognition of Male Privilege: Recall of Safety Precautions

In *The Macho Paradox* (Katz, 2006), educator Jackson Katz described an exercise during which he drew a line down the middle of a chalkboard and asked men and women to write down on each side the steps they take to protect themselves from assault. Whereas men stared at the board in silence, women readily recounted safety precautions as a part of their daily routine (e.g., "holding my key as a potential weapon", "don't go jogging at night").

In Study 2b, I exposed men and women to safety precaution items adapted from Katz' classroom exercise and later asked them to recall as many items from the list as they could. Research from cognitive psychology shows that a well-established knowledge structure contains features representing a concept and associations among features (Barsalou, 1983). An impoverished knowledge structure, however, contains only fragmentary aspects of a concept with little association among the represented features. Thus, if men have a weaker conceptual grasp of male privilege as the absence of worries about assault, they will be less able to recall its associated instances of safety precautions compared to women. I further predict that this hypocognition will mediate gender gap in awareness of male privilege and gender discrimination.

Procedure and Measures

One hundred and sixty-six participants (M_{age} = 36.37, 48.8% female, 77.1% non-Hispanic White) were recruited from TurkPrime, of which 81 were women and 85 were men. Participants were presented with a list of 10 safety precaution items adapted from *The Macho Paradox* (Katz, 2006) (set I: e.g., "hold one's key as a potential weapon"; set II: e.g., "book flights that arrive during the day") and 5 filler items (set I: e.g., "drink eight glasses of water per day"; set II: e.g., "turn off the faucet when brushing teeth"). Participants were randomly assigned to one of the two item sets. They rated the extent to which each action represented an example of how people protect themselves from being assaulted ($\alpha_{\text{Safety Precaution}}$ = .84, $\alpha_{\text{Filler Action}}$ = .87; 1 = *not at all* to 7 = *very well*).

Next, participants completed a two-minute numerical distraction task, counting backwards by 3 in writing from the number 5486. Afterwards, participants were asked to write down as many items as they could recall from the previous item list. The recall instruction made no mention of safety so as to minimize memory intrusions. Two research assistants coded the number of safety precautions (κ = .89) and filler actions (κ = .96) correctly recalled by each participant.

As in Study 2a, participants rated their awareness of male privilege (α = .87) and how much men and women are or were subject to discrimination in the United States from 1950s to 2010s.

Results

I performed similar analyses as in previous studies while controlling for item set in models involving safety precautions and filler actions. Means reported below are estimated marginal means averaged across item set.

Safety precautions. Men rated the safety precaution items to be less prototypical of actions people take to protect themselves from assault (M = 3.94, SE = .14) compared to women (M = 4.76, SE = .15), $F(1, 163) = 16.15$, $p < .001$, $\eta_{p2} = .09$. There was no gender difference in the prototypicality ratings of filler items (Ms = 1.57 vs. 1.66), $F(1, 163) = .29$, $p = .591$, $\eta_{p2} = .002$.

Regarding the key measure of hypocognition, men recalled fewer safety precaution items (M = 3.99, SE = .22) than women (M = 4.94, SE = .25), $b = -.21$, $SE = .07$, $z = -2.91$, $p = .004$. There was no gender difference in the number of filler items recalled (Ms = 1.32 versus 1.30), $b = .02$, $SE = .14$, $z = .11$, $p = .910$.

Privilege awareness and discrimination perception. Men were less aware of male privilege (M = 3.48, SE = .16) than women (M = 4.43, SE = .14), $t(164) = 4.41$, $p < .001$, $d = .68$. Men also perceived less discrimination against women (relative to men) (M = 4.30, SE = .28) compared to women (M = 5.55, SE = .29), $F(1, 164) = 9.47$, $p = .002$, $\eta_{p2} = .06$. This perceptual gap widened over the decades, as indicated by a significant gender x decade interaction, $F(1.6745, 274.62) = 7.42$, $p = .001$, $\eta_{p2} = .04$. Simple effects analyses showed that gender difference in perceived discrimination emerged in the 1970s and became increasingly pronounced throughout 2010s, bs > .97, $t(164)$s > 2.50, ps < .014.

Mediation. Replicating Study 2a, hypocognition among men (versus women) mediated gender difference in acknowledging male privilege and perceiving the extent of discrimination faced by women (relative to men). Specifically, the lack of discrimination instances generated by men (versus women) predicted their lower awareness of male privilege (indirect effect = -.14, 95% CI [-.29, -.02]) and lower perception of gender discrimination across decades (indirect effect = -.40, 95% CI [-.82, -.05]).

Study 2c Hypocognition of Male Privilege:

Recall and Recognition of Discrimination Instances

Study 2c extended the recall findings related to safety precaution to gender discrimination more broadly. I showed participants a TEDx talk of a transgender woman describing her experience from both sides of the gender divide and acknowledging the daily hassles she now faced as a woman. I measured hypocognition by asking participants to recall as many hassles mentioned in the talk as possible a day after they watched the talk. I also added a recognition accuracy measure as an additional index of hypocognition to examine the extent to which participants could distinguish instances that were actually presented in the talk from non-presented "lures". I predict that hypocognition, as either a lack of recall or recognition accuracy, will predict gender difference in attitudes related to awareness and discrimination.

Procedure and Measures

Two hundred and twenty-eight participants (M_{age} = 36.67, 41.2% female, 66.7% non-Hispanic White) recruited from TurkPrime completed the survey at both time points. Ninety-four of the participants were women and 134 were men.

Participants rated their awareness of male privilege (α = .89; 1 = *strongly disagree* to 6 = *strongly agree*) and how much men and women are or were subject to discrimination in the United States from 1950s to 2010s (1 = *not at all* to 10 = *very much*) as before. They then watched a TEDx talk in which a transgender woman described how her experience of everyday living differed from that when she was living as male. She recounted a series of daily inconveniences and instances of discrimination that she has encountered now living as female and acknowledged the male privilege she once had (Williams, 2017).

A day later, participants were asked to write down as many instances described in the TEDx talk as they could recall, which were coded by two research assistants (κ = .93). Participants also completed a recognition task, during which they were presented with a list of 11 instances mentioned in the talk (e.g., being explained things—in which they have knowledge—by a man) and 11 instances not described in the talk (e.g., being told to smile by a stranger or male colleague). Participants were asked to indicate their level of certainty regarding whether each instance was mentioned in the talk (1 = *definitely not mentioned* to 6 = *definitely mentioned*).

Results

Recall of discrimination instances. Men recalled fewer gender discrimination instances described in the TEDx talk (M = 3.06, SE = .15) than women (M = 4.06, SE = .21), b = -.28, SE = .07, z = -3.99, $p < .001$.

Recognition of discrimination instances. I conducted a signal detection analysis to assess whether men were less accurate recognizing the gender discrimination instances described in the TEDx talk. I calculated two independent measures from signal detection theory: sensitivity (d'), the ability to distinguish previously mentioned instances from unmentioned foils; and response bias (c), the general threshold for answering "the instance was mentioned" or "the instance was not mentioned" (Stanislaw & Todorov, 1999).

Men showed less sensitivity towards recognizing gender discrimination instances (M = 1.54, SE = .08) than women (M = 1.81, SE = .09), $t(226) = 2.18$, p = .030, d = .29. In addition, women showed a lower response threshold (greater bias) for remembering discrimination instances as being mentioned in the talk (M = -.31, SE = .04) compared to men (M = -.17, SE = .04), $t(226) = -2.56$, p = .011, d = -.34, regardless of whether the discrimination instances were

actually mentioned. This finding is consistent with classic schema work demonstrating that greater false alarms in recognition are indications that an underlying conceptual schema is present and activated (Cantor & Mischel, 1977).

Privilege awareness and discrimination perception. Men were less aware of male privilege (M = 3.74, SE = .12) than women (M = 4.63, SE = .14), $t(226) = 4.82$, $p < .001$, $d = .65$. Men also perceived less discrimination against women (relative to men) (M = 4.01, SE = .25) compared to women (M = 5.37, SE = .29), $F(1, 268) = 12.73$, $p < .001$, $\eta_{p2} = .05$. This perceptual gap held across decade, as indicated by a non-significant gender x decade interaction, $F(1.72, 387.74) = 1.27$, $p = .280$, $\eta_{p2} = .006$.

Mediation. I first tested whether hypocognition among men (versus women)—as indexed by the lack of discrimination instances recalled—mediated gender difference in acknowledging male privilege and perceiving the extent of discrimination faced by women (relative to men). Indeed, the lack of discrimination instances recalled by men (versus women) predicted their lower awareness of male privilege (indirect effect = -.15, 95% CI [-.28, -.04]) and lower perception of gender discrimination across decades (indirect effect = -.44, 95% CI [-.78, -.17]).

Next, I tested whether hypocognition—as indexed by the lack of recognition accuracy (lower sensitivity *d'*)—mediated gender difference in privilege awareness and discrimination perception. Analyses showed that the lack of accuracy in recognizing discrimination instances among men (versus women) predicted their lower awareness of male privilege (indirect effect = -.07, 95% CI [-.16, -.002]) and lower perception of gender discrimination across decades (indirect effect = -.27, 95% CI [-.42, -.15]). Note that response bias (c) did not mediate gender difference

in privilege awareness (indirect effect = -.04, 95% CI [-.12, .02]) or discrimination perception (indirect effect = -.004, 95% CI [-.14, .13]).

Study 3a Hypocognition of White Privilege: Generation of Discrimination Instances Experienced by Black Americans

Studies 3a-3b moved from hypocognition of male privilege to that of White privilege. I measured hypocognition by having White and Black Americans generate (Study 3a) and recall from a presented list (Study 3b) instances of racial discrimination in everyday living. I hypothesize that White Americans will generate and recall fewer discriminatory behaviors compared to Black Americans, and this hypocognition will explain why they lack awareness of White privilege and underperceive racial discrimination.

Procedure and Measures

Two hundred and ninety-eight participants (M_{age} = 38.22, 62.1% female) recruited from TurkPrime, of which 154 were White and 144 were Black.

Participants followed a similar procedure as in Studies 1 and 2a and wrote down instances of racial discrimination experienced by Blacks in everyday living, which were coded by two research assistants (κ = .93). Participants also rated their awareness of White privilege (α = .87; 1 = *strongly disagree* to 6 = *strongly agree*) (Pinterits et al., 2009), how much White and Black Americans are or were subject to discrimination in the United States from 1950s to 2010s (1 = *not at all* to 10 = *very much*) (Norton & Sommers, 2011).

Results

Discrimination instances. White Americans generated fewer instances of racial discrimination (M = 4.89, SE = .18) than Black Americans (M = 5.93, SE = .20), b = -.19, SE = .05, z = -3.86, $p < .001$.

Privilege awareness and discrimination perception. White Americans were less aware of White privilege (M = 4.18, SE = .11) than Black Americans (M = 5.25, SE = .07), $t(296) = 7.91$, $p < .001$, $d = .92$. White Americans also perceived less discrimination against Black Americans (relative to White Americans) (M = 5.57, SE = .23) compared to Black Americans (M = 6.80, SE = .24), $F(1, 296) = 13.74$, $p < .001$, $\eta_{p2} = .04$. This perceptual gap widened over the decades, as indicated by a significant ethnicity x decade interaction, $F(1.73, 510.60) = 32.31$, $p < .001$, $\eta_{p2} = .10$. Simple effects analyses showed that ethnic difference in perceived discrimination emerged in the 1980s and became increasingly pronounced throughout 2010s, bs > .93, $t(296)$s > 2.68, ps < .007.

Mediation. Hypocognition among White Americans (versus Black Americans) mediated ethnic difference in acknowledging White privilege and perceiving the extent of discrimination faced by Black Americans (relative to White Americans). Specifically, the lack of discrimination instances generated by Whites (versus Blacks) predicted their lower awareness of White privilege (indirect effect = -.08, 95% CI [-.15, -.03]) and lower perception of racial discrimination across decades (indirect effect = -.30, 95% CI [-.56, -.07]).

Study 3b Hypocognition of White Privilege:

Recall of Discrimination Instances Experienced by Black Americans

Procedure and Measures

Two hundred and forty-five participants (M_{age} = 38.18, 60.4% female) recruited from TurkPrime, of which 139 were White and 106 were Black.

Participants were presented with a list of 10 discrimination instances (set I: e.g., “being followed by security while shopping”; set II: e.g., “being questioned about their presence in their own neighborhood”) and 5 filler instances (set I: e.g., “being asked to drink eight cups of water

per day"; set II: e.g., "being advised to turn off the lights before leaving home"). Participants were randomly assigned to one of the two item sets. They rated the extent to which each instance represented an example of everyday racial discrimination ($\alpha_{\text{Discrimination Instance}} = .89$, $\alpha_{\text{Filler Instance}} = .75$; 1 = *not at all* to 7 = *very well*).

Next, participants completed a two-minute numerical distraction task, counting backwards by 3 in writing from the number 5486. Afterwards, participants were asked to write down as many items as they could recall from the previous item list. The recall instruction made no mention of racial discrimination so as to minimize memory intrusions. Two research assistants coded the number of discrimination instances ($\kappa = .93$) and filler instances ($\kappa = .95$) correctly recalled by each participant.

As in Study 3a, participants rated their awareness of White privilege ($\alpha = .90$), how much White and Black Americans are or were subject to discrimination in the United States from 1950s to 2010s.

Results

I performed similar analyses as in previous studies while controlling for item set in models involving discrimination and filler instances. Means reported below are estimated marginal means averaged across item set.

Discrimination instances. White Americans rated the discrimination instances to be less prototypical of experiences of everyday racial discrimination ($M = 3.97$, $SE = .14$) compared to Black Americans ($M = 4.54$, $SE = .16$), $F(1, 242) = 7.29$, $p = .007$, $\eta_{p2} = .03$. There was no ethnic difference in the prototypicality ratings of filler instances (Ms = 1.12 vs. 1.15), $F(1, 242) = .15$, $p = .697$, $\eta_{p2} < .001$.

Regarding my key measure of hypocognition, Whites recalled fewer discrimination instances (M = 3.91, SE = .17) than Blacks (M = 4.58, SE = .21), b = -.16, SE = .06, z = -2.54, p = .011. There was no ethnic difference in the number of filler instances recalled (Ms = 1.12 versus 1.02), b = .10, SE = .12, z = .78, p = .438.

Privilege awareness and discrimination perception. White Americans were less aware of White privilege (M = 4.23, SE = .13) than Black Americans (M = 5.25, SE = .09), t(228.23) = 6.42, p < .001, d = .77. Whites also perceived less discrimination against Blacks (relative to Whites) (M = 5.63, SE = .22) compared to Blacks (M = 7.00, SE = .25), F(1, 243) = 16.92, p < .001, η_{p2} = .07. This perceptual gap widened over the decades, as indicated by a significant gender x decade interaction, F(1.54, 375.39) = 26.57, p < .001, η_{p2} = .10. Simple effects analyses showed that ethnic difference in perceived discrimination emerged in the 1970s and became increasingly pronounced throughout 2010s, bs > .84, t(243)s > 2.76, ps < .007.

Mediation. Replicating Study 3a, hypocognition among Whites (versus Blacks) mediated ethnic difference in acknowledging White privilege and perceiving the extent of discrimination faced by Blacks (relative to Whites). Specifically, the lack of discrimination instances recalled by Whites (versus Blacks) predicted their lower awareness of White privilege (indirect effect = -.14, 95% CI [-.29, -.01]) and lower perception of racial discrimination across decades (indirect effect = -.23, 95% CI [-.47, -.06]).

Study 4 Hypocognition of White Privilege: Generation of and Response Time Towards Discrimination Instances Experienced by Asian Americans

In Study 4, I examined hypocognition of White privilege in light of the invisibility of discriminatory actions experienced by Asian Americans, which often include racial

microaggressions emphasizing their cultural foreignness (Zou & Cheryan, 2017). Worse yet, a certain class of microaggressions, such as microinvalidations, can mask as compliments (e.g., "Your English is really good!") while nullifying one's American identity by treating one as a perpetual foreigner (Sue et al., 2007). These discrimination instances can be ambiguous, fleeting, and difficult to disarm in the moment (Sue et al., 2019); hence, they often go unnoticed and unaddressed, invisible to White Americans who are not schematic of them.

As in previous studies, I measured hypocognition by asking White Americans and Asian Americans to generate as many instances of racial discrimination as they could. I also assessed reaction time as a more implicit measure of hypocognition. White Americans may say "yes" to whether an instance reflects discriminatory behavior, but make such response more slowly than Asian Americans because they have a more impoverished idea of the content and scope of discrimination faced by Asian Americans. I predict that hypocognition, as indexed by either measure, will underlie a lack of awareness of White privilege and perception of racial discrimination.

Procedure and Measures

Two hundred and forty-ninety participants (M_{age} = 36.84, 62.2% female) recruited from TurkPrime, of which 145 were White and 104 were Asian.

Participants followed a similar procedure as in Studies 1, 2a, and 3a and wrote down instances of racial discrimination experienced by Asian Americans in everyday living, which were coded by two research assistants (κ = .91).

Next, participants completed a reaction time task, judging as quickly as possible whether they think an instance represents an example of everyday racial discrimination faced by Asian Americans in the U.S. by pressing the F key (*yes*) or the J key (*no*). The reaction task consisted

of 20 discrimination instances (e.g., being asked where they are really from) and 10 filler instances (e.g., being advised to turn off the lights before leaving home). Prior to the actual task, participants completed 16 practice questions to get used to pressing F and J keys as a way to agree or disagree with simple statements (e.g., "1 + 2 = 3") as well as 4 trial questions, which included 2 discrimination instances and 2 filler instances different from those included in the actual reaction time task.

As in previous studies, participants rated their awareness of White privilege ($\alpha = .78$; 1 = *strongly disagree* to 6 = *strongly agree*) and how much White Americans and Asian Americans are or were subject to discrimination in the United States from 1950s to 2010s (1 = *not at all* to 10 = *very much*).

Results

Generation of discrimination instances. White Americans generated fewer instances of racial discrimination ($M = 4.26$, $SE = .17$) than Asian Americans ($M = 5.23$, $SE = .22$), $b = -.21$, $SE = .06$, $z = -3.51$, $p < .001$.

Reaction time for discrimination instances. All reaction time responses were natural log transformed to correct for skewness. White Americans and Asian Americans did not differ in the proportion of "yes" responses to identifying a discrimination instance as an example of everyday racial discrimination faced by Asian Americans (70% vs. 69%), $b = -.02$, $SE = .23$, $z = -.08$, $p = .936$. Nor did they differ in responding "yes" to identifying a filler instance as an example of racial discrimination (3% vs. 8%), $b = -.89$, $SE = .90$, $z = -1.00$, $p = .319$. In addition, whether participants responded "yes" or "no" did not interact with ethnic difference in reaction time. Therefore, in the analyses that I report below, I computed aggregated scores for reaction time (natural log transformed) across 20 discrimination instances ($\alpha = .97$) and across 10 filler

instances (α = .95). I examined whether Whites and Asians differed in reaction time to discrimination instances while controlling for baseline reaction time to filler instances.

White Americans reacted more slowly to discrimination instances ($M_{\ln(\text{Reaction Time})}$ = .57, *SE* = .02) than Asian Americans ($M_{\ln(\text{Reaction Time})}$ = .49, *SE* = .03), *b* = .08, *SE* = .04, *t* = 2.18, *p* = .030, after controlling for baseline reaction time for filler instances.

Privilege awareness and discrimination perception. White Americans were less aware of White privilege (*M* = 3.88, *SE* = .11) than Asian Americans (*M* = 4.48, *SE* = .10), *t*(247) = 3.96, *p* < .001, *d* = .51. Whites also perceived less discrimination against Asians (relative to Whites) (*M* = 4.43, *SE* = .21) compared to Asians (*M* = 5.53, *SE* = .25), *F*(1, 247) = 11.77, *p* < .001, η_{p2} = .05. This perceptual gap widened over the decades, as indicated by a significant gender x decade interaction, *F*(1.85, 456.43) = 15.12, *p* < .001, η_{p2} = .06. Simple effects analyses showed that ethnic difference in perceived discrimination emerged in the 1980s and became increasingly pronounced throughout 2010s, *b*s > 1.17, *t*(247)s > 3.28, *p*s < .002.

Mediation. I first tested whether hypocognition among White Americans (versus Asian Americans)—as indexed by the lack of discrimination instances generated—mediated ethnic difference in acknowledging White privilege and perceiving the extent of discrimination faced by Asians (relative to Whites). Indeed, the lack of discrimination instances generated by Whites (versus Asians) predicted their lower awareness of White privilege (indirect effect = -.07, 95% CI [-.14, -.01]) and lower perception of racial discrimination across decades (indirect effect = -.20, 95% CI [-.40, -.05]).

Next, I tested whether hypocognition—as indexed by slower reaction time—mediated ethnic difference in privilege awareness and discrimination perception. I controlled for baseline reaction time towards filler instances as before. Analyses showed that the slower reaction

towards discrimination instances among Whites (versus Asians) predicted their lower awareness of White privilege (indirect effect = -.06, 95% CI [-.14, -.004]) and lower perception of racial discrimination across decades (indirect effect = -.07, 95% CI [-.09, -.06]).

Study 5

Study 5 aimed to reduce hypocognition through an intervention by having participants listen a transgender woman describing her experience from both sides of the gender divide. I expect that learning about the discrimination experience and loss of male privilege from the perspective of a transgender woman will help ameliorate hypocognition and raise awareness of gender privilege and boost perception of gender discrimination.

Procedure and Measures

Three hundred and eleven participants (M_{age} = 38.93, 45.3% female, 72.3% non-Hispanic White) recruited from TurkPrime completed the survey at both time points. One hundred and forty-one of the participants were women and 170 were men.

Participants rated their awareness of male privilege (α = .86; 1 = *strongly disagree* to 6 = *strongly agree*) and how much men and women are or were subject to discrimination in the United States from 1950s to 2010s (1 = *not at all* to 10 = *very much*) as baseline measures. About two weeks later, they were randomly assigned to watch one of two TEDx talks. In the intervention condition, participants watched a TEDx talk as in Study 2c, in which a transgender woman described the everyday inconveniences and discrimination she now faces living as female compared to the lack thereof while living as male, her former gender (Williams, 2017). In the control condition, participants watched a TEDx talk in which a productivity consultant described ways to focus one's attention in a world of distraction (Bailey, 2019). Each original

video was around 15 minutes and edited to 9 minutes for the purpose of my survey to contain central instances and key points.

After watching the TEDx talk, participants completed 4 comprehension checks and 4 engagement questions (e.g., "How engaging was the TEDx talk?", $\alpha = .81$; 1 = *not at all* to 7 = *very much*). Afterwards, they completed the same privilege awareness ($\alpha = .87$) and discrimination perception questions as before.

Results

Comprehension checks. We conducted a generalized linear model with a binomial distribution predicting the proportion of comprehension checks participants answered correctly from their gender (women = -0.5, men = +0.5), condition (control = -0.5, intervention = +0.5), and their interaction. A non-significant condition main effect indicated no difference in comprehension for the intervention and control TEDx talks (91.7% vs. 92.3%), $b = -.08$, $SE = .46$, $z = -.18$, $p = .858$. There was a main effect of gender, such that women answered more comprehension checks correctly than men (95.2% vs. 87%), $b = -1.10$, $SE = .46$, $z = -2.41$, $p = .016$. However, this gender difference was consistent across conditions, as indicated by a non-significant gender x condition interaction, $b = -.18$, $SE = .92$, $z = -.20$, $p = .841$.

Engagement checks. We subjected the aggregated engagement score to a 2 gender (women vs. men) x 2 condition (control vs. intervention) between-subject ANOVA. A non-significant condition main effect indicated no difference in engagement for the intervention and control TEDx talks (*M*s = 5.89 vs. 5.84), $F(1, 307) = .13$, $p = .715$, $\eta_{p2} < .001$. There was a main effect of gender, such that women engaged more with the TEDx talks overall than men (*M*s = 6.11 vs. 5.62), $F(1, 307) = 17.07$, $p < .001$, $\eta_{p2} = .053$. However, this gender difference was

consistent across conditions, as indicated by a non-significant gender x condition interaction, $F(1, 307) = 2.64$, $p = .105$, $\eta_{p2} = .009$.

Effects of Intervention. To examine the effect of intervention on awareness of male privilege, I conducted a linear model predicting privilege awareness at Time 2 from condition (control = -0.5, intervention = +0.5), participant gender (women = -0.5, men = +0.5), and their interaction while controlling for baseline privilege awareness at Time 1. The intervention raised participants' awareness of male privilege, $b = .37$, $SE = .08$, $t = 4.54$, $p < .001$. This main effect of intervention did not differ by participant gender, as indicated by a non-significant condition x gender interaction, $b = -.01$, $SE = .16$, $t = -.09$, $p = .931$. Not only did the intervention increase male privilege awareness for men (*M*s = 3.99 vs. 4.35), but also did it increase privilege awareness for women (*M*s = 4.16 vs. 4.54) to a similar extent.

To examine the effect of intervention on perception of gender discrimination, I conducted a linear mixed model predicting perceived discrimination against women (versus men) at Time 2 from the fixed effects of participant gender (women = -0.5, men = +0.5), condition (control = -0.5, intervention = +0.5), decade (1950s to 2010s = -3, -2, -1, 0, 1, 2, 3), their interaction while controlling for baseline privilege awareness at Time 1, along with the random effect (random intercept) of participant. The intervention raised participants' perception of gender discrimination, $b = .75$, $SE = .19$, $t(303.23) = 3.92$, $p < .001$. This intervention main effect became more pronounced for perceived discrimination over the decades, as indicated by a significant intervention x decade interaction, $b = .12$, $SE = .03$, $t(1859.78) = 3.86$, $p < .001$. However, the intervention main effect did not differ by participant gender, given the non-significant condition x gender interaction, $b = -.02$, $SE = .38$, $t(303.22) = -.06$, $p = .951$. Not only did the intervention increase perception of gender discrimination for men across decades (*M*s =

4.26 vs. 5.00), but also did it increase perceived discrimination for women (*M*s = 4.82 vs. 5.58) to a similar extent (Figure 9).

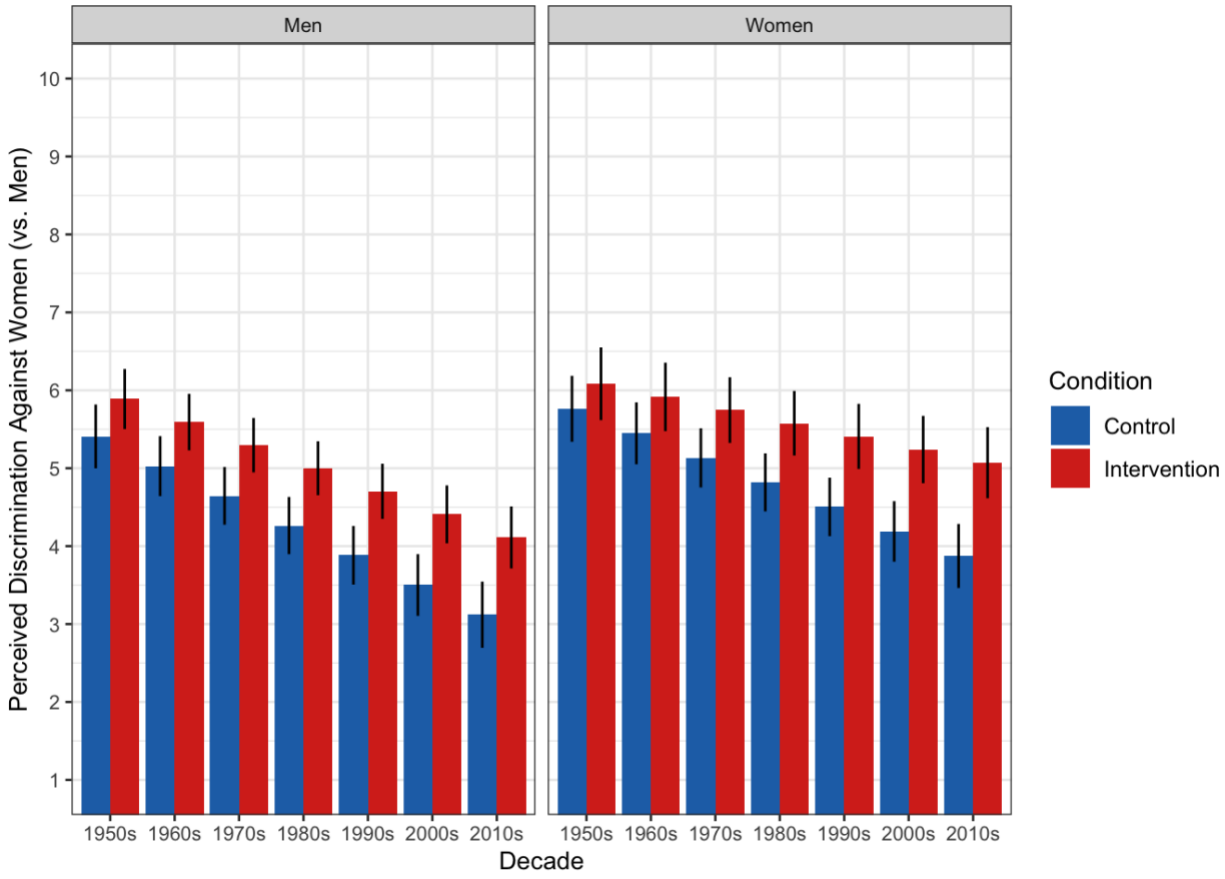


Figure 9. The effect of intervention (versus control) on perceived gender discrimination from 1950s to 2010s among men and women.

Discussion

Social privileges are invisible to those who have them. In 8 studies, I show that people of socially dominant groups are hypocognitive of their privilege and have little idea of the daily hassles and discrimination experienced by subordinate groups. Right-handers generated fewer handedness-related hassles compared to left-handers (Study 1). Men generated fewer gender discrimination instances, recalled fewer items of safety precaution against assault from a

presented list, and showed worse recall and recognition of examples of gender discrimination from a video compared to women (Studies 2a to 2c). Whites generated and recalled fewer racial discrimination instances than non-Whites and recognized discriminatory behavior more slowly (Studies 3a to 4).

In line with national reports (Menasce Horowitz et al., 2017; Oliphant, 2017) and past psychological research (Norton & Sommers, 2011), we demonstrated that dominant groups (right-handers, men, Whites) were less aware of their privilege and saw less discrimination aimed at disadvantaged groups compared to subordinate group members (left-handers, women, non-Whites), based on established measures (Norton & Sommers, 2011; Pinterits et al., 2009). Attitudinal chasms regarding perception of gender (Studies 2a to 2c) and racial discrimination (Studies 3a to 4) either persisted or became increasingly pronounced in recent decades. Across studies, hypocognition explained group asymmetries in recognizing social privilege and perceiving discrimination. Learning about the discrimination experience and loss of privilege from the perspective of a transgender woman helped reduce hypocognition and raise privilege awareness and discrimination perception (Study 5).

The bulk of the literature on social privilege centers on motivational defense, which suggests that when privilege is made visible, people react with defensiveness and "cloak" their privilege to assuage guilt around their privileged identities (Phillips & Lowery, 2018). They claim personal hardships and victimhood, emphasize hard work and individual effort, downplay advantages conferred to them by society, and see acts of discrimination as isolated rather than systemic (Phillips & Lowery, 2020; Taylor Phillips & Lowery, 2015; Unzueta & Lowery, 2008; Young & Sullivan, 2016). I acknowledge that people may engage in acts of willful ignorance once explicitly confronted with their privilege. However, my study of hypocognition provides an

informational approach to explaining why people from dominant groups, even with good intentions, fail to acknowledge their privilege in the first place. Findings show classic cognitive signatures (e.g., slower reaction time, worse recognition accuracy) of an impoverished schematic structure of handedness hassles (Study 1), burdens of self-protection (Study 2b), and discrimination instances (Studies 2a, 2c, 3a thru 4) among right-handers, men, and White Americans (Barsalou, 1983; Neisser, 1976). It is the lack of cognitive architecture to comprehend what their privilege entails—and the absence of discrimination associated with that privilege—that underlie group differences in recognizing privilege and acknowledging discrimination. In providing an empirical demonstration of hypocognition across handedness advantage, male privilege, and White privilege, I provide a differing perspective to studying the invisibility of social privilege based on cognition rather than motivation. I further add to the literature on *Marley hypothesis*, which highlights the role of ignorance of history in denial of systemic racism, independent of one's motivations (Bonam et al., 2019; Nelson et al., 2013).

A hypocognition approach to understanding privilege blindness also informs avenues of intervention to boost awareness of privilege without necessarily evoking defensive reactions. Research has shown that directly addressing privilege, such as telling people that they have privilege or asking them to "check their privilege", often incites backlash (Phillips & Lowery, 2020), particularly among conservatives or Whites who strongly identify with their racial identity (Branscombe, Schmitt, & Schiffhauer, 2007; Egan Brad, Spisz, & Tanega, 2018). Even when privilege checking proves to be effective in increasing discrimination perception, it works only for people who are already receptive to the idea. Rather than having people confront their privileges head on, I tested an intervention (Study 5) that allowed men and woman to peer into the world of a transgender woman, as she told her story of navigating everyday hassles as female

(e.g., being mansplained to, not being taken seriously) in contrast with her previous experience as male. By inviting people to experience the other side of the gender divide through the eyes of a transgender woman, this cognitive intervention succeeded in reducing hypocognition and increasing both men and women's awareness of male privilege and perception of gender discrimination.

Although I present evidence of hypocognition among members of socially dominant groups, I do not imply that they face no obstacles in everyday living. Nor do I suggest that subordinate groups are immune to hypocognition. Each social group has its blind spot of what barriers other groups encounter (Davidai & Gilovich, 2016). However, the social dominance literature has documented that part of having social privilege as a member of the dominant group is to have their identity viewed as normative standard (Pratto & Stewart, 2012) and to hold more power in society (Fiske, 2001). As such, members of dominant groups can afford to remain oblivious to their group identities and the privilege associated with them, whereas members of subordinate groups have to be vigilant about what their identities bring and hold a realistic view of the discrimination present in everyday living (Wu & Dunning, 2020). Findings highlight this asymmetry in hypocognition and point to hypocognition as one cognitive mechanism that explains why gaps in privilege attitudes and discrimination perception exist.

Nevertheless, an interesting question arises: can subordinate groups be hypocognitive of their lack of privilege? In Study 5, the TEDx talk intervention not only reduced hypocognition among men, but also among women. Although women were more schematic of discrimination, more aware of male privilege, and perceive gender discrimination to a greater extent than men to begin with, women showed a further increase in acknowledgment of male privilege and gender discrimination post-intervention. In the TEDx talk, transgender woman Paula Stone Williams

expounded, “There is no way a well-educated white male can understand how much the culture is tilted in his favor… because it's all he's ever known, and all he ever will know. And conversely, there's no way that a woman can understand the full import of that because being a female is all she's ever known” (Williams, 2017). Perhaps it takes crossing the gender divide to fully realize one’s lack of conferred advantage and grasp its significance. It remains to be seen in future research how hypocognition plays out in the perception of lacking privilege among subordinate groups.

In my demonstration of hypocognition, I focused on separate social identities (handedness, gender, race), not the intersectionality of identities. Some work has shown that belonging to a subordinate position on one dimension of the social hierarchy may help enhance perception of one’s privilege on a different dimension (Rosette & Tost, 2013). White women, for example, are more likely to recognize their White privilege than White men, with the exception of White women who have already achieved success. It will be interesting for future work to examine whether identity intersectionality reduces one’s hypocognition about their privileged identities.

In 1959, white journalist John Howard Griffin had his skin temporarily darkened to live life as a black man (Griffin, 1961). He embarked on a journey through the Deep South in dark skin, during the time of racial segregation. He received an onslaught of scorns, hate stares, racial slurs, and threats from White strangers. On occasion, some Whites would offer him rides. However, he was astonished at how quickly they were to remark on stereotypes about Blacks and gush about their fantasies of a “Negro” life. After a month, Griffin could no longer stand how he was treated and checked into a monastery. He wrote of this haunting experience, “Hell could be no more lonely or hopeless.”

We no longer live in the age of Jim Crow, yet Griffin's experience may retain its significance. Journalist and writer Andrew Solomon once wished for himself "to be young and middle-aged, and perhaps even very old, all at the same time—and to be dark- and fair- skinned, deaf and hearing, gay and straight, male and female… to exploit all of the imagination's curious intricacies" (Solomon, 2015). Very few of us can traverse multiple social worlds in real life, but we can do so in imagination, in empathy, in listening to each other's stories, in peering into unfamiliar worlds. Until then, the experiences of differing social groups will remain unknown to each other, and the word "privilege" will stay a nebulous construct, a vacuous expression. Transgender people who have gone through a gender transition are often astounded at the challenges faced by the other gender—now that they live visibly as that other gender—and, at the same time, lament the gender privileges they have now lost. Perhaps it takes the experience of being paralyzed by ponderous difficulties to genuinely appreciate the lives of others. Perhaps it takes the fortitude of Griffin's transformation into a Black man to fully comprehend the hardship of living on the other side of the color line. But it surely takes a lot more than "checking our privilege" to grasp the privilege of our own.

Chapter 4 Implications and Future Directions

Hypocognition confines perception, impairs memory (Chapter 2), underlies privilege denial, and warps discrimination perception (Chapter 3). What interventions can be developed to reduce hypocognition? How does hypocognition develop in the first place? In an attempt to reduce hypocognition, can we go too far to the other extreme (e.g., overapplying a concept to circumstances where it does not belong)? Below I explore theoretical and practical implications of hypocognition and future directions.

Hypocognition and Public Health

The concept of exponential growth is often hypocognized among the minds of the lay public (Wagenaar & Timmers, 1979). People can easily grasp the notion of linear growth, but underestimate the exponential growth process and neglect the effect of compounding (M. R. Levy & Tasoff, 2017). In turn, they make poor financial forecasts (Stango & Zinman, 2008), make suboptimal retirement savings decisions (Goda, Levy, Manchester, Sojourner, & Tasoff, 2019), and misperceive the impact of economic growth (Christandl & Fetchenhauer, 2009). It will be interesting to extend the implication of hypocognition to public health and test whether hypocognition of exponential growth contributes to the underestimation of the severity of pandemics such as COVID-19 (Fetzer, Hensel, Hermle, & Roth, 2020).

Hypocognition and Sustainable Consumption

Most people would be willing to make sustainable choices, if only they had a conception of what they are. Future work can explore low-cost interventions to ameliorate hypocognition of sustainability-related concepts by introducing cognitive frames conducive to engagement in

sustainable consumptive habits. For example, one pathway to mitigate climate change is through agricultural change by shifting away from petroleum- grown "oil-based" foods–a system which emits greenhouse gases and destabilizes local food markets–towards locally grown, organic "sun-based" foods (Lakoff, 2010). However, consumers cannot begin to recognize the ecological and social consequences of sustainable food consumption if they are hypocognitive of the conceptual distinction between sun- and oil-based foods in the first place. Future interventions can expose consumers to easy-to-access cognitive frameworks (e.g., distinction between "sun" and "oil" foods) and test whether this exposure can help increase conceptual awareness and propel sustainable consumption over time.

Cultural Consciousness Despite Individual Endorsement

Can hypocognition of a concept affect behavior and cognition at a societal level, despite or in addition to individual endorsement? Many workplace diversity trainings aim to improve individuals' awareness of prejudice and discrimination. However, what people think is often the product of their local culture.

One emerging line of my research shows that people from societies in which the concept of *stereotype* is absent or newly introduced are more likely to commit an act of stereotyping, compared to people from societies familiar with the concept. This finding raises the possibility that susceptibility to stereotyping stems not only from individual propensity to endorse essentialist beliefs; it may also come from a deficiency of conceptual understanding as a product of one's cultural environment.

Development of Hypocognition

Two kinds of people discern Jewish faces with relative accuracy: people who self-identify as Jewish and anti-Semites (Allport & Kramer, 1946). Although this research is not

without controversy and methodological challenges (Tskhay & Rule, 2013), it does raise an intriguing question: what is the basis for developing schematicity versus hypocognition? One possibility is that objects and categorizations remain hypocognized unless they present an opportunity or a threat. In facilitating categorization of ambiguous social groups, motivations for either affiliation or prejudice may have to be present to aid development of schematicity in order to perceive facial cues. In the absence of either motive, one stays hypocognitive of such social categorization.

Hypercognition

If there are certain concepts that people cannot use in their explanations because they fail to have them in their cognitive arsenal, there are other likely concepts that people slide over to use instead. Those other concepts become the "go to" notions for people to use to make sense of their world. These concepts would be cognitively salient and filled with elaboration to other ideas. In certain cases, people may lean on them too much. They take these concepts and over-extend their use as explanatory variables, ultimately giving these known concepts too much credit for producing events they witness in real world. In sum, hypocognition leads to the potential overuse of other concepts that are familiar and complex.

When this happens, people engage in *hypercognition*. A hypercognitive concept is salient and woven extensively, perhaps too much, into people's explanatory schemes of objects and events (Levy, 1973). For example, Westerners might be hypercognitive about self-esteem. Not only is it a culturally-central concept, but much is attributed to it. People claim that high self-esteem is the key for better performance, success, happiness, and health, whereas low self-esteem is responsible for violence, cheating, delinquency, prejudice, and other social ills. Actual data, however, suggest that the relationship between self-esteem and such outcomes is more

meager and complex. Although high self-esteem may be consistently related to reports of happiness, its link to the other supposed consequences is difficult to establish empirically (Baumeister, Campbell, Krueger, & Vohs, 2003). Its use as an explanatory variable is overextended.

Déformation Professionelle

Experts and professionals may experience their own peculiar form of hypercognition. When interpreting a situation, they may overuse the constricted set of concepts salient in their own profession while neglecting a broader array of equally valid concepts, a phenomenon known as *déformation professionnelle* (Warnotte, 1937). Consider a factory where the workers are no longer as productive as they used to be. Where an economist may see a problem with an incentive structure and a psychologist instead a problem in self-identification with work, a sociologist might see a breakdown in social norms.

Medical research, too, provides demonstrations of *déformation professionnelle.* Doctors readily interpret a patient's illness to terms of their own specialty. Cardiologists are more likely to diagnose a case as heart disease than their peers specializing in infectious disease. Infectious disease specialists are more likely diagnose a case as an infection than will their compatriots in hematology or gastroenterology. Non-specialists were the best diagnosticians of all. As such, it appears that doctors diagnose what they know. What they do not know because of specialization may lead to preventable errors at the time of diagnosis (Hashem, Chi, & Friedman, 2003).

In a similar vein, psychiatric clinicians over-diagnose depression, relative to a standard assessment instrument, whereas primary care physicians under-diagnose (Schulberg, 1985). Patients are not free from hypercognition themselves. Those hypercognitive of "winter blues"

suffer from seasonal affective disorder (SAD) at an outsized rate (Rosenthal, 1984), despite mixed evidence of whether SAD exists (Traffanstedt, Mehta, & LoBello, 2016).

Can Hypocognition Be Motivated?

So far, I have discussed hypocognition as a purely cognitive phenomenon, but could it be born out of motivated, purposeful intentions? A frequently overlooked part of Robert Levy's treatise on Tahitians is why Tahitians suffered from a hypocognition of grief (R. I. Levy, 1984). As it turns out, Tahitians did have a private inkling of grief. However, the community deliberately kept the public knowledge of the emotion hypocognitive to suppress its expression. Hypocognition was used as a form of social control, a wily tactic to expressly dispel unwanted concepts by never elaborating on them. After all, how can you feel something that doesn't exist in the first place?

Intentional hypocognition can serve as a powerful means of information control. Chinese rebel writer Han Han once recounted that any of his writings containing the words "government" or "communist" would be censored by the Chinese Internet police (CNN, 2010). Ironically, efforts of censorship also muffled an abundance of praise from pro-leadership blogs. An effusive commendation such as "Long live the government!" would, too, be censored for the mere mention of "government".

But a closer look reveals the furtive workings of hypocognition. Rather than rebuking negative remarks and rewarding praises, the government blocks access to any related discussion all together, rendering any conceptual understanding of politically sensitive information impoverished in the public consciousness. "They don't want people discussing events. They simply pretend nothing happened… That's their goal," Han Han pondered. Regulating what is

said is more difficult than ensuring nothing is said. The peril of silence is not a suffocation of ideas. It is to engender a state of blithe apathy in which no idea is formed.

Nevertheless, I'd like to think that the attempt at hypocognizing a concept can often propel a more urgent need for its expression. The emergence of a unifying language of #MeToo gives voice to those who were compelled into silence. The materialization of a new gender glossary lends credence to the existence of those whose identity departs from the rigid binaries of man and woman ("Redefining gender," 2017). Ideas and categories that are yet to be conceptualized leave open aspirational possibilities for future progress. Every now and then, a new term will bubble up; a new concept will burst forth—to give meaning to walks of life previously starved of recognition, to instill life into our inchoate impulses, to tell the stories that need to be told.

Appendices

Appendix A: Novel Concepts

Baader-Meinhof phenomenon: the phenomenon in which people who are just introduced to a phenomenon, word, person, or object start seeing it more frequently than before

Bangst: stress over diminishing funds

Benevolent sexism: a chivalrous attitude that appears favorable towards women but is actually sexist, because it views women as pure or weak creatures in need of men's protection

Civil inattention: the phenomenon in which strangers who are in close proximity demonstrate that they are aware of one another, without imposing on each other

Dunning-Kruger effect: a cognitive bias in which the incompetent do not have the ability to recognize their own ineptitude

Egosurf: boost one's ego by searching for one's own name on Google or other search engines

Figital: excessively checking one's digital device

Geobrag: post repeated status updates on social media noting one's location in an attempt to gain attention from others and boost one's status

Imposter syndrome: a phenomenon in which people fear being found out as incompetent, despite overwhelming evidence of their high abilities. Imposter syndrome can happen to men and women in various professions.

Indirect speech act: a phenomenon in which when people speak, they veil their intentions in innuendo, euphemism, or doublespeak instead of blurting something out explicitly

Pareidolia: a phenomenon in which people see patterns or faces in random objects (e.g., clouds, shadows)

Perserveerance: procrastination via performing other tasks

Precrastination: the tendency to complete tasks as soon as possible; the opposite of

procrastination

Semantic satiation: a phenomenon in which when a word or phrase is repeated over and over again, it temporarily loses its meaning for the listener

Shoeburyness: the vague uncomfortable feeling of sitting in a seat that is still warm from someone else's bottom

Shoverdose: binge-watch a TV series

Sillage: the scent that lingers in the air, such as the trace of someone's perfume or cologne

Uptalk: a way of speaking that ends declarative sentences with rising sounds as if one is asking a question

Vaguebooking: an intentionally vague status update on social media such as Facebook that prompts friends to ask what is going on

Vocal fry: speaking in a creaky voice with glottal vibrations

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