Hypocognitive Mind:

How Lack of Conceptual Knowledge Confines What People See and Remember

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Abstract

We examine *hypocognition*, in which people lack a cognitive or linguistic representation of a concept necessary to identify, interpret, or remember instances of it. Six studies ($N = 2,085$) revealed that hypocognition degrades retention of fundamental information in everyday living, such as frequency of encounter. Hypocognitive participants reported encountering instances of a concept less often compared to 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 novel 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.

Keywords: hypocognition, concept, cross-cultural

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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. The term was originally coined by anthropologist Robert Levy (1973) through his observation that Tahitians lacked the concept of grief. Although they might privately experience vague facets of grief, the concept was absent from public consciousness; nor did it have any shared meaning or consensual acknowledgement within its cultural community (Levy, 1984). As such, Tahitians failed to identify instances of the emotion when they suffered from it, such as experiencing painful loss of their loved ones. Instead, they could only describe their sorrows as feeling “sick” or “strange.”

Although the notion of hypocognition has been discussed extensively in anthropology and linguistics, the notion has not received comparable emphasis within psychology, even though it places significant cognitive constraints on one’s psychological life and is a significant

determinant of behavior. People hypocognitive of exponential growth, for example, often fail to save as much money or avoid debt compared to those who are aware of the concept (Stango & Zinman, 2009). Roughly one-third of those suffering from Type II diabetes fail to seek medical care because they have little cognitive representation of the disease and how it relates to their seemingly unrelated but tangible symptoms (Cowie et al., 2006). The impact of hypocognition extends to the understanding and experience of more complex phenomena, such as emotion. For example, Americans may be induced to experience some aspects of the Japanese emotion *amae* (pleasure derived from basking in another person's indulgence), they are nevertheless hypocognitive of the emotion and have only a rudimentary understanding (Niiya, Ellsworth, & Yamaguchi, 2006). In emotion perception, temporary inaccessibility to an emotion concept, such as anger, reduces the speed with which people encode and identify instances of the emotion in faces (Gendron, Lindquist, Barsalou, & Barrett, 2012).

Goals of the Current Research

In this paper, we explore hypocognition and its cognitive consequences for what people retain about the experiences they have. We suggest that being hypocognitive of a concept means being less accurate in remembering the presence and frequency of encounter for instances of the concept. In particular, people from different cultural backgrounds will vary in how accurately they can report fundamental information about their experiences with the physical environment. We also provide evidence differentiating hypocognition from simply lacking a label for a category or object.

Memory for Instances of Encounter

We 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. We 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).

We 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 retold 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 (Black, Turner, & Bower, 1979; Brewer & Treyens, 1981), we emphasize how having conceptual knowledge is crucial for promoting accuracy in retention of basic information about the environment.

Evidence from Cross-Cultural Psychology

Different cultures expose members to different concepts and categories. To the extent that we explore how hypocognition depletes retention of information, it is important to highlight that cultural background might underlie differences in conceptual knowledge and the lack thereof. Growing research at the intersection of cross-cultural psychology and linguistics suggests that lacking conceptual knowledge degrades performance when people face the task of identifying stimuli, distinguishing them from each other, or judging their similarity. For example, English and German speakers have only a single concept for the color blue, whereas Greek and Russian speakers have two distinct representations for light and dark blue (Thierry, Athanasopoulos, Wiggett, Dering, & Kuipers, 2009; Winawer et al., 2007). Deprived of finer-grained color concepts, English and German speakers are slower and less accurate in identifying and distinguishing various shades of blue compared to Greeks and Russians, who show a perceptual advantage during early visual processing (Maier & Rahman, 2018). Regarding numbers, the Pirahã tribe of Amazonia have only a “one-two-many” counting system. As such, they experience difficulty identifying the exact number of items beyond two (Gordon, 2004).

These cultural effects need not be constrained to uses of labels to denote different categories. Non-Arabic speakers judge similarity among Arabic letters based on how they are shaped, relying on external characteristics of the letters compared to speakers are fluent in the language. As a result, they are slower and less accurate than fluent speakers in judging the differences among the letters. The advantage that Arabic speakers have, in comparison, is traceable to their richer conceptual knowledge about the letters. It is not merely due to knowing the names of letters, but instead draws from a tapestry of knowledge of how the letters sound or the brushstrokes used to produce them (Wiley, Wilson, & Rapp, 2016).

In this way, the cultural work echoes findings from the literature on expertise. Concepts acquired through professional expertise are, by definition, hypocognized among novices (Nokes, Schunn, & Chi, 2010). As such, novices lack the concept-based knowledge that experts develop and accrue over time (Adelson, 1981), leading to differences in identification and representation when presented with the same stimuli. For example, novice physicians make more errors in identifying abnormalities in lung X-rays compared to more seasoned physicians because novices have an incomplete grasp of the underlying medical concepts (Lesgold et al., 1988). Novice physicists fail to notice changes in pulley diagrams that experts readily spot, because novices lack the underlying physics principles such as Newton's Second Law of Motion to guide them to relevant diagram features (Chi, Glaser, & Rees, 1982; Feil & Mestre, 2010). Additional perceptual and representational deficits have been documented in the domains of chess (Chase & Simon, 1973), mathematics (Silver, 1979), computer programing (McKeithen, Reitman, Rueter, & Hirtle, 1981), and architecture (Akin, 1980).

More broadly, if culture is a shared knowledge system that comprises associative networks of schemes and concepts (Fiske & Taylor, 1984; Hong & Cheon, 2017), people who

are hypocognitive should come away with an incomplete experience. They will show impairment in identification, recognition, and memory of events and objects outside their individual expertise and beyond their cultural milieu. In addition, this effect should persist even when verbal labeling is present.

Distinguishing Hypocognition from Related Notions

In defining the term hypocognition, we also clarify what it is not. By hypocognition, we refer to a paucity of conceptual knowledge of and associations to a category. We 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, we 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, we 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 category and knowing its name are independent processes (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, we examined the cognitive consequences of hypocognition for retaining

information of encounter and its frequency. We 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. We 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

We first explored a general question: is there was a relationship between lacking conceptual knowledge and failures to recall instances of experiencing it. We 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). We 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; $M_{\text{age}} = 35.02$, $SD = 10.92$, range = 20 to 75; 78.8% non-Hispanic white) were recruited via TurkPrime (Litman, Robinson, & Abberbock, 2017).¹

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

¹ See Supplemental Online Materials for sample size determination and exclusion criteria for all studies.

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

We 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, we 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).²

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).

² See Supplemental Online Materials for a guideline on model specification for all studies.

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

Study 2A: Recognition of Common Versus Exotic Fruits

Study 1 suggested that hypocognition interfered with identifying instances of a concept. However, we did not know the true frequency with which participants encountered instances of the concepts we presented 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. We showed American participants a basket containing common and exotic

fruits. We 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; $M_{\text{age}} = 36.90$, $SD = 10.66$, 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 (Study 2A).

Results

Manipulation checks. We assessed participants' knowledge of and familiarity with the familiar and unfamiliar fruits. To examine fruit knowledge, we 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. We 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, we 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 ($M = 2.25$, $SE = .03$, $[2.19, 2.31]$), $b = 4.45$, $SE = .19$, $t(31.92) = 22.88$, $p < .001$, $[4.06, 4.85]$.³

Recognition. We next examined whether unfamiliarity (versus familiarity) with a fruit impaired recognition accuracy via two different analyses. First, we 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 $M_{\text{Undisplayed}} = 2.48$), $b = 1.28$, $SE = .22$, $z = 5.75$, $p < .001$, $[.73, 1.84]$.⁴

³ Key effects were largely consistent across nuisance factors (e.g., set, order) throughout Studies 2 to 4.

⁴ Throughout the paper, we constructed the linear mixed models using the R packages *lme4* and *lmerTest*; we reported t-statistics for main and interaction effects for linear regressions and z-statistics for logistic regressions. We tested all simple effects using the R package *multcomp* (*glht* function) and reported z-statistics (Bretz, F., Hothorn, T., & Westfall, 2016).

A signal detection analysis confirmed that participants were more inaccurate in recognizing unfamiliar than familiar fruits. In particular, we 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. For each index, we 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 we attributed to hypocognition. Thus, in Study 2B, we 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. We 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; $M_{\text{age}} = 38.42$, $SD = 12.16$, range = 18 to 74; 79.0% non-Hispanic white) were recruited via TurkPrime. We 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: *x, z, f, g, k*; or set II: *m, c, l, q, y*) and 5 cursive letters rotated or flipped so as to be rendered unrecognizable (set I: *z, c, o, p, r*; or set II: *q, u, g, i, n*). 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 (Study 2B).

Results

Manipulation checks. To examine symbol knowledge and symbol familiarity, we 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. We 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 $M_{\text{Undisplayed}} = 2.87$), $b = .93$, $SE = .11$, $z = 8.79$, $p < .001$, $[\text{.67}, 1.18]$. However, this recognition accuracy worsened when the symbols were oriented as unfamiliar, rotated letters ($M_{\text{Displayed}} = 3.59$ versus $M_{\text{Undisplayed}} = 3.18$), $b = .43$, $SE = .13$, $z = 3.22$, $p = .001$, $[\text{.10}, .75]$.

Signal detection analyses confirmed these findings. Participants showed less sensitivity toward recognizing symbols that were unfamiliar ($d' = .26$) than familiar ($d' = .58$), $b = .32$, $SE = .05$, $t(268) = 5.95$, $p < .001$, $[\text{.21}, .42]$. 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). We showed American participants common and exotic fruits one at a time, varying the frequency at which each fruit occurred from 0 to 4 times. We 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; $M_{\text{age}} = 35.98$, $SD = 10.52$, range = 18 to 70; 66.3% non-Hispanic white) were recruited via TurkPrime.

To test for automatic frequency encoding, we 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, we randomly assigned participants to one of three frequency order conditions following a Latin square design (see Supplemental Materials for detail on frequency order assignment).

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? We 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, we 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 $\times$ 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 ($M = 1.81$, $SE = .03$, $[1.75, 1.86]$), $b = .17$, $SE = .04$, $t(195) = -4.74$, $p < .001$, $[.10, .24]$ (see Supplemental Online Materials for simple effects of frequency estimates; Figure 4).

Figure 4. Estimated frequency of familiar versus unfamiliar fruits (Study 3).

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, we 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, we propose that dumplings are as hypocognized in British culture as cheeses are in Chinese culture.

We 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. We 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; $M_{\text{age}} = 40.17$, $SD = 12.99$, 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; $M_{\text{age}} = 33.99$, $SD = 8.07$, 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 (see Supplemental Online Materials for detail on study design and frequency order assignment).

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. We 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, we 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, we 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. We examined whether British and Chinese participants were more inaccurate at tracking the frequency of culturally unfamiliar foods compared to familiar ones. We 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; see Supplemental Online Materials for simple effects of frequency estimates within each culture).

Figure 5. Estimated frequency of culturally familiar versus unfamiliar foods (Study 4).

Study 5 Knowing a Concept versus Having a Label

Studies 1-4 demonstrated 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. We proposed that lacking an underlying concept for an object—even when verbal labeling is present—still impairs frequency encoding.

To show this effect, we began by taking the cursive alphabetic letters from Study 2B and rotated/flipped them to render them unrecognizable. We 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. We 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; $M_{\text{age}} = 36.52$, $SD = 10.62$, 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. 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. We ensured that within each labeling condition, no repeating symbol was accompanied by the same voice.

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

Results

Estimated frequency. We conducted two a priori contrasts. First, we 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, we 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). We 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 $\times$ 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 non-sensical 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; see Supplemental Online Materials for simple effects of frequency estimates).

Figure 6. Estimated frequency of unfamiliar symbols accompanied by labels with conceptual information, nonsensical labels, or no label/conceptual information (Study 5).

General 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 (Levy, 1973). We 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? Our findings suggest not. We construe hypocognition as 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, our 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, 2018a, in press). 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, we do not deny that 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

Our 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 (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; 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.

Our 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, we 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 schema can lead to memory distortion, disagreements arise on what happens when there is an absence of 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, our 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.

Concluding Remarks

Finally, our 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 (Chi et al., 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?

In one meeting regarding the concepts included in Study 1, one author gleefully introduced to the other the esoteric concept of *shoeburyness*, the vague uncomfortable feeling of sitting in a seat that is still warm from someone else's bottom. One day, the other author sat in an airport, only to experience the unpleasant sensation of shoeburyness for the first time. Once hypocognitive of shoeburyness, he is now plagued by numerous encounters with the concept every month. He wishes his innocence back.

References

- Adams, D., & Lloyd, J. (1983). *The meaning of Liff: The original dictionary of things there should be words for*. London, UK: Pan Books.
- Adelson, B. (1981). Problem solving and the development of abstract categories in programming languages. *Memory & Cognition*, 9(4), 422–433. <https://doi.org/10.3758/BF03197568>
- Alba, J. W., & Hasher, L. (1983). Is memory schematic? *Psychological Bulletin*, 93(2), 203–231. <https://doi.org/10.1037/0033-2909.93.2.203>
- Anderson, J. R., & Bower, G. H. (1972). Recognition and retrieval processes in free recall. *Psychological Review*, 79(2), 97–123. Retrieved from <https://pdfs.semanticscholar.org/4ee2/37d215c41374cb94227a44d1a51af7d3873f.pdf>
- Anderson, J. R., & Bower, G. H. (1973). *Human associative memory*. Washington, D.C.: Winston.
- Astley, S. L., & Wasserman, E. A. (1998). Novelty and functional equivalence in superordinate categorization by pigeons. *Animal Learning and Behavior*, 26(2), 125–138. <https://doi.org/10.3758/BF03199206>
- Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. New York, NY: Cambridge University Press.
- Black, J. B., Turner, T. J., & Bower, G. H. (1979). Point of view in narrative comprehension, memory, and production. *Journal of Verbal Learning and Verbal Behavior*, 18(2), 187–198. [https://doi.org/10.1016/S0022-5371\(79\)90118-X](https://doi.org/10.1016/S0022-5371(79)90118-X)
- Bower, G. H., Black, J. B., & Turner, T. J. (1979). Scripts in memory for text. *Cognitive Psychology*, 11(2), 177–220. [https://doi.org/10.1016/0010-0285\(79\)90009-4](https://doi.org/10.1016/0010-0285(79)90009-4)
- Bretz, F., Hothorn, T., & Westfall, P. (2016). *Multiple comparisons using R*. Chapman and

Hall/CRC.

- Brewer, W. F. (2000). Bartlett's concept of the schema and its impact on theories of knowledge representation in contemporary cognitive psychology. In A. Saito (Ed.), *Bartlett, culture and cognition* (pp. 69–89). Psychology Press.
- Brewer, W. F., & Treyens, J. C. (1981). Role of schemata in memory for places. *Cognitive Psychology*, 13(2), 207–230. [https://doi.org/10.1016/0010-0285\(81\)90008-6](https://doi.org/10.1016/0010-0285(81)90008-6)
- Chase, W. G., & Simon, H. A. (1973). Perception in chess. *Cognitive Psychology*, 4(1), 55–81. [https://doi.org/10.1016/0010-0285\(73\)90004-2](https://doi.org/10.1016/0010-0285(73)90004-2)
- Chi, M. T. H., Glaser, R., & Rees, E. (1982). Expertise in problem solving. In R. J. Sternberg (Ed.), *Advances in the Psychology of Human Intelligence* (Vol. 1, pp. 1–75). Hillsdale, NJ: Erlbaum.
- Cowie, C. C., Rust, K. F., Byrd-Holt, D. D., Eberhardt, M. S., Flegal, K. M., Engelgau, M. M., ... Gregg, E. W. (2006). Prevalence of diabetes and impaired fasting glucose in adults in the U.S. population: National Health and Nutrition Examination Survey 1999-2002. *Diabetes Care*, 29(6), 1263–1268. <https://doi.org/10.2337/dc06-0062>
- Davidson, D., & Hoe, S. (1993). Children's recall and recognition memory for typical and atypical actions in script-based stories. *Journal of Experimental Child Psychology*. <https://doi.org/10.1006/jecp.1993.1005>
- Druks, J., & Shallice, T. (2000). Selective preservation of naming from description and the “restricted preverbal message.” *Brain and Language*, 72(2), 100–128. <https://doi.org/10.1006/brln.1999.2165>
- Feil, A., & Mestre, J. P. (2010). Change blindness as a means of studying expertise in physics. *Journal of the Learning Sciences*, 19(4), 480–505.

<https://doi.org/10.1080/10508406.2010.505139>

Fiske, S. T., & Taylor, S. E. (1984). *Social cognition: From brains to culture*. Thousand Oaks, CA: Sage.

Gendron, M., Lindquist, K., Barsalou, L., & Barrett, L. F. (2012). Emotion words shape emotion percepts. *Emotion, 12*(2), 314–325. <https://doi.org/10.1037/a0026007>

Gendron, M., Roberson, D., van der Vyver, J. M., & Barrett, L. F. (2014). Perceptions of emotion from facial expressions are not culturally universal: evidence from a remote culture. *Emotion (Washington, D.C.), 14*(2), 251–262. <https://doi.org/10.1037/a0036052>

Glick, P., & Fiske, S. T. (1996). The Ambivalent Sexism Inventory: Differentiating hostile and benevolent sexism. *Journal of Personality and Social Psychology, 70*(3), 491–512. <https://doi.org/10.1037/0022-3514.70.3.491>

Gordon, P. (2004). Numerical cognition without words: Evidence from Amazonia. *Science, 306*(5695), 496–499. <https://doi.org/10.1126/science.1094492>

Grill-Spector, K., & Kanwisher, N. (2005). Visual recognition: As soon as you know it is there, you know what it is. *Psychological Science, 16*(2), 152–160. <https://doi.org/10.1111/j.0956-7976.2005.00796.x>

Hasher, L., & Chromiak, W. (1977). The processing of frequency information: An automatic mechanism? *Journal of Verbal Learning and Verbal Behavior, 16*(2), 173–184. [https://doi.org/10.1016/S0022-5371\(77\)80045-5](https://doi.org/10.1016/S0022-5371(77)80045-5)

Hasher, L., & Zacks, R. T. (1979). Automatic and effortful processes in memory. *Journal of Experimental Psychology: General, 108*(3), 356–388. <https://doi.org/10.1037/0096-3445.108.3.356>

Hasher, L., & Zacks, R. T. (1984). Automatic processing of fundamental information: The case

of frequency of occurrence. *American Psychologist*, 39(12), 1372–1388.

<https://doi.org/10.1037/0003-066X.39.12.1372>

Hong, Y., & Cheon, B. K. (2017). How does culture matter in the face of globalization?

Perspectives on Psychological Science, 12(5), 810–823.

<https://doi.org/10.1177/1745691617700496>

Judd, C. M., Westfall, J., & Kenny, D. A. (2017). Experiments with more than one random

factor: Designs, analytic models, and statistical power. *Annual Review of Psychology*, 68(1),

601–625. <https://doi.org/10.1146/annurev-psych-122414-033702>

Kho, J. (2014). Open thread: What does “sustainable” mean to you? *The Guardian*. Retrieved

from [https://www.theguardian.com/sustainable-business/sustainable-](https://www.theguardian.com/sustainable-business/sustainable-green-%0D%0Ameaning-consumer-open-thread%0D%0A)

[green-%0D%0Ameaning-consumer-open-thread%0D%0A](https://www.theguardian.com/sustainable-business/sustainable-green-%0D%0Ameaning-consumer-open-thread%0D%0A)

Kintsch, W., & Greene, E. (1978). The role of culture-specific schemata in the comprehension

and recall of stories. *Discourse Processes*, 1(1), 1–13.

<https://doi.org/10.1080/01638537809544425>

Klatzky, R. L., & Rafnel, K. (1976). Labeling effects on memory for nonsense pictures. *Memory*

& Cognition, 4(6), 717–720. <https://doi.org/10.3758/BF03213239>

Lesgold, A., Robinson, H., Feltovich, P., Glaser, R., Klopfer, D., & Wang, Y. (1988). Expertise

in a complex skill: Diagnosing x-ray pictures. In R. G. M. T. H. Chi & M. J. Farr (Eds.),

The nature of expertise (pp. 311–342). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Retrieved from papers3://publication/uuid/466ED8C9-F37B-436E-A718-F0D46836156B

Levy, R. I. (1973). *Tahitians: Mind and experience in the Society Islands*. Chicago: University of

Chicago Press. <https://doi.org/http://dx.doi.org/10.1016/j.cmet.2014.03.003>

Levy, R. I. (1984). Emotion, knowing, and culture. In R. Shweder & R. A. LeVine (Eds.),

Culture theory: Essays on mind, self, and emotion (pp. 214–238). Cambridge.

Litman, L., Robinson, J., & Abberbock, T. (2017). TurkPrime.com: A versatile crowdsourcing data acquisition platform for the behavioral sciences. *Behavior Research Methods*, 49(2), 433–442. <https://doi.org/10.3758/s13428-016-0727-z>

Lupyan, G. (2008). From chair to “chair”: A representational shift account of object labeling effects on memory. *Journal of Experimental Psychology: General*, 137(2), 348–369. <https://doi.org/10.1037/0096-3445.137.2.348>

Lupyan, G., Rakison, D. H., & McClelland, J. L. (2007). Language is not just for talking: Redundant labels facilitate learning of novel categories. *Psychological Science*, 18(12), 1077–1083. <https://doi.org/10.1111/j.1467-9280.2007.02028.x>

Lupyan, G., & Thompson-Schill, S. L. (2012). The evocative power of words: Activation of concepts by verbal and nonverbal means. *Journal of Experimental Psychology: General*, 141(1), 170–186. <https://doi.org/10.1037/a0024904>

Maier, M., & Rahman, R. A. (2018). Native language promotes access to visual consciousness. *Psychological Science*, 29(11), 1757–1772. <https://doi.org/10.1177/0956797618782181>

Mandler, J. M., & Johnson, N. S. (1977). Remembrance of things parsed: Story structure and recall. *Cognitive Psychology*, 9(1), 111–151. [https://doi.org/10.1016/0010-0285\(77\)90006-8](https://doi.org/10.1016/0010-0285(77)90006-8)

McKeithen, K. B., Reitman, J. S., Rueter, H. H., & Hirtle, S. C. (1981). Knowledge organization and skill differences in computer programmers. *Cognitive Psychology*, 13(3), 307–325. [https://doi.org/10.1016/0010-0285\(81\)90012-8](https://doi.org/10.1016/0010-0285(81)90012-8)

Minsky, M. (1975). A framework for representing knowledge. In P. H. Winston (Ed.), *The psychology of computer vision* (pp. 211–277). New York, NY: McGraw-Hill. <https://doi.org/10.1016/B978-1-4832-1446-7.50018-2>

- Naveh-Benjamin, M., & Jonides, J. (1986). On the automaticity of frequency coding: Effects of competing task load, encoding strategy, and intention. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 12(3), 378–386. <https://doi.org/10.1037/0278-7393.12.3.378>
- Niiya, Y., Ellsworth, P. C., & Yamaguchi, S. (2006). Amai in Japan and the United States: an exploration of a “culturally unique” emotion. *Emotion (Washington, D.C.)*, 6(2), 279–295. <https://doi.org/10.1037/1528-3542.6.2.279>
- Nokes, T. J., Schunn, C. D., & Chi, M. T. H. (2010). Problem solving and human expertise. *International Encyclopedia of Education*, 5, 265–272. <https://doi.org/10.1016/B978-0-08-044894-7.00486-3>
- Oyserman, D. (2017). Culture three ways: Culture and subcultures within countries. *Annual Review of Psychology*, 68(1), 435–463. <https://doi.org/10.1146/annurev-psych-122414-033617>
- Paivio, A. (1991). Dual coding theory: Retrospect and current status. *Canadian Journal of Psychology/Revue Canadienne de Psychologie*, 45(3), 255–287. <https://doi.org/10.1037/h0084295>
- Paivio, A., & Csapo, K. (1971). Short-term sequential memory for pictures and words. *Psychonomic Science*, 24(2), 50–51. <https://doi.org/10.3758/BF03337887>
- Palan, S., & Schitter, C. (2018). Prolific.ac—A subject pool for online experiments. *Journal of Behavioral and Experimental Finance*, 17, 22–27. <https://doi.org/10.1016/j.jbef.2017.12.004>
- Pinker, S. (2007). *The stuff of thought: Language as a window into human nature*. New York, NY: Viking.

- Rumelhart, D. E. (1981). *Understanding understanding*. San Diego, CA: Center for Human Information Processing.
- Schank, R. C. ., & Abelson, R. P. (1977). *Scripts, plans, goals and understanding: An Inquiry into human knowledge structures*. Hillsdale, NJ: Erlbaum.
- Silver, E. A. (1979). Student Perceptions of Relatedness among Mathematical Verbal Problems. *Journal for Research in Mathematics Education*, 10(3), 195–210.
- Skurnick, L. (2015). *That should be a word: A language lover's guide to choregasms, povertunity, brattling, and 250 other much-needed terms for the modern world*. New York, NY: Workman Publishing Company.
- Stango, V., & Zinman, J. (2009). Exponential growth bias and household finance. *Journal of Finance*, 64(6), 2807–2849. <https://doi.org/10.1111/j.1540-6261.2009.01518.x>
- Thierry, G., Athanasopoulos, P., Wiggett, A., Dering, B., & Kuipers, J.-R. (2009). Unconscious effects of language-specific terminology on preattentive color perception. *Proceedings of the National Academy of Sciences of the United States of America*, 106(11), 4567–4570. <https://doi.org/10.1073/pnas.0811155106>
- Thorndyke, P. W., & Yekovich, F. R. (1980). A critique of schema-based theories of human story memory. *Poetics*, 9(1–3), 23–49. [https://doi.org/10.1016/0304-422X\(80\)90011-X](https://doi.org/10.1016/0304-422X(80)90011-X)
- Whorf, B. L. (1956). *Language, thought, and reality*. Cambridge, MA: Technology Press of Massachusetts Institute of Technology.
- Wiley, R. W., Wilson, C., & Rapp, B. (2016). The effects of alphabet and expertise on letter perception. *Journal of Experimental Psychology: Human Perception and Performance*, 42(8), 1186–1203. <https://doi.org/10.1037/xhp0000213>
- Winawer, J., Witthoft, N., Frank, M. C., Wu, L., Wade, A. R., & Boroditsky, L. (2007). Russian

- blues reveal effects of language on color discrimination. *Proceedings of the National Academy of Sciences of the United States of America*, 104(19), 7780–7785.
<https://doi.org/10.1073/pnas.0701644104>
- Wu, K., & Dunning, D. (2018a). Hypocognition: Making sense of the landscape beyond one's conceptual reach. *Review of General Psychology*, 22(1), 25–35.
<https://doi.org/10.1037/gpr0000126>
- Wu, K., & Dunning, D. (2018b). Unknown unknowns: The problem of hypocognition. *Scientific American Mind*, 29(6), 42–45. <https://doi.org/10.1038/scientificamericanmind1118-42>
- Wu, K., & Dunning, D. (in press). Hypocognition and the invisibility of social privilege. In S. R. Thye & E. J. Lawler (Eds.), *Advances in group processes* (Vol. 37). Emerald Publishing.
<https://doi.org/https://doi.org/10.31234/osf.io/5ge79>
- Zacks, R. T., Hasher, L., Alba, J. W., Sanft, H., & Rose, K. C. (1984). Is temporal order encoded automatically. *Memory & Cognition*, 12(4), 387–394. <https://doi.org/10.3758/BF03198299>
- Zacks, Rose T., & Hasher, L. (2002). Frequency processing: a twenty-five year perspective. In P. Sedlmeier & T. Betsch (Ed.), *Frequency processing and cognition* (Vol. 6, pp. 21–36). New York, NY: Oxford University Press.
<https://doi.org/10.1093/acprof:oso/9780198508632.003.0002>
- Zangwill, O. L. (1972). Remembering revisited. *Quarterly Journal of Experimental Psychology*, 24(2), 123–138. <https://doi.org/10.1080/00335557243000003>
- Zentall, T. R., Wasserman, E. A., & Urcuioli, P. J. (2014). Associative concept learning in animals. *Journal of the Experimental Analysis of Behavior*, 101(1), 130–151.
<https://doi.org/10.1002/jeab.55>

Appendix A: Novel Concepts (Study 1)

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