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Consideration of culture in cognition: How we can enrich methodology and theory

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Abstract

In this paper, we argue that adopting an inclusive approach where diverse cultures are represented in research is of prime importance for cognitive psychology. The overrepresentation of participant samples and researchers from WEIRD (Western, Educated, Industrialized, Rich, and Democratic) cultures limits the generalizability of findings and fails to capture potential sources of variability, impeding understanding of human cognition. In an analysis of articles in representative cognitive psychology journals over the five-year period of 2016–2020, we find that only approximately 7% of articles consider culture, broadly defined. Of these articles, a majority (83%) focus on language or bilingualism, with small numbers of articles considering other aspects of culture. We argue that methodology and theory developed in the last century of cognitive research not only can be leveraged, but will be enriched by greater diversity in both populations and researchers. Such advances pave the way to uncover cognitive processes that may be universal or systematically differ as a function of cultural variations, and the individual differences in relation to cultural variations. To make a case for broadening this scope, we characterize relevant cross-cultural research, sample classic cognitive research that is congruent with such an approach, and discuss compatibility between a cross-cultural perspective and the classic tenets of cognitive psychology. We make recommendations for large and small steps for the field to incorporate greater cultural representation in the study of cognition, while recognizing the challenges associated with these efforts and acknowledging that not every research question calls for a cross-cultural perspective.

Keywords

Culture and cognition; Cross-cultural cognition; Diversity; WEIRD; Methodology; Theory

Our aim in writing this paper is to assess from within the field of cognitive psychology why considering culture is a useful endeavor that benefits our understanding of the human mind. The ideas shared in this paper developed in the context of recent calls to widen

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Declarations

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participation in psychological science and cognitive neuroscience (e.g., Abiodun, 2019; Barnes et al., 2021; Dotson & Duarte, 2020; Qu et al., 2021; Roberts et al., 2020; Wang, 2016), acknowledging how the characteristics of the participants in studies, the background and training of the scientists, and the geography of where the work is conducted are important aspects of the diversity of the population to which we want to generalize findings. In concert with efforts by leading journals and societies, our goal in this paper is to take stock of variety in the representation of population and topics, addressing the broad range of influences that culture exerts on cognition. For example, a Psychonomic Society journal recently issued a call for papers for a forthcoming special issue of *Memory and Cognition* on "Exploration of Human Cognitive Universals and Human Cognitive Diversity." The topic of this special issue demonstrates the society's commitment to supporting a more diverse and representative field, and is in line with the editorial by current Editor-in-Chief Ayanna Thomas that emphasizes the importance of diverse perspectives (Thomas, 2020). The Society for Applied Research in Memory and Cognition's *Journal of Applied Research in Memory and Cognition* also has commissioned relevant special issues, where Editor-in-Chief Qi Wang announced a March 2021 special issue on "Culture and Memory" (Wang, 2021a) and a recent call for manuscripts on "Applied Cognitive Science around the Globe." Following from these recent efforts to draw attention to the cultural context in which cognitive research is conducted, we will characterize the study of culture and cognition thus far, evaluate the extent to which samples in cognitive psychology have encompassed comparisons across cultures, and relate this to other trends in the field to consider diverse samples and research teams. Next, we will argue why the study of culture is compatible with the approach of cognitive psychology, drawing on the history of the field and reviewing some ways in which culture has been demonstrated to affect cognitive processes.

In the spirit of Greenwald's call (2012) from a decade ago that "there is nothing so theoretical as a good method," we propose that a renewed focus on culture in our experiments will enhance the assessment of generalizability of findings and deepen the scope of theoretical advances in cognition. We make this call for heightened attention to culture recognizing the strides made in the study of cognition thus far. Yet the very progress of the field positions us well to leverage existing theoretical and methodological tools to begin to evaluate the amount of variance that culture can bring to information processing. Moreover, we acknowledge the difficulty of incorporating a cross-cultural approach. The enormous challenges inherent in working with global teams, challenges that can be practical, methodological, or theoretical, and the challenges for broadening sample representation are not to be underestimated, nor are the associated challenges for achieving statistical power. In this paper, we argue for why broadening cultural representation is an important endeavor to include in experimental work in the hopes that researchers who have not traditionally considered culture in their study of cognition will appreciate that this consideration can be compatible with the study of cognition. Our goal is to encourage colleagues to adopt a cross-cultural perspective in some of their future research, for example, through collaborations or exploring the richness of their current participant samples, where possible.

What is culture?

First, what do we mean by “culture”? We broadly define culture as a group of people with shared experiences or perspectives. This definition is in line with how Steven Heine (2012) defines culture in his textbook on cultural psychology. That definition emphasizes two features of culture: the transmission of information through other members of the species and groups of individuals who share a context. Typically defined on the basis of shared geography, such a definition allows for several levels of defining culture, perhaps ranging from countries or constellations of nations to more local delineations such as a region (e.g., North vs. South) or town. Geography can act as a proxy for beliefs, customs, styles of thought, and ways of thinking about the self in relation to others that are shared amongst a group of people (Markus & Kitayama, 1991; Nisbett et al., 2001). But the definition of culture is not limited to geography. One discussion of the concept even goes so far as to consider culture “a shorthand for a grouping variable of secondary interest” (Adams & Markus, 2004, p. 336). Cultural groups are typically defined based on demographic characteristics (e.g., ethnicity, race, sexual orientation) or other shared affiliations (e.g., university, social group), practices (e.g., religion, occupation), or societal stratifications (e.g., Markus, 2008; Mishra, 2000; Stephens et al., 2014). Cultural affinities also may be based on other unifying constructs such as language, cuisine, and specific customs that are often subsumed under geographical, national, or demographic groupings.

Culture exerts dynamic, multifaceted influences on individuals. As discussed by Wang (2021 a, b, c), culture operates at multiple levels, spanning the individual (e.g., the cultural values and beliefs held by an individual), dyads (e.g., cultural learning through socialization), group (e.g., impact of historical memory on national identity), situations (e.g., dynamic processes such as cultural frames), and temporal frames, acknowledging the changing nature of culture over time. For example, autobiographical memory development in children can be shaped by pathways including self-goals, language, emotion knowledge, and perceptual style (Wang, 2021c). Emphasizing change over time necessarily invokes the concept of plasticity. Life experiences sculpt the brain (Han et al., 2013; Kitayama & Uskul, 2011; Park & Gutchess, 2002) in unique ways, be they an effect of ecology (e.g., farming, fishing, or herding, Uskul et al., 2008; rice vs. wheat farming, Talhelm et al., 2014), urban versus rural setting (e.g., Caparos et al., 2012), training in a specific line of work (e.g., London taxicab drivers; Maguire et al., 2000), developing a new hobby (e.g., juggling; Draganski et al., 2004), or spending a lifetime immersed in culturally guided ways of thinking and acting.

How we operationalize culture along groups, dimensions, or frames of reference (e.g., an individualistic or group-based perspective) depends on the nature of the theoretical question at hand, and in this vein, culture may be viewed as an important way to conceptualize context. In cognitive research, the importance of context in cognitive performance has long been recognized. This includes the variety of ways in which context may be defined, from environmental affordances and the interrelatedness of perception and action (Gibson, 1979) to framing effects in decision-making (Tversky & Kahneman, 1981). The potential influence of context on performance, when defined in terms of culture, provides an important way to assess the universality versus specificity of cognitive processes across samples, thereby

helping us refine cognitive theories. Here, we recommend Wang (2020) and Prather (2021) for recent reviews relevant to the study of culture.

The relative lack of discourse about culture in cognitive research has allowed for culture to be operationalized in different ways, to the extent researchers have considered it as a factor in testing cognitive phenomena. Moreover, the delineation of cultural groups poses many challenges, including ambiguity about definitions, incorrect assumptions, and failures to appreciate the socially constructed nature of the constructs (Markus, 2008). For the purposes of our review of the literature in this paper, we focus on cultural groups defined on the basis of distinct geographical entities, often operationalized as countries or regions, that are associated with distinct ideas, customs, and practices. This is in keeping with the typical approach in the literature to defining cultural groups on the basis of nation of origin and self-reported cultural values. In addition, our review encompasses grouping variables that are not always labeled as "culture" in the literature, such as race, ethnicity, and socioeconomic status, which vary within a nation. At the same time, we recognize the necessity for a continual evaluation of how culture is defined and for theoretical considerations to shape these choices for a particular study. In this vein, in a later section when we consider the prevalence of culture in articles in representative cognitive journals, we take a broader range of dimensions into account when characterizing culture. Thereafter, we return to this point, concerning the need for a continual effort to arrive at suitable operationalization, in the Conclusion section.

Considering the relationships amongst culture, race, and ethnicity, we share proposed definitions for the constructs of race and ethnicity. Moya and Markus (2010) put forth a definition of race based on "…historically derived and institutionalized ideas and practices that… [sort] people into ethnic groups according to perceived physical and behavioral human characteristics"; their definition continues, emphasizing the power dynamics, group conflict, and denigration that distinguish racial groups. In contrast, Markus' definition of ethnicity is one that she equates to "culture" (Markus, 2008), emphasizing the breadth of practices and commonalities that can be shared amongst people, allowing them to identify as group members (Moya & Markus, 2008). Critically, Markus (2008) notes that "despite [race and ethnicity] literatures' powerful findings and compelling insights, they have not reached a consensus on what race and ethnicity are, how they overlap, or how they differ." Because these fields—studying race, ethnicity, and culture—exist largely independently, with little overlap at conferences or in journals, there is no clear consensus on definitions and little cross-pollination of literatures. Although we include race and culture under the umbrella of "culture" due to the potential for shared practices or experiences within a group, we acknowledge the important differences amongst these constructs due to power dynamics and conflict. With respect to the thesis presented in this paper, we focus on the notion of culture, where the concept relates to customs, practices, and life experiences, typically correlated with regions, and often also with language.

Why should the field of cognitive psychology encompass the study of culture?

The consideration of the study of culture and calls to recruit diverse samples are not new. A paper (Henrich et al., 2010) outlining the overrepresentation of samples from societies that are Western, Educated, Industrial, Rich, or Democratic (WEIRD) provoked a great deal of discussion. The paper highlighted the tremendous sampling bias across the globe such that 96% of participants in psychological research are from Western industrialized countries; the United States alone accounted for 68% of the research participants. Another characterization of WEIRD is White, English-speaking, normatively Invisible, Racially color-evasive, socially Dominant class, emphasizing other dimensions of the individuals commonly included in or excluded from research (see Thomas et al., in press, for a discussion). Our definition of culture in this paper is most in line with the Henrich et al. definition of WEIRD, though many of our points apply to both usages. To the extent the cognitive-experimental research tradition has been historically more prevalent in the WEIRD regions of the world, our paper reflects issues to address within this research practice. As we elaborate through the rest of this paper, our goal is nonetheless to encourage reflections about better inclusion of culture in cognitive research broadly.

In addition to a preponderance of WEIRD regions and samples in research, the paper by Henrich et al. illustrated the dramatic differences that can occur across cultural groups, such as the extreme high offers made by Americans in social decision-making games (e.g., Dictator and Ultimatum games) in contrast to the lower offers made by some small-scale societies (i.e., the “minimal cooperative unit within a society”; Firth, 1951). The paper also highlighted a visual illusion that emerged strongly for American college students but was barely present for San foragers (Segall et al., 1966), with the other societies studied falling between these extremes. Some replication failures could even reflect cultural influences, when samples differ in systematic ways that are not accounted for when comparing outcomes. Moreover, assumptions of the generalizability of findings to humankind is particularly true for samples recruited in the United States of America (US), such that nation of origin is included in the title of scientific articles less often for samples from the US than it is for samples from other WEIRD and non-WEIRD societies (Cheon et al., 2020).

In limited cases in which culture is considered, there has often been an expectation that a non-WEIRD sample should be compared to a WEIRD control group, which implies there is a standard to which all groups should be compared. Recently there has been increasing awareness of the importance of studying a diversity of samples for their own sake (e.g., Apfelbaum et al., 2014; Prather et al., 2022), in addition to earlier endeavors such as the National Survey of Black Americans (Jackson, 1991) that examined the heterogeneity within representative samples of Black Americans. Indeed, a cognitive journal had a recent call for submissions for a special issue (https://www.psychonomic.org/page/MCexploration) that explicitly welcomed studies from a single country or sample without needing a comparison to a “WEIRD” control group. This tactic may set a precedent, charting the course for standard issues of journals to incorporate this practice. Moreover, such an approach conveys that there is not a clear delineation between WEIRD and non-WEIRD samples; rather, it

may be best conceptualized as a continuum with much variation across groups, even when only considering the five dimensions captured by the acronym "WEIRD."

One aspect of the diversity of research samples that has recently received attention is in terms of the race of research participants (Roberts et al., 2020). Based on analyses of five decades of publications from select journals sampled from social, developmental, and cognitive psychology, research highlighting racial diversity has been shown to be rare. The data presented by Roberts et al. (2020) showed that this deficiency was particularly true in cognitive psychology. In contrast to increases over time in social and developmental journals, the number of studies that highlight or even report on race has consistently stayed near zero in cognitive journals.

Inspired by the approach taken by Roberts et al. (2020), we assessed how common comparisons of cultural groups have been in cognitive psychology in recent years. To do so, we focused on the seven journals published by the Psychonomic Society. We chose these journals because the Psychonomic Society is one of the largest societies focused on cognitive psychology, with over 4300 members from over 60 countries. Compared to other societies with a similar focus, the Psychonomic Society journals are an appropriate choice because the journals are positioned squarely within psychology with an experimental focus, and the society publishes multiple journals with a cognitive focus that also span major subareas within cognition. Although there are other journals focused on the study of culture (e.g., *Journal of Cross-Cultural Psychology*, *Culture and Brain*, *Journal of Cognition and Culture*, *Journal of Cultural Cognitive Science*), some adopt an interdisciplinary perspective spanning the humanities or fields such as anthropology or education, and none have an approach centered in cognitive psychology. We argue that relegating the study of culture to specialized journals could limit the impact of the research and reduce the likelihood that culture will connect with mainstream cognitive psychology (see Roberts et al., 2020, for similar arguments about the study of race).

For this comparison, we reviewed all of the articles published in a five-year span (2016–2020) in these journals. A team of coders first scored for whether the article considered culture, using the definition discussed in our "What is culture" section[1]; coders assessed whether authors drew conclusions relevant to culture in the results and discussion. In the following paragraphs, we will further characterize the variety of approaches to operationalizing culture in these studies. One of the coders reviewed and rescored all of the entries; she noted discrepancies from the original scoring. The discrepancies were reviewed by one of us, who also reviewed the scoring of the content of the culture comparisons and discussed it with the other author. As illustrated in Fig. 1, culture is minimally represented in the articles published in these journals, with approximately 7% addressing the topic, and in close parallel to the underrepresentation noted over a decade ago by Henrich et al. (2010).

For the articles that considered culture, we then identified the nature of the culture comparison. Figure 2 illustrates the content of the articles that consider culture. The

[1]Although we did not consider comparisons of age groups to be a culture-related comparison (based on the operationalization of culture we outlined earlier), it is possible that cohort effects could be similar to the types of effects we are counting as culture.

remainder of this section of the manuscript further characterizes each of these topics by describing examples of manuscripts that were included in the counts presented in this figure. The vast majority (approximately 83%) of the articles investigate topics related to language or bilingualism. Language articles encompass comparisons across speakers of different languages (e.g., Mandarin versus English; Gao et al., 2018), comparisons of different number formats (e.g., Arabic versus Mandarin; Quinlan et al., 2020), and training to learn a nonnative phonetic contrast (e.g., Fuhrmeister & Myers, 2020). Bilingualism topics include comparisons of bilinguals and monolinguals (e.g., Bialystok et al., 2020; Ratiu et al., 2017), comparisons of individuals' first versus second language (e.g., Lempert, 2016), and second language learning (e.g., Yum et al., 2016). Notably, the higher number of papers that consider culture in *Behavior Research Methods* relative to the other journals largely reflects the journal's role in publishing stimuli normed in a variety of linguistic and cultural contexts (e.g., Boukadi et al., 2015; Stadthagen-Gonzalez et al., 2016).

A typical approach in culture and cognition studies is to compare groups from two different regions or cultural traditions to each other. In our coding of articles, group membership included comparison of nationalities or broader geographical distinctions (e.g., Western versus Eastern samples; Callizo-Romero et al., 2020) or nation of origin (e.g., immigrants from East Asia versus native Canadians; Cramer et al., 2016), as well as regions (e.g., East versus West Croatia; Svob et al., 2016). Some studies extended previously established effects to a new cultural context (e.g., Nitta et al., 2018 extended research conducted in the US to a Japanese sample), without necessarily including a direct comparison of cultural groups. In contrast, considerations of race largely employed facial stimuli from different racial groups (e.g., Asian versus White, Zhou et al., 2018; Afrocentric features, Kleider-Offutt et al., 2021), primarily to investigate the other-race effect (e.g., Hills et al., 2019). The study coded as "demographics" tested culture-related factors as the *target* of judgments rather than as a grouping variable for the *participants* to investigate biases in demographics estimation (Landy et al., 2018).

The remaining studies approached culture in a variety of ways. Beliefs encompassed cultural values (e.g., priming independence versus interdependence; Zhu et al., 2018). The distinction between the independent and interdependent selves is a common way to operationalize culture in the broader culture literature (e.g., Markus & Kitayama, 1991), contrasting whether one sees the self as unique and separate from others (independent; more typical of Western cultures) or inherently defined by others and reflecting a collectivistic view (interdependent; more typical of Eastern cultures). In addition, the concept of "beliefs" compared the consistency of views within a group (Tan & Mueller, 2016). Articles investigating religion probed both the religion of participants (Barlev et al., 2018) and the religion of targets of perception or judgment (e.g., Islamophobia; Lewandowsky & Yesilada, 2021). A handful of articles considered cultural transmission (e.g., how language or other knowledge spreads amongst individuals), although many were responses to a target article on the topic (Kirby, 2017). The single paper coded as investigating persuasion used computational linguistic techniques to probe how leaders of the communist party of China adopted persuasive strategies (Li & Graesser, 2016). Finally, the conclusions of two articles equally spanned multiple coding categories (i.e., nationality and race, Craig et al., 2017; nationality and language; Xu et al., 2020) and could not be reduced to a single category. In

brief, whether we characterize culture as one of the several color-coded dimensions shown in Fig. 2, or pool these dimensions together (291 of 4092 articles), the numbers remain low for the representation of culture across journals.

How is culture investigated in other subdisciplines of psychology?

Prior papers have considered the integration of culture and cognition. Markus and Kitayama's foundational 1991 paper, probing cultural differences in the construal of the self, connected this idea to cognition, emotion, and motivation. Richard Nisbett's framework for cultural differences in systems of thought was inherently cognitive, investigating ways in which holistic versus analytic styles could impact reasoning, perception, attention, and memory (de Oliveira & Nisbett, 2017; Nisbett et al., 2001; Nisbett & Masuda, 2003). Within the domain of memory, Qi Wang identified numerous pathways through which culture can exert rich effects (Wang, 2021b). What is different about our approach is that our starting point is from a cognitive perspective, rather than a cultural one, asking why cognitive psychology should care about culture, and what has prevented the field, until recently, from more frequently considering the role of cultural variations.

With their emphases on variation across individuals and situations, clinical and social psychology are arguably the subdisciplines most attuned to culture. Clinical psychology has a deep appreciation for the ways in which culture can influence diagnosis, treatment, and patient-therapist interactions (e.g., Alarcón, 2009; Cagigas & Manly, 2014; Soto et al., 2018). For social psychology, the field looks outward to factors in the environment that shape human thought and behavior. Theories from social psychology to explain cultural differences focus on constructs such as self-construal and social environments. The self can be conceptualized as independent of others or inherently interconnected and defined by others. This distinction can shape emotion, motivation, and cognition (Kitayama & Salvador, 2017; Markus & Kitayama, 1991). The social environment emphasizes the ways in which group interactions, potentially including how ecological differences in subsistence, such as collectivistic rice farming or fishing as opposed to individualistic wheat farming or herding, could reinforce different styles of thought (de Oliveira & Nisbett, 2017; Talhelm et al., 2014; Uskul et al., 2008; Varnum et al., 2010). The field is also known for its use of clever and sometimes naturalistic designs to investigate human behavior, such as reducing cheating or increasing generosity when depictions of eyes are present in the environment (Dear et al., 2019; Haley & Fessler, 2005) or modeling bystander apathy in the lab (Latane & Darley, 1968).

In contrast to the social perspective that primarily emphasizes the social environment, developmental psychology is particularly attuned to *when* in the developmental time course cultural differences emerge, as well as testing the universality of developmental processes. For example, the development of an autonomous notion of the self may be a prerequisite for developing autobiographical memory. Cultural differences in the time course of the first process may account for delays in the second, potentially explaining why East Asians have later first memories than European Americans (Wang, 2006a). In terms of the universality of processes, elements of fairness emerged consistently across the multiple societies tested by middle childhood (Blake et al., 2015). Focus on interaction with one's environment, key to

the Vygotskian (Vygotsky, 1978) appreciation of the role of the sociocultural context during development, is a perspective that is shared with social psychology. Social interactions are a key factor in how the developmental perspective considers the emergence of the mind, such as the ways in which mother–child interactions can impact what is attended to in the environment (Fernald & Morikawa, 1993), and what and how autobiographical events are remembered (Fivush, 2011; Wang, 2006b; Wang & Conway, 2004).

In contrast to the approaches outlined above, studying culture from a cognitive perspective brings a distinct approach to investigating human thought and behavior. The approach of cognitive psychology to the study of culture contrasts that of other subfields of psychology. Cognitive psychology has a goal of understanding the human mind and information processing, with an emphasis on universal principles. The inclusion of culture in the study of cognition would enable a test of the universal principles, when they hold up and when they are not observed, and provide an explanation for the variability based on the role of culture. The distinctions we draw next are necessarily a matter of emphasis and degree and are not mutually exclusive, but they are worth appreciating. Cognitive approaches typically emphasize how culture contributes to questions involving basic science, rather than research with a translational focus, as is the focus of clinical psychology. In addition, cognitive psychology historically has focused inwardly on the mental processes within the individual, apart from outward environmental influences that are the focus of social psychology. Cognitive psychology tends to examine processes at a discrete moment in time rather than considering the trajectories over time that are the focus of developmental psychology.

It is also worth distinguishing the perspective that cognitive psychology brings to the study of culture from that of culture-focused disciplines, namely cultural psychology and cultural neuroscience. Cultural psychology is most interested in understanding the ways in which the experiences shared by a culture shape the human mind (Heine, 2012). This perspective can span the consideration of both cultural universals and cross-cultural differences, and encompass qualitative as well as quantitative methods. The field can be seen as subsuming under the study of culture many perspectives including cognitive, social, and developmental domains. Although cultural neuroscience shares with cognitive psychology a focus on delineating mechanisms, it also adopts an almost developmental perspective that emphasizes the causes for shifts in the development of the brain across groups, considering factors such as genetics and the environment. Particular brain regions (e.g., frontoparietal network) or markers (e.g., the N400 component in ERP [event-related potential] research) are thought to reflect specific processes that can be engaged to different extents across cultures. For example, functional magnetic resonance imaging (fMRI) supports the idea that Westerners may exhibit more object sensitivity than East Asians, based on the neural regions that selectively adapt to object information over repetition (Goh et al., 2007). But results from these studies, at least in the current state of the literature, do not address inferences at levels as those that can emerge from the behavioral cognitive literature, such as about cultural differences in the breadth and resolution of attention (Boduroglu et al., 2009; Boduroglu & Shah, 2017). In other words, at the current state of research, the differences in emphases and approaches are subtle but important to note. As we will elaborate in a later section, the similarities between the approaches in cultural psychology and cognitive

psychology are substantive and substantial; as such, evaluation of subtle differences and broad similarities can help advance synergistic progress across cultural and cognitive psychological perspectives.

How does culture influence cognition?

Perhaps the most intuitive way in which culture influences cognition is in shaping the types of knowledge and facts that are learned by individuals. Bartlett (1932) was an early proponent of these ideas (as discussed in the next section), yet the opportunity to further explore the effects of cultural differences in knowledge was missed for many decades. In recent years, this has been studied, for example, in within-culture comparisons of memory for presidents of the United States and Chinese dynasties. These studies reveal systematic patterns of which historical information is remembered in a nation's collective memory more (e.g., Lincoln as the 16th president; Chiang Kai-shek) or less (e.g., Lyndon Johnson; Republic of China period) than would be expected based on serial position curves (Fu et al., 2016; Roediger III & DeSoto, 2014). One would not expect the same information to be remembered as well or to show the same patterns of what is preserved versus forgotten in the memory of people from a different nation. A globally relevant example of the way in which memory differs across nations is how people remember the 10 most important events from World War II. Although people from 11 countries tend to recall overlapping events from WWII (e.g., D-Day, or the opening of the western front), there is some striking variability in the events recalled (Abel et al., 2019). In particular, Russians generated a number of core events (e.g., Battle of Stalingrad; Battle of Kursk) that were not shared by other nations. Beyond remembering different events, the value placed on these events can differ dramatically across nations (though see Choi et al., 2021, for evidence of convergence in evaluation of events across nations), with people placing high value on their own nation's contributions to the war effort to the extent that it demonstrated "collective narcissism" (Roediger et al., 2019). Or, as stated by the authors, "differing national perspectives shape diverse memories of the same complex event" (p. 16678). Differences in cultural experiences and what is remembered can persist across generations, such that war-related events that occurred during their parents' lives are remembered by children and substantially shape the children's identities (Svob et al., 2016). Furthermore, the organization of public event memories can differ within a country based on political views, changing over time for voters of the ruling party such that memories are no longer clustered by political nuances for the dominant group (Mutlutürk et al., 2022).

In learning contexts, including schools, the importance of the sociocultural environment was highlighted in Vygotsky's (Vygotsky, 1978) influential work, which has profoundly shaped developmental and educational psychology (John-Steiner & Mahn, 1996). Vygotsky's approach highlighted culture as a critical tool in cognitive development for learning not only what to think but also how to think. To illustrate how culture can shape cognition in a number of ways, we can look to the literature on arithmetic performance across cultures. The long-standing advantage for Chinese over American students in arithmetic performance reflects cultural differences at multiple levels, including educational practices in schools (Stigler et al., 1987), strategy usage (Campbell & Xue, 2001), parental and peer attitudes, and belief in the importance of effort (Chen & Stevenson, 1995). Vygostkian

theory underscores another instantiation for why it is important for cognitive psychologists to take into account cultural variations in their samples.

That cultural differences exist in knowledge should not be surprising. The content of knowledge or strategies explicitly taught in educational systems can vary across contexts. In physics, for example, content knowledge differs for American and Chinese students, although the groups converge on scientific reasoning ability (Bao et al., 2009). Implicitly, content and biases in information processing are conveyed through cultural narratives and values. Even physical environment can shape learning and reasoning. It has long been appreciated that being raised in environments with manufactured carpentered buildings, typical of urban settings, can shape cognition and perceptual inferences compared to those raised without such structures (e.g., Rivers, 1901; Segall et al., 1963). Cultural differences in remembering standardized experiences presented in a controlled laboratory setting may go one step further in demonstrating ways in which cultural values and strategies for information processing can shape memory in diverging ways even for the same experience. That is, such studies establish that remembering is in the mind of the beholder and identify specific ways in which memories can systematically differ as a function of culture. For example, cultural differences arise in the accuracy of memory for detailed visual objects (e.g., Leger & Gutchess, 2021) and in false memories for information studied in relation to the self (Wang et al., 2021) or related by taxonomic categories (Schwartz et al., 2014), strategies prioritized in the West.

Yet culture has been demonstrated to shape processes that many of us would have considered to be basic abilities that would be immutable across cultures, such as in perception and attention. In visual search tasks, Westerners exhibit search asymmetry whereby searching for a long line amongst shorter lines is faster than the opposite task, but this is not the case for recent immigrants from East Asia (Cramer et al., 2016). Face perception differs across cultures in terms of basic visual scan patterns, such that East Asians fixate more centrally, whereas Westerners fixate more on the eyes and mouth; East Asians use lower spatial frequencies more than Americans, as early as within the first 30 msec of face processing (as reviewed by Blais et al., 2021). Color change detection tends to be facilitated when the array is preserved rather than scrambled, but cultures differ in the effect of expanding versus shrinking the array, with the former advantageous for performance in East Asians whereas the latter disadvantages them, relative to Westerners (Boduroglu et al., 2009). After training on a visual perceptual learning task that relies on attending holistically and extracting global information, collectivists learn faster and perform more accurately than individualists (Chua et al., 2021). Such a shift in appreciating how culture could contribute to variability in basic cognitive processes could coincide with a growth in cognitive research establishing the importance of individual differences in abilities such as executive function and working memory (e.g., Kane & Engle, 2002; Miyake et al., 2000). In this vein, this perspective on the effects of culture on basic cognitive abilities also aligns with research on the effects of expertise on cognitive processing, whereby culture serves as a measure of expertise. For example, expertise with certain language scripts and characters can influence basic-level perception, intertwining effects of cultural experiences with basic-level cognitive processing, or how expertise and cultural background can impact the reasoning strategies used for biological categories (Medin et al., 2002).

Despite the differences that are identified across cultural groups, research investigating the contributions of culture to cognition casts a wide net, sometimes also focusing on similarities across groups. Such an approach could help to substantiate claims of universality or to clarify interactions between biology and experience or other sociocultural factors (Park & Gutchess, 2002; see Wang, 2016, for discussion of the benefits of studying cultural similarities). Research on the identification of celestial constellations across cultures is an example that reveals both similarities (e.g., Pleiades and Orion's Belt are commonly identified across cultures) and differences. Using computational modeling, Kemp et al. (2022) argued that perceptual properties such as brightness and proximity account for many of the groupings that occur across the 27 cultures they investigated. Although the *interpretation* of the constellations—through the names and stories—can vary across cultures, the takeaway is one of convergence across cultures due to basic perceptual processes more than had been appreciated. This complement of cultural similarities and differences in basic perceptual processing highlights how including culture in the study of cognition can help explain what might otherwise appear as noisy or contradictory patterns of performance and thereby enhance theories of cognition.

How does the study of culture connect to classic cognitive research?

Even as the emphasis on identifying underlying mechanisms when studying how cultural context contributes to cognition has grown in recent years, the notion that culture and language can shape thought has long been recognized. With respect to language, dating back to the Whorfian hypothesis (Whorf, 1956) the idea of linguistic relativity, or whether language determines or even constrains thought, has been vigorously debated and challenged (e.g., Boroditsky, 2001; Casasanto, 2008; H.H. Clark & Clark, 1977). Hunt and Agnoli (1991), in their review, identify that these ideas about the impact of language on thought date back to Herodotus (Fishman, 1980, cited in Hunt & Agnoli, 1991) and later Einstein (Einstein, 1954, cited in Hunt & Agnoli, 1991). Approaching the question from a cognitive perspective, rather than a linguistic one, Hunt and Agnoli (1991) favor a view that different languages influence cognition in distinct ways, with languages posing unique challenges (e.g., the tendency for there to be more ambiguous utterances in one language than another). Furthermore, they acknowledge the potential for biases in language to alter memory in distinct ways, a perspective in line with memory research (Carmichael et al., 1932) in which providing a verbal label distorts memory for an ambiguous drawing (e.g., a line connecting two circles can be distorted to resemble a "barbell" or "eyeglasses," based on which verbal label was provided). Building on the connection to memory, classic research by Bartlett (1932) reported on the cultural phenomenon whereby British participants in their mnemonic retelling distorted a Native American story (War of the Ghosts) so as to fit it into their vastly different cultural framework. In yet another domain of cognition, textbooks on cognition routinely describe Eleanor Rosch's work on categorization that illustrates both culture-generalization and culture-dependent processes. Participants universally exhibited cognitive economy in favoring basic-level categories, demonstrating that emergence of prototypes are a culture universal, but their processing of exemplars reflected the influence of specialized knowledge and culture dependence (Rosch, 1978).

Leveraging tools of cognitive psychology

The examples we just noted by no means cover all domains of debate in cognitive research. Rather, they illustrate the recurring considerations about the relationship between culture and cognition that have occupied scholars over centuries. What is new here is a call to take fresh stock of the extent to which we as a discipline have explored this relationship, and with that assessment in view, examine the relationship between culture and cognition with renewed focus, using the theoretical and methodological tools of cognitive psychology.

Cognitive psychology is a field that harnesses precision in measurement and models to understand the mind, interpreting differences in mere milliseconds as indices of distinct psychological processes. Through rigorous experimental design, by manipulating a single aspect of a task such as the distinctiveness or proximity of distractors in the feature search task (Treisman, 1986) or the set size or response required (e.g., yes or no) in short-term memory search (Sternberg, 1966), inferences can be made about the mechanisms and processes underlying thought. This precision complements the study of culture regarding its quasi-experimental nature, in that participants cannot be randomly assigned a “culture” when culture is operationalized based on demographics or life experiences. In general, the cultural background cannot be truly manipulated to allow for random assignment of participants. This feature limits the causal inferences that can be made about the mechanisms that underlie cultural differences. Nevertheless, the tools of cognitive psychology allow one to pinpoint precise stages of cognitive processes that differ. For example, assays of reaction time can identify how left-to-right or right-to-left reading systems across cultures influence the organization of sequences in working memory (Guida et al., 2018). Using both measures of sensitivity and response bias can characterize multiple ways in which culture can influence memory (Freire & Pammer, 2020; Leger & Gutchess, 2021). Similarly, through the use of groups designed through experimental manipulations, where some groups are constructed to be ethnically uniform whereas other groups are constructed to be ethnically diverse, laboratory manipulations of group composition can pinpoint how ethnically diverse versus uniform groups influence the memory performance of members of underrepresented groups (Pepe et al., 2021). Modeling can be used to compare how cultural groups differ in how evidence accumulates and in the criteria for making a decision (Gutchess et al., 2021), to assess the extent to which a group shares a belief or knowledge (Tan & Mueller, 2016), or to identify the perceptual properties shared by constellations identified across cultural groups (Kemp et al., 2022)

One approach to studying culture that is consistent with experimental manipulation is the use of priming (Hong et al., 2000). By priming one cultural identity (e.g., Chinese or American, in the case of a bicultural Chinese American) or one set of cultural values (e.g., independent or interdependent self), it is possible to experimentally manipulate which identity is brought to the forefront of the mind and is most salient in the moment. This approach has been used successfully in studies of autobiographical memory (Wang, 2008; Wang & Ross, 2005) and attention (Miyamoto et al., 2006). For example, priming the interdependent self by reading stories using collective pronouns (e.g., we, our) led to faster responses to compound stimuli containing global and local information in a multilevel selective attention task (Asch, 1962; Kinchla, 1974, 1977; Navon, 1977), whereas priming

independence by reading stories with individualistic pronouns (e.g., I, me) facilitated responses to local more than global information (Lin et al., 2008; Lin & Han, 2009). Although these represent some successful uses of priming to manipulate cultural frames in individuals, priming may not be effective when tasks are extended over time or highly demanding of cognitive processes, such as encoding and retrieving a number of stimuli over several minutes (see Gutchess & Sekuler, 2019, for a discussion of the potential limitations of priming in cognitive tasks). The general point, however, is that these studies demonstrate the feasibility of implementing experimental manipulation in studying cultural influences on cognition, while the particulars of implementation and the success of the approach may vary with the questions.

How does considering culture benefit the study of cognition?

Historically, much of the field of psychology adopted an approach of attempting to uncover universal laws. For example, Weber, Fechner, and Stevens's classic laws, expressed through formulas, characterize principles in the study of psychophysics. An approach focused on universal laws was appealing as it would allow psychological science to take its place alongside the physical sciences (Shepard, 1987). If culture influences not only the content of thought and accumulated knowledge but also preferences for information-processing strategies, as the examples in the preceding section show us, then it would be important to include a consideration of culture in our measures and theory to serve this same goal of seeking generalization.

For the experimental study of cognition, ignoring the diversity and characteristics of participants could be seen as reflecting an egalitarian view of the equivalence of the perceptual, motor, and cognitive processes across individuals. Other considerations have also contributed to a lack of cultural diversity in the study of cognition. For example, working with multiple cultural groups can increase the need for larger sample sizes, and access to participants may be challenging. Creating stimuli that are appropriate for multiple cultural groups is often a large undertaking in and of itself, and also substantially extends the timeline of a study. Many studies require controlled environments and millisecond-level precision for data collection, which can limit the type of environments in which studies can be conducted. Moreover, the appeal of the field could be limited when it is perceived by many in the scientific community and in social communities as historically English-dominated. Although cognition can certainly inform applied questions, it sometimes can be seen as disconnected from major public health issues or societal problems. These features can limit who decides to pursue research in this field, alongside the challenges of conducting such work.

Although there has been a lack of focus on cultural diversity in the study of cognition, there is also the acknowledgment that variations in people's exposure to different practices, information, and learning can complicate the detection and interpretation of basic processes. For example, going back to memory research over a century ago, Ebbinghaus (1885) famously chose nonsense syllables as learning material in his experiments on human memory, avoiding even single words, as these can be susceptible to individual differences in interpretation depending on the learners' idiosyncratic histories.

Such considerations to control for individual differences are not specific to memory research. Experiments investigating aspects of the visual system, for example, might recruit relatively few participants who complete hundreds of trials of a task. Measurement noise may be attributed primarily to external properties, such as the stimuli or the testing environment, which the field takes great pains to standardize. Administering large numbers of trials can account for momentary fluctuations in attention or eye gaze. Thus, the source of variability has traditionally been attributed primarily to environmental factors or intra-individual factors that operate across trials that are not of theoretical interest. However, the importance of also considering meaningful inter-individual variability in performance has been acknowledged (Kosslyn et al., 2002; Seghier & Price, 2018; Thompson-Schill et al., 2005), supporting comparisons of what information is attended to or which strategies are implemented across cultural groups. Shweder (1990) even went so far as to argue that by not modeling the variability introduced by sociocultural environment, the success of the "cognitive revolution" was hampered. Thus, modeling sources of variability associated with culture may allow us to create more comprehensive models of human cognition.

Attempts to standardize experiences and minimize noise can in some cases ignore important sources of variation across individuals. As argued by H. Clark Barrett (2020), "[t]he promise of cross-cultural cognitive science will not be fully realized unless we continue to be more inclusive of the world's populations and strive for a more complete cognitive portrait of our species" (p. 620). That is, without systematically considering key individual difference variables, such as culture, the data will lead us to form an "incomplete and… possibly biased view" (p. 620) of human cognition. These concerns are magnified when participant sampling is unrepresentative of the population (e.g., using only WEIRD samples). Moreover, researchers themselves bring their own perspectives on what processes they choose to study; diversifying the pool of researchers across cultures offers the opportunity to expand the ways in which we conceptualize cognitive processes and approach their study (see also Lin & Li, 2022).

Nisbett and Norenzayan (2002) also challenged assumptions about the universality and fundamental nature of many cognitive processes. Although they acknowledged that some of the content of cognition could be universal (e.g., the ways in which infants understand naive physics and model the world around them), they argued that even processes considered to be "basic" could be shaped by cognition as a result of different experiences in the world. We noted some examples of this nature in an earlier section (How does culture influence cognition?). Moreover, they saw cognition and cultural practices as closely intertwined such that one begets and sustains the other in an ongoing cycle. The role of experience is nicely illustrated by research testing the effect of urbanization on perceptual judgments. The Himba of northern Namibia have traditionally resided in nonurban settings. For Himba who have relocated to an urban environment, they exhibit a reduction in local (as opposed to global) processing bias in selective attention tasks (Asch, 1962; Kinchla, 1974, 1977; Navon, 1977) compared to Himba residing in traditional settings; their performance looks more like that of residents of Britain or Japan than the traditional Himba (Caparos et al., 2012). Strikingly, even brief exposure to urban environments shifts judgments in Himba who reside in traditional settings, with the number of global choices on a task increasing as a function of lifetime visits to the city (Caparos et al., 2012; Exp 2). Thus, in addition to the resonance

with the impact of expertise (noted in an earlier section) and of individual differences that have occupied the interests of cognitive psychologists, incorporating cultural background and experiences into models will more generally advance a more accurate understanding of a range of human abilities. Given these considerations, a goal for future research is to further examine the extent to which individual differences due to cultural background represent a unique source of variance or whether the effects of culture can be accounted for by other common individual difference metrics such as expertise.

The goals of the study of culture and cognition are aligned

While surprising to many who do not study culture, the goals of cultural psychology are well aligned with those of cognitive psychology, despite the subtle and important differences we noted earlier. The two fields share the approach of attempting to delineate mechanisms and identify the *processes* that explain the phenomenon of interest. As described by Wang (2016), "cultural psychology is not just about the 'what' but, more importantly, 'why' and how" (p. 585). Just as it is insufficient to simply note that searches of short-term memory take longer when there are more items in the set and important to explain why (Sternberg, 1966), it is insufficient to simply document that one cultural group exhibits more accurate performance on a task than another. In other words, both fields seek to understand what processes differ across the conditions or groups, resulting in differences in performance. As cognitive psychologists would readily affirm, a focus on mechanisms is what ultimately supports theory-building and new discoveries about the nature of human thought. Indeed, Wilhelm Wundt (1916), the prototypical experimentalist, argued that the study of cultural psychology goes hand in hand with experimental psychology, as mental processes are "creations of the social community" (as discussed by Nisbett & Norenzayan, 2002; p. 566). Once again, the canonical concept of context and experience shaping performance that are central in cognitive theory can be seen as embodied within these cultural influences. Yet, this rapprochement between culture and cognition has not taken hold in mainstream cognitive research.

Despite assumptions that cultural psychology is primarily interested in group differences, the field is deeply interested in individual differences (Wang, 2016). This appreciation reflects acknowledgement of the high degree of overlap in performance and cognitive styles across cultural groups. That is, it is rarely the case that all of the participants from culture A perform more accurately or display evidence of a particular style that does not overlap with the distribution of performance of participants from culture B. Rather, the differences are a matter of degree, with the central tendency differing between cultural groups. Moreover, individual differences can play a critical role in identifying potential causes of cultural differences (though see Na et al., 2010, for a discussion of how individual differences may not account for cultural differences). For example, people who have more interdependent self-construals—those who consider social relationships and others to be intrinsically related to the self—have more gray matter volume in parahippocampal place areas compared to those with more independent self-construals, who see the self as separate and distinct from others (Yu et al., 2021). These findings could indicate that cultural differences in attention to context, thus far identified at the level of the group (Masuda & Nisbett, 2001; Miyamoto et al., 2006), occur due to individual differences in interdependent versus independent

self-construal. In addition, the ability to identify an individual difference factor that accounts for which groups exhibit a cognitive style would help to explain how cultural differences emerge over developmental trajectories. That is, children must accumulate knowledge and experiences in order for cognition and behaviors to diverge as an effect of culture; for example, acquisition of knowledge about emotion accounts for the amount of detail contained in recall of autobiographical events (Wang, 2008; Wang, 2016). In other words, explanations can become richer when we can consider culture and cognition together.

The opportunity to integrate culture into the study of cognition does not imply that study of cognitive processes in relatively homogeneous groups does not have great value in its own right. Indeed, in some cases only small groups of participants are needed to establish a principle or provide an existence proof. In other cases, large samples are needed to properly power studies in pursuit of other fundamental discoveries, and such sample sizes can be procured properly in homogeneous circumstances. These approaches provide solid and necessary contributions regardless of where the study is initiated and located. Another consideration is that the influence of culture may be smaller than the cognitive effects themselves. Although effect sizes ranged from small to large for the papers cited in the earlier section characterizing the operationalization of culture in the journal articles included in our analysis, the preponderance of effects was on the low end of medium effect size. In general, attention to effect size can shed light on culture-universal and culturesensitive aspects of specific cognitive phenomena. It also allows for understanding failures to replicate, for example, when effect sizes that are small do not hold up across cultures. Expanding samples, regions, researchers, and topics of research allows for the discovery of multiple routes to solve cognitive challenges, such as multiple strategies that may be effective or different styles of information processing. Our call is to augment, not replace, a cognitive approach to the study of human behavior.

Recommendations

How to begin incorporating culture into one’s research? We did not want to advocate for the importance of considering culture in the study of cognition without also presenting some guideposts for how one could begin to incorporate culture into one’s research, as well as acknowledging challenges—conceptual, methodological, and practical—that will affect our decisions as researchers. In addition, we acknowledge that our perspectives are shaped by our own identities as scientists working in a WEIRD cultural context, typically communicating with other scientists working in the same spaces. As noted earlier, this perspective is also situated in the historic context of cognitive research being situated largely in Western cultures.

What we describe below are efforts that are underway or calls that have been made by some in the field. That is, we are not the first to come up with these suggestions, but we bring these together here in an effort to support and spread the message and include practical suggestions for those interested in pursuing such a direction. In that vein, we share suggestions for individuals and then build up to developments that would strengthen the field, following Roberts et al.’s (2020) approach to address multiple levels in their recommendations (see also Prather et al., 2022, for further recommendations). Our

suggestions are broadly consistent with calls to adopt a WILD approach, which emphasizes conducting research with a Worldwide, In situ, Local, and Diverse perspective (Newson et al., 2020). Recruiting representative samples of participants from locations around the globe while working collaboratively with researchers and individuals in the local community to define research questions and experimental approaches in ways that are appropriate for local norms are critical components of the ideas we describe below. Although the extension of research to more naturalistic settings is important, we acknowledge that such an approach can be a challenge for the study of cognition, which in many cases relies on controlled environments. As such, the proper balance between experimental rigor and expansion to WILD specifications will be a challenge for the field to consider. It is important to note at the outset here that we do not intend for these suggestions to be prescriptive or exhaustive, or to imply that one size fits all; as just noted, we also acknowledge the challenges. Rather, we offer these approaches as examples for improvement in how we as a field can incorporate culture in cognitive research based on what questions we are pursuing and can use that context to achieve a broader representation.

There already may be substantial diversity in some research samples that could be characterized in the participant sections of manuscripts. For cognitive experiments, rarely do we report demographic information beyond sex; it may be worthwhile to consider reporting other sample characteristics (e.g., nationality, race, ethnicity). For samples that are heterogeneous, including student samples at universities with large international populations, cultural variables (e.g., demographic variables or scales measuring cultural values or orientations) could be incorporated for exploratory analyses when samples are sufficiently large and cultural variables can be clearly operationalized. Sharing this information in online repositories would make such data useful for meta-analyses or other follow-up comparisons. We acknowledge, however, the challenges to sharing demographic data, including the potential for re-identification when there are only a few participants from a particular group in the sample. Such considerations make reporting of demographics a trickier enterprise, yet presenting the demographics of the sample at a summary level would nonetheless contribute to understanding its representativeness in terms of culture and related characteristics. Another concern is that re-analyses of shared data might be performed for purposes outside of the range of questions and hypotheses, broadly defined, for which participants had originally provided consent (for a related discussion, see Fox Tree et al., 2022). Therefore, a nuanced and careful approach is required, even when considering existing data.

Another route is to systematically examine the range of culture-relevant characteristics available within a sample, such as the large populations of foreign students enrolled at some institutions. These individuals could contribute to research as participants or as part of the team. Similarly, working with trainees from diverse backgrounds could present an opportunity to bring multiple cultural lenses from within the team to research questions. Although this may reflect some bias in who opts to train in another country, in terms of both who is available in the location to be studied and who is doing the studying (e.g., are participants and scientists studying abroad representative of their home culture?), this is merely suggested as a starting point as global collaborations develop.

Other routes can support collecting data through multisite international collaborations. One way is to work with researchers who train internationally. As they complete their training and begin their own labs across the globe, in some cases returning to their home country, they can collaborate globally with peers or former mentors. In this conceptualization, the idea is to foster collaborations that are equal partnerships, with members of teams across sites involved in hypothesis generation and theory-building, rather than treating one site as secondary and merely a source for data collection. In a similar vein, when a researcher is a member of a marginalized group, awareness of and attempts to mitigate structural inequities are important, such as who receives credit or recognition for the work (Fox Tree et al., 2022). Cross-cultural teams allow for the development of culturally appropriate hypotheses, stimuli, and comparison of task performance across different samples. It must be recognized, however, that this can lead to a long timetable for new faculty to establish their labs and be able to tackle such collaborations. Potential solutions could involve online data collection, reducing the burden of data collection, as well as encouraging the depositing of data into online repositories. Working with existing data could allow for novel comparisons of participants across cultural groups and support meta-analyses, or, with enough supporting materials, replication of a previous study in additional cultural groups (although, as noted earlier, such approaches require additional care for ensuring participant protection). Beyond international collaborations and comparisons, there is also considerable opportunity to expand the scope of cross-cultural research where we may include not only East–West comparisons, but also go beyond to study culture with more breadth and depth (e.g., comparison of groups within a nation, such as rice versus wheat farmers; Talhelm et al., 2014).

Beyond the opportunities already available in many research programs, researchers may consider collaborations and ways in which culture could contribute to results that diverge across labs. It may be that samples or stimuli are influenced by cultural variables, and this results in systematically different outcomes across samples. Given concerns about the replication crisis, it may be useful to systematically consider how a lack of replication may be understood in terms of cultural variations. When a small or moderate effect is established in one narrowly drawn sample, then it is not surprising when it fails to replicate in another narrow sample. There may be cases in which systematically including “culture” as an independent variable could account for different patterns of results that emerge across samples or sites or bring to light the robust versus the sensitive nature of a phenomenon in its susceptibility to context changes. An adversarial collaboration, in which scientists with opposing theories or patterns of findings work together, could lead to the direct comparison of groups across multiple labs. In our roles as reviewers, editors, and consumers of research, greater awareness that a WEIRD sample is often implicitly treated as the standard would contribute in similar ways to understanding sound methodology with different results. That means avoiding expectations that a non-WEIRD sample should be compared to a control sample or resisting requiring authors to consider the cultural features of their sample when these same expectations would not be applied to a WEIRD sample (see a related argument about race in Prather et al., 2022).

Beyond the role of individuals, we embrace the increased globalization efforts by professional societies in recent years to welcome members from a variety of countries

into societies and meetings. These efforts include hosting conferences in multiple countries, supporting remote and virtual meeting formats, partnerships of related societies based in different countries, and in diverse representation on governing boards, committees, and editorial boards. These practices may foster the development of collaborations, bringing researchers with related interests into the same space to connect across differences in framing of questions, terminology used, or the conceptualization of processes, as well as ensuring the publication and promotion of research conducted by scientists from a variety of backgrounds. Journals tend to have a Western or even US bias in who publishes, reviews, and edits the research, and this may limit the global diversity of the journal (Lin & Li, 2022). Going forward, building more infrastructure to bring researchers together through regular meetings and resources (e.g., web platform for researchers to share knowledge and even find collaborators) and grant mechanisms that operate across nations (examples include collaborative funding from partnerships between the National Science Foundation in the US and international funding agencies, and funds allocated for international collaborations) would help to advance the inclusion of culture in the study of cognition. In addition, incorporating discussion of culture and other aspects of diversity into graduate training will heighten awareness of considering these factors when deciding what type of research should be published in journals or presented at conferences with a cognitive focus. Additional training for editorial teams around topics related to diversity, equity, and inclusion will better prepare individuals to adjudicate the strengths needed in this research and the challenges that may be difficult to surmount.

As we noted at the outset, we recognize, and are indeed personally acquainted with, the challenges inherent in expanding the scope of one’s research agenda to include cultural variations, even when doing so through collaboration, larger or more diverse samples sizes, and designing tasks and stimuli appropriate for testing multiple groups. For example, designing two stimuli sets that are equated on important dimensions could involve iterations in collecting data to norm the stimuli before one can even create the experiment. Translating tasks and instructions can involve understanding the nuance of wording or need for technical terms that may not exist across languages. Phonology can be important to consider, even when the study does not investigate language. For a memory study, particular stimuli could be more memorable in one language than another when words rhyme or share an initial phoneme; for pictograph languages, a brushstroke may be repeated across words within a category, helping to cue memory for multiple items. To make fair cross-cultural comparisons, samples must be drawn equivalently from the populations at each site. This is particularly important to consider when studying non-student populations that could vary widely on factors such as socioeconomic status, educational background, and occupational attainment. Administering standardized neuropsychological tests to ensure participants are sampled equivalently requires knowledge to select a test that is appropriate to use across sites, and the additional time to administer it. These are not trivial matters in designing robust studies, nor always feasible. Awareness of these issues is important for evaluating research, appreciating the contribution of individuals on larger, cross-site teams, and appropriately weighting the demands of conducting this type of research when evaluating candidates for jobs, promotions, or funding.

Issues pertaining to statistical power also factor into the merits of when and how we may successfully achieve greater cultural representation. We are also not making the case that every question and every study must approach samples, regions, and questions with culture included in its design to advance our understanding of cognition. However, being thwarted by these challenges will prevent us from making progress; we as a community need to identify the steps we can take—big and small—to start making progress on the understanding of cognition across culturally diverse samples.

Finally, it is important to acknowledge the potential for misinterpretation and misuse of research on group differences (see Thomas et al., in press, for a recent discussion of scientific racism). As researchers, we have a responsibility to present data on cultural group differences as malleable differences in strategy usage or attention due to life experiences rather than biological imperatives and to avoid interpreting patterns of performance as "better" or "worse." Cross-cultural collaborations and/or connections with advisors embedded in the community, when developed as partnerships, can aid in posing questions and interpreting results in a way that is scientifically responsible and respectful to participant groups. In essence, the focus is placed on understanding the richness that culture can produce in the use of cognition and capturing variability in the data with this framework as a reference point.

Conclusions

It is time for cognitive psychology to better encompass cultural perspectives in the study of human cognition. As we have argued, the study of culture is compatible with a cognitive approach in a number of ways, including the shared focus on mechanisms, consideration of individual differences, and interest in discovering generalizable principles as well as establishing boundary conditions. Cognitive psychology has long focused on the ways in which knowledge and experience can influence the interpretation of stimuli in order to standardize experimental procedures. Knowledge and experience are in many ways the products of cultural variations, linking culture and cognition in our research pursuits. The field of cognition also emphasizes that a desire to accurately model human cognition requires accurately modeling sources of variability. Consideration of culture can help expand our understanding of the sources of variability that impact cognition, helping us characterize the similarities and differences in the ways culture influences cognition.

By systematically incorporating the factor of culture, we can find richer explanations and broader understanding of cognition across humanity. This will allow us to expand on the understanding of performance gained from studying homogeneous groups. Such an approach helps to address the "WEIRD problem" of who is studied in psychological research. The often unconscious decision regarding which culture is studied, based on where a researcher is positioned on the globe and the populations to which one has ready access, can determine what is studied and the answers that are uncovered. As highlighted by H. Clark Barrett (2020), researchers and their geographical locations are also nonrepresentative, with the majority of publications hailing from Western nations (e.g., USA, Europe) (see also Lin & Li, 2022). As discussed by Wang (2016), cultural psychology plays a critical role informing theory development, the very mechanisms we uncover, and the knowledge and

biases we bring to the laboratory. One's cultural background and perspective necessarily guide choices of what questions to study, the methods with which to study these questions, the development of theories, and, as a reviewer or editor, qualitative assessments of what research seems important to publish. The marriage of cultural psychology with cognitive psychology offers a powerful combination to delve deeply into experimental questions about human thought with a greater breadth of samples and researchers across the globe.

In addition, as cognitive research takes account of culture more than it does at present, we have the opportunity to contribute to determining suitable operationalizations of the construct of culture. As illustrated in our characterization of what topics are studied under the rubric of "culture" (see Fig. 2), cognitive studies published in Psychonomic Society journals that have adopted approaches to studying culture outside of the domain of language are limited in number.

In conclusion, in describing the historical recognition of cultural influences on cognition, the recent calls on the importance of incorporating culture in research, the insights gained in cognitive studies that systematically included culture, and the theoretical richness that can be gained by inclusion of cultural variations and broader cultural representation through questions, samples, researchers, and regions, we have aspired in this paper to welcome colleagues into the study of culture and cognition. Studying cultural influences on cognition offers tremendous opportunity, not only in terms of creating a more representative field with more comprehensive models of human cognition, but in the opportunities to build on the knowledge gained from a study of single culture samples, develop stronger constructs, and creatively pursue cultural influences in a wide variety of ways. We invite cognitive researchers to see culture as in many cases compatible with the goal of understanding the human mind and the experimental approach to doing so.

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Data availability

The datasets generated during and/or analyzed during the current study are available in the OSF repository: https://osf.io/uxtfh/.

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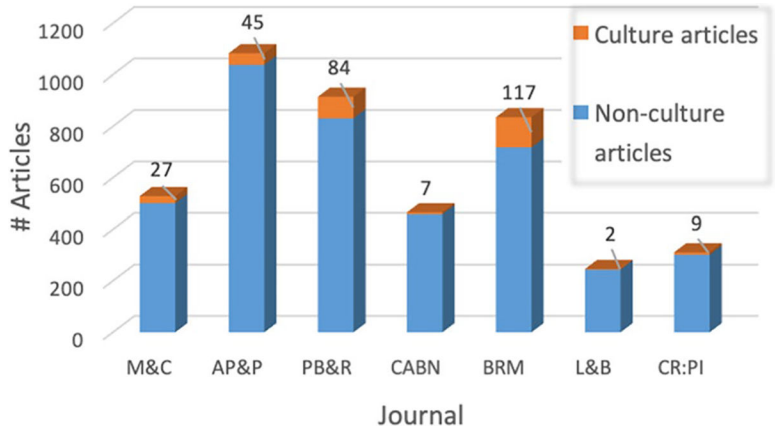

Fig. 1.

Prevalence of articles related to culture in the journals of the Psychonomic Society from 2016 to 2020. The number of articles published in each journal during this timeframe is divided into those that consider culture (in orange) and those that do not (in blue). Abbreviations of journal names: M&C (*Memory & Cognition*), AP&P (*Attention, Perception, & Psychophysics*), PB&R (*Psychonomic Bulletin & Review*), CABN (*Cognitive, Affective, & Behavioral Neuroscience*), BRM (*Behavior Research Methods*), L&B (*Learning & Behavior*), and CR:PI (*Cognitive Research: Principles and Implications*)

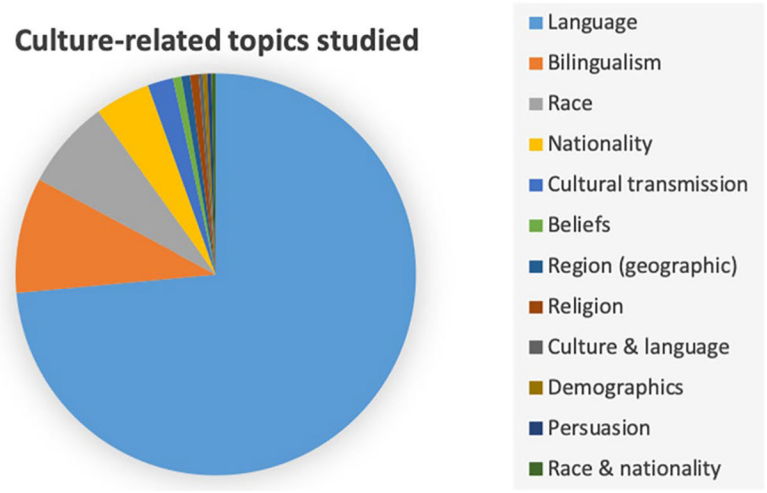

Fig. 2.

Culture-related topics studied. For articles in journals of the Psychonomic Society from 2016–2020 coded as involving "culture," the topics were further coded to illustrate how culture was studied. Topics are ordered by largest to smallest proportion in the legend. Approximately 83% of the articles involved language or bilingualism, with a small number of articles addressing other aspects of culture. Examples of manuscripts included in the count for each topic are further characterized in the text