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examine other sources of variability, as well. Cognitive processes are by nature non-deterministic: Children do not employ a deterministic strategy to perform cognitive tasks (e.g., Siegler 1996), and patients with dementia, head injury, ADHD, and schizophrenia are even less consistent in their thinking (for a review, see MacDonald et al. 2006). Likewise, the same individual may perform a task differently at different times. In one of our studies (Bucciarelli & Johnson-Laird 1999), a group of participants had to draw deductions from syllogistic premises by using cut-out paper shapes representing syllogistic terms. Results showed that individuals' strategies differed from trial to trial in terms of which premises to interpret first, how to interpret the premises, and how to diligently search for counterexamples. As a result, it was impossible to predict individuals' cognitive operations based on their previous performance.

What other sorts of factors affect the way we think? Maturation and psychopathological factors are clear determinants, but the content on which a cognitive process operates may affect the process itself. Individuals think about different contents because they differ in their experiences, education, and beliefs. Culture may explain variability in these factors only to a certain extent, and hence psychologists ought to develop theories that explain how a cognitive process (a) can be modulated by content, and (b) develops and decays under normal and pathological conditions, respectively.

Consider the case of bicultural individuals. The behaviour of these individuals is guided by one internalized culture or the other at different moments (e.g., Ng & Lai 2009; Pouliasi & Verkuyten 2007), and they organize their cultural identities differently (Haritatos & Benet-Martínez 2002). When bicultural individuals' cultures contain inconsistent moral values, they will experience moral dilemmas such as the following described by a 19-year-old second-generation Indian American: "I enjoy my Indian culture, I feel that it is rich in tradition, morality, and beauty; confused because I have been in many situations where I feel being both cultures is not an option . . . I feel like you have to choose one or the other" (Haritatos & Benet-Martínez 2002). How might a theory explain this phenomenon? Mental models theory (e.g., Johnson-Laird 2006) allows for individuals to entertain inconsistent beliefs, because we tend to rely on separate sets of beliefs in separate contexts (Johnson-Laird et al. 2000). This is evident in moral reasoning, in which moral intuitions and conscious moral reasoning are based on beliefs that are neither complete nor consistent (Bucciarelli et al. 2008). Our conception of culture therefore differs from that in cross-cultural psychology, which considers culture as a network of discrete, specific constructs that guide cognition only when they come to the foreground in an individual's mind (Hong et al. 2000).

How do cross-cultural differences in thinking emerge in a society? Henrich et al. explain the development of these differences by appealing to content (data perceived, norms, and connotations) and context (individuals' contemporary environment, the environment during development, and the immediate experimental environment). We emphasize that an analysis of reasoning strategies can explain variability within the same individual. Therefore, if content, context, and strategy drive cultural differences, then those factors are of primary interest, whereas cultural differences are merely incidental. Cognitive theories should distinguish between the universal processes they propose and the specific contents on which they operate. For instance, our own theory of moral reasoning (Bucciarelli et al. 2008) posits that moral reasoning is simply normal deontic reasoning (Bucciarelli & Johnson-Laird 2005) applied to moral contents and contexts. Moral contents and contexts may differ across cultures, but the theory of deontic reasoning we propose is, and ought to be, domain-general. Such a dissociation between general computational operations and the contents they operate on allows researchers to construct theories that are sensitive not just to cultural differences, but to age-related, social, personality, and strategic differences, as well.

Responsible behavioral science generalizations and applications require much more than non-WEIRD samples

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Abstract: There are many methodological considerations – some intricately associated with the use of WEIRD samples – that adversely affect external validity as much as, or even more than, unrepresentative sampling does. Among suspect applications, especially worrisome is the incorporation of WEIRD-based findings regarding moral reasoning and retribution into normative expectations, such as might be held by international criminal tribunals in “cognitively distant” war-torn areas.

The article by Henrich et al. is a valuable contribution that goes beyond prior critiques of the deplorable lack of representativeness of a large proportion of participant samples that have been used in the behavioral sciences. The cogency of argumentation, and both the breadth and the detail of the empirical documentation that is provided, are impressive. Therefore, my commentary will not challenge the main thesis proposed by Henrich et al. Instead, its purpose is to supplement and increase the scope of their article's argument.

An important, although perhaps self-evident, observation is that the authors' thesis concerning WEIRD samples would be even more useful (perhaps considerably more so) had they at least mentioned and briefly outlined some other factors – often closely, and sometimes unavoidably, associated with the research designs using WEIRD samples – which may even more detrimentally affect the generalizability (external validity) of the results than does the lack of WEIRD samples' representativeness.

An abbreviated list of such factors will have to suffice here: unrepresentative sets of independent variables; artificiality of research settings; a limited number of tasks (often a single task) through which the independent variables are presented; and relying on a single data-collection method (such as questionnaires, surveys, or rating scales) – and therefore obtaining a single dependent measure (or an uninformatively correlated set of measures) that is often qualitatively different from the one to which generalization is sought in the “real world.” The mentioned factors are highly relevant for a more complete understanding of the issues in some of the areas discussed in the target article, especially fairness and cooperation, punishment of “excessive” cooperators, personal choice, “fundamental attribution error,” and moral reasoning.

Moreover, one must worry about the (statistical) interaction of the effect of WEIRD samples' uniqueness (extremity, non-modal character) with the effects of these additional factors (e.g., the frequently highly artificial tasks), such that the overall result (especially when interactions are of a multiplicative form) would be even more misleading with regard to some real-world criterion and domain of desired application than is the case on the basis of WEIRD samples' “differentness” alone. On the other hand, if, for example, a greater variety of tasks were used, the presently observed differences between WEIRD and various non-WEIRD samples might in some cases disappear. One simply cannot predict what would happen without doing the research.

The above family of methodological observations has its root in the pioneering work of Campbell and colleagues (e.g., Campbell & Stanley 1963; Webb et al. 1966). Among the subsequent empirical demonstrations of some of the underlying principles were the studies by Ebbesen and Konečni: for example, of decisions under risk (in automobile driving; e.g., Ebbesen et al. 1977; Konečni et al. 1976) and of key decisions by judges, prosecutors, and other participants in the criminal justice system (Konečni & Ebbesen 1982b). An important aspect of this work has been the mustering

of the theoretical and empirical support for the idea of *validated simulations* in behavioral science (Konečni & Ebbesen 1992).

Among the judicial decisions studied in this research program were those of the setting of bail and, especially, the sentencing of felons (e.g., Ebbesen & Konečni 1975; Konečni & Ebbesen 1982a). This work utilized both WEIRD and non-WEIRD samples (as in the fourth “telescoping contrast” in Henrich et al.; see sect. 6) and supports the target article’s skepticism. Moreover, a more general, but logical, extension is to question the applicability of WEIRD-based findings regarding aggressiveness, retribution, fairness and equity, and moral reasoning in general (cf. sect. 4.4.) to *international law*. Here the most troubling possibility is the deliberate or unconscious incorporation of WEIRD-based findings into the normative expectations held by international bodies in “cognitively distant” war-torn areas – such as in Rwanda by the United Nations Assistance Mission for Rwanda and the International Criminal Tribunal for Rwanda. What must be very carefully taken into account are not only the enormous complexities of ancient tribal relations, but also those stemming from massive religious conversions by some of the warring parties under an external oppressor (as in Bosnia and Herzegovina, another internationally adjudicated conflict).

In sum, there is far more to external validity than the unrepresentativeness of samples. The only truly solid reason to trust an experimental simulation (especially one that potentially involves enormous human costs) is to have had it validated by means of careful successive approximations to the real world, each step moving closer to the actual real-world phenomenon – not just with different participant samples, but also guided by a multi-method X multi-dependent-measure matrix (Konečni & Ebbesen 1992).

Some additional observations are in order. Just as *Nature Genetics* requires all empirical papers to include data from two independent samples (target article, sect. 6.2, para. 3), the *Journal of Personality and Social Psychology*, for example, might begin to require not just the use of at least two different methods in the laboratory, but also both laboratory and field research – *before* researchers move away from psychology freshmen. If this were required, it seems likely that some “cute,” supposedly counterintuitive, task-specific effects (including in the area of heuristics and biases) would not be replicated even with different WEIRD samples. I am not as favorably disposed as Henrich et al. apparently are to Mook’s (1983) idea that the use of WEIRD samples is justified “when seeking existential proofs” (sect. 7.1.6, para. 1); nor to the authors’ admittedly clever idea of setting up research facilities in bus terminals and airports to capture non-university participants (sect. 7.3, para. 6) – if the same old suspect methods, such as “reactive” questionnaires and games with trivial pay-offs, would continue to be used.

Henrich et al. believe that behavioral scientists’ tendency to claim “universality” for data obtained with WEIRD participants may in part be due to so many researchers themselves being WEIRD (sect. 7.1.1, para. 8). This fact may also be partly responsible for researchers’ relative reluctance to worry adequately about external validity and about the effects of complex higher-order interactions among type of participants, methods, and settings. A sustained interest in such interactions may require a *contextual* (“field-dependent”) worldview and a holistic reasoning style that is (according to Henrich et al.) less utilized by WEIRD people, who favor analytical reasoning.

When nurture becomes nature: Ethnocentrism in studies of human development

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Abstract: This commentary will extend the territory claimed in the target article by identifying several other areas in the social sciences where

findings from the WEIRD population have been over-generalized. An argument is made that the root problem is the ethnocentrism of scholars, textbook authors, and social commentators, which leads them to take their own cultural values as the norm.

I am grateful to the authors of the target article for illuminating this very serious problem in the social and behavioral sciences. I also have written critically on the issue, but without the courage to fully assert the fundamental weirdness of researchers’ favorite subjects. I will add to Henrich et al.’s catalog by briefly reviewing several areas where the WEIRD tribe can be shown to be extreme outliers.

Culture and cognitive development. The best known model of cognitive development originated with the Swiss biologist, Jean Piaget. He derived his theory largely on his observations and interactions with his own very brainy and sophisticated children (Vidal 1994). As Piaget (and colleagues) tested his propositions, subjects were largely drawn from the same milieu of middle-class European society. Piaget led the vanguard but a veritable army of cognitivists followed in his wake. The models that emerged were rooted entirely in research with children from the WEIRD tribe. Had these scholars delved into the anthropological literature, particularly with respect to the cognitive processes implicated in native belief systems, they might have paused to consider the implications. Indeed, Alexander Luria, close colleague of Lev Vygostsky, traveled to Central Asia in the 1930s and easily discovered alternative patterns of thinking in the reasoning of Uzbek peasants (Luria 1976).

Later, researchers working in West Africa (Dasen et al. 1978; Greenfield 1966) and Papua New Guinea (PNG) (Kelly 1971) sought to test these theoretical ideas about children’s cognitive development outside the West and found that they didn’t hold up very well, especially beyond early childhood. As Luria had earlier shown, scholars were finding that cognitive “development” was driven by exposure to modern institutions – schooling, in particular – rather than reliably erupting, like second molars (Cole et al. 1971). Others succeeded in showing very specific connections between cultural practices and cognitive skill (Price-Williams et al. 1969). Somewhat later in PNG, the typical two-culture (WEIRD vs. “other”) comparison was broadened to systematically assess cognition in a variety of societies with varying subsistence patterns and degrees of acculturation (Lancy 1983). These studies revealed that the patterns of cognitive behavior in the WEIRD population were uncommon compared to preferred local alternatives (Lancy & Strathern 1981).

Culture and children’s social behavior. Social psychologist Millard Madsen began with the premise that Western middle-class children were markedly *different*. He devised a series of ingenious, game-like devices that unambiguously revealed whether a child was disposed towards a competitive or cooperative stance. In his initial work, he found that subjects in the United States made only competitive moves in the game (which only rewarded *cooperative* moves), whereas children from a Mexican village made only cooperative moves. Replicated in numerous other societies, the studies revealed U.S. children as outliers, being much more competitive than children from other societies (Madsen 1971). Further cross-cultural variation was neatly predicted by the child’s social circumstances, so village kids were found to be more cooperative than urban kids, for example. In the highlands of PNG, Melpa children from warring clans were less cooperative than pairs from the same or allied clans (Lancy & Madsen 1981).

Culture and parent-child interaction. The problem identified by Henrich et al. arises, I believe, from a (likely universal) ethnocentrism. Contemporary orthodoxy regarding child development and child-rearing can turn nurture into nature. The way WEIRD parents raise their children becomes more than just the current fashion, it becomes “natural,” rooted in the phylogeny or history of the species. This can be quickly illustrated.

Working among the Gusii of Kenya, LeVine (2004) has raised doubts about widely accepted tenets of the theory of infant attachment. Like many, if not the majority of mothers throughout