

REPLY TO JACQUET ET AL.:

# Culture and the neurobiology of norm violation detection

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We fully agree with Jacquet, Baumard, and Chevallier (JBC) (1) that one must be cautious in interpreting cross-cultural data. However, none of the specific methodological points they make are warranted and their characterization of our theoretical perspective on cultural neuroscience is misinformed.

JBC suggest some specific confounds that might compromise our work (2). Their caution is not new; cross-cultural psychologists have long argued that one must take precautions in conducting research in different geographical locations so as to be able to infer cultural differences (3). Heeding this advice, we had the same experimenter run the study, selected and piloted the materials extensively, and used the same acquisition parameters and analysis flows in both countries. Importantly, we included controls to show that there would not be cultural differences on certain nonsocial violation domains (i.e., semantic violation). If technical differences in acquisition systems were driving cultural differences in the social norm violation task, they could not explain why we found no cultural differences, as we predicted, on the other semantic violation task. Moreover, they cannot explain how cultural differences in the social norm N400 could predict many theorized attitudes and behaviors.

JBC's question on the comparability of the two cultural groups is also unwarranted. Our samples were matched on age, gender, and education. In addition, controlling for socioeconomic status does not affect our N400 results. By contrast, our samples differed on many cultural beliefs and attitudes as expected, including perceived tightness, ethnocentrism, importance of territorial

defense, and creativity, which were related in expected ways to the neural detection of social norm violations.

JBC point out the possibility of some specific domains where the United States is tighter and China is looser (e.g., smoking) and use this to cast doubt on our general thesis. However, our results apply across a very wide range of behaviors (e.g., singing or talking) and situations (e.g., library or bus) that are common in both cultures. Because any group-level features are stochastically distributed within each group, any group-level differences can come with some small number of exceptions at the level of specific instances. One simply cannot use the exceptions to deny the overall group-level differences that are demonstrated. Similarly, JBC's concern of alpha inflation is unwarranted, because we corrected for this using a cluster-based approach (ref. 2, *Materials and Methods*, p. 15353).

Finally, JBC attribute to us a position that brain responses reflect essentialist characteristics of cultural groups. We strongly oppose this attribution. In fact, we have argued that much of cultural variation in brain responses is mediated by plastic changes of connectivity of the brain that result from individuals' active participation in cultural practices (4, 5). These culture-specific responses are thus adaptations to specific geoeological conditions (6–8).

In sum, JBC's specific methodological comments are unwarranted, and they portrayed a distorted view of our theoretical position. Our research illustrates that neuroimaging is indeed a potent means by which to investigate the nature of cultural influences on mental processes.

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