

Brain activity reveals how detecting violations of social norms varies between cultures

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Credit: Human Brain Project

(Medical Xpress)—Social norms are a fundamental characteristic of human behavior, and they vary across cultures in interesting ways. It's even been suggested that the development of social norms and the

punishment of norm violations are a uniquely human behavior. However, little research into the neural basis for the detection of social norm violations has been conducted to date.

From an adaptive perspective, the ability to detect violations of [social norms](#) may be critical for survival. Groups that have experienced outside threats and periods of resource scarcity develop stronger norms and harsher punishments for infractions in order to coordinate a social response to crisis. China is one example of a society with strong social norms. By contrast, groups in conditions of relatively low threat, such as the population of the United States, develop looser norms with more tolerance for deviations. Interestingly, "loose" societies tend to permit a higher degree of creativity, while "tight" societies prefer orthodox or conventional responses to problems.

A good deal of neurological research exists on other kinds of norm violation detection, such as linguistic/semantic violations, e.g., "She ordered a plate of spaghetti and footballs." Existing studies of such detections using EEG have reported a negative-going deflection with a peak at ~400 ms after detecting an unexpected linguistic stimulus. This component is referred to as N400. Additionally, N400 effects have been observed in response to other non-semantic detection activities, and it is considered to be a reliable index for the detection of surprising, anomalous stimuli and social incongruence.

A group of researchers in the U.S. and China collaborated recently on a small study, reported in the *Proceedings of the National Academy of Sciences*, testing their hypothesis that the N400 is an index for norm violation detection and that its amplitude in response to social norm violations would be greater in people from "tight" societies than those from "loose" societies.

They recruited 29 subjects from China and 29 from the U.S. They

observed the EEG responses of the subjects to videos depicting 34 behaviors, such as dancing, in three situations which were either strongly inappropriate, such as an art museum; weakly inappropriate, such as a subway platform; or appropriate, such as a tango class. The "appropriate" condition was the control condition, which allowed the researchers to compare the neural reactions to norm violations.

The researchers determined that the Chinese participants identified more behaviors as strongly inappropriate than the U.S. participants. However, they found no differences between U.S. and Chinese participants for the "appropriate" stimuli, validating it as a useful control condition for the study.

The authors noted that both sets of participants expressed N400 effects at the central and parietal [brain](#) regions, suggesting that this component is recruited equally for norm detection in both cultures. However, only the Chinese group exhibited N400 at the frontal and temporal regions. The authors note, "One conjecture might be that, whereas both Americans and Chinese are equally likely to detect discrepancies between an observed behavior and the behavior normatively expected (as revealed in the centro-parietal N400), only Chinese go beyond the expected norm violation to infer the mental state of the person violating the norms. Recent cross-cultural research has shown that Chinese are much more tuned into others' perspectives than Americans, which lends some support to that notion."

They suggest that further research into social norm violation detections using fMRI would advance the knowledge of the neurological basis for social behaviors and social coordination.

More information: How culture gets embrained: Cultural differences in event-related potentials of social norm violations. *PNAS* 2015 ; published ahead of print November 30, 2015, [DOI](#):

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Abstract

Humans are unique among all species in their ability to develop and enforce social norms, but there is wide variation in the strength of social norms across human societies. Despite this fundamental aspect of human nature, there has been surprisingly little research on how social norm violations are detected at the neurobiological level. Building on the emerging field of cultural neuroscience, we combine noninvasive electroencephalography (EEG) with a new social norm violation paradigm to examine the neural mechanisms underlying the detection of norm violations and how they vary across cultures. EEG recordings from Chinese and US participants ($n = 50$) showed consistent negative deflection of event-related potential around 400 ms (N400) over the central and parietal regions that served as a culture-general neural marker of detecting norm violations. The N400 at the frontal and temporal regions, however, was only observed among Chinese but not US participants, illustrating culture-specific neural substrates of the detection of norm violations. Further, the frontal N400 predicted a variety of behavioral and attitudinal measurements related to the strength of social norms that have been found at the national and state levels, including higher culture superiority and self-control but lower creativity. There were no cultural differences in the N400 induced by semantic violation, suggesting a unique cultural influence on social norm violation detection. In all, these findings provided the first evidence, to our knowledge, for the neurobiological foundations of social norm violation detection and its variation across cultures.

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