Do we think that machines can think?

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When our PC goes on strike again we tend to curse it as if it was a human. The question of why and under what circumstances we attribute human-like properties to machines and how such processes manifest on a cortical level was investigated in a project led by Dr. Sören Krach and Prof. Tilo Kircher from the RWTH Aachen University (Clinic for Psychiatry and Psychotherapy) in cooperation with the Department of "Social Robotics" (Bielefeld University) and the Neuroimage Nord (Hamburg). The findings are published July 9 in the online, open-access journal *PLoS ONE*.

Almost daily, new accomplishments in the field of human robotics are presented in the media. Constructions of increasingly elaborate and versatile humanoid robots are reported and thus human-robot interactions accumulate in daily life. However, the question of how humans perceive these "machines" and attribute capabilities and "mental qualities" to them remains largely undiscovered.

In the fMRI study, reported in PLoS ONE, Krach and colleagues investigated how the increase of human-likeness of interaction partners modulates the participants' brain activity. In this study, participants were playing an easy computer game (the prisoners' dilemma game) against four different game partners: a regular computer notebook, a functionally designed Lego-robot, the anthropomorphic robot BARTHOC Jr. and a human. All game partners played an absolutely similar sequence, which was not, however, revealed to the participants.

The results clearly demonstrated that neural activity in the medial

prefrontal cortex as well as in the right temporo-parietal junction linearly increased with the degree of "human-likeness" of interaction partners, i.e. the more the respective game partners exhibited human-like features, the more the participants engaged cortical regions associated with mental state attribution/mentalizing.

Further, in a debriefing questionnaire, participants stated having increasingly enjoyed the interactions most when their respective interaction partners displayed the most human features and accordingly evaluated their opponents as being more intelligent.

This study is the first ever to investigate the neuronal basics of direct human-robot interaction on a higher cognitive level such as mentalizing. Thus, the researchers expect the results of the study to impact long-lasting psychological and philosophical debates regarding human-machine interactions and especially the question of what causes humans to be perceived as human.

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