Diffusion of Responsibility in Human-Robot Teams

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As people tend to interpret the reason for events in a self-esteem-enhancing manner, success is attributed to internal factors and failure to external factors (Miller & Ross, 1975). The perceived *Sense of Agency* (SoA) refers to that assumed connection between an individual's own actions and external events, i.e., how oneself feels responsible for an outcome. This feeling is reduced by the presence of others, which results in *diffused feelings of responsibility*. Regarding joint actions, it is assumed that failure results in a stronger reduced SoA than success.

When individuals are about to work on shared tasks in teams with robots, it is of great interest to understand how responsibility is distributed. So far, Ciardo, Tommaso, Beyer and Wykowska (2018) demonstrated that reduced SoA was reported by subjects who successfully completed a joint task with a robot. However, they did not consider how SoA was affected if the joint task fails. The present work thus aims to investigate how failure influences feelings of responsibility when working in a team with a robot.

Furthermore, we were interested how the appearance of a robot impacts *perceived responsibility*. It has been demonstrated that more anthropomorphic looking robots are perceived as more intelligent and sympathetic (Hegel, Krach, Kircher, Wrede & Sagerer, 2008). Also, robots with more human-like features, such as a head, are regarded as more capable to understand human behavior (Hoffmann, Bock & Rosenthal-v.d. Pütten, 2019). In addition, Wiese, Weis, Bigman, et al. (2021) showed that the fit between the task and the human-likeness of the robot leads to a higher willingness to interact with the robot. Conclusively, we assume that working together with a highly human-like robot reduces responsibility for a failed task stronger than working with a less human-like robot. Moreover, we assume that the nature of the task affects SoA as well.

To test these assumptions, we conducted an online-experiment with the robot's human-likeness (with/without head), and the nature of the task (rational/social) as between-subjects factors, resulting in a 2x2 design.

To realize sort of a human-robot interaction experience online, participants were asked to imagine applying for a job where they are about to work in a team with a robot. As a recruitment test, participants had to solve one tests together with the robot: either a rational (calculation of invoice amounts) or a social one (emotion recognition in faces). The robot (Softbank's Pepper) was introduced by means of a video recording in which it introduced itself. For a controlled manipulation of human-likeness, the robot was displayed with or without its head. After each task, the result was presented as a team score to leave room for interpretation who is to blame for the result. Regardless of the performance, all participants received a poor team rating indicating failure. Participants were then asked to rate their perceived SoA and attributed credit and blame. In addition, we measured the perceived human-likeness of the robot, as well as demographics, prior experiences with robots and participants' control believes as control variables.

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