The Role of Adaptivity in Human-Robot Collaboration: A Field-in-the-Lab Experiment*

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Abstract

Artificial intelligence (AI) and sensor technology have made collaborative robots (cobots) more relevant in the industry. Thus, understanding human-cobot interaction in contrast to human-human interaction is vital, as cobots become more adaptive to worker behaviour and needs. We conducted a 'field-in-the-lab' experiment in a realistic production environment. In all treatments, there was a human Worker 1 at Station 1 in a two-station production line. We varied whether Worker 2 at Station 2 was a human or a robot. The teams produced electronic motor components, and Worker 1 could submit intermediate products to Worker 2 or a 'waiting queue.' All components that completed the queue or were finished by Worker 2 increased the team payoff. We classified Worker 1's production speed as 'high' (H), 'medium' (M), or 'low' (L). Matching this speed, in the 'adaptive' treatments, the robotic Worker 2 was set to speed H>M>L, the human Worker 2 received productivity feedback H>M>L, or received the piece rate H>M>L. After the production round, Worker 1 could make an incentivised statement about who is responsible for the production result. We find strong robot aversion: More intermediate products were sent to the waiting queue in the robot as compared to the human treatments. We also find more statements shifting responsibility to Worker 2 in the robot as compared to the human treatments. Adaptivity increased productivity and mildly reduced robot aversion. It also reduced the responsibility shifts to the robots, but this reduction was not statistically significant. This study has important implications for using cobots and can inform the adaptive design of effective human-robot collaboration, which can enhance workplace productivity.

Keywords: robots, responsibility, algorithm aversion

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