

# Persuasive Robots Can Help Save Energy: The Influence of the Agency of a Robot on Its Power to Influence Sustainable Behavior

J. Ham, & C. Midden

*Eindhoven University of Technology, Eindhoven, the Netherlands*

Earlier research indicates that artificial social agents can persuade people to save energy. However, artificial social agents are not real humans, and people may ascribe different amounts of agency to them. Would the persuasive power of a social robot diminish when people ascribe only little agency to it? We propose that two theoretical perspectives on human-computer interaction provide different predictions: social agency theory (Mayer et al., 2003) would argue that more cues of social agency lead to a more social interaction. Thus, conscious knowledge about the agency of a robot (e.g., knowing that a robot intends its own actions or behaves randomly) should lead to a more social interaction in which persuasion (a social process) has stronger impact. In contrast, based on the media equation (Nass & Reeves, 1996), we would argue that people's responses to robots will be comparable to how they respond to other humans, and that these responses are mainly automatic in nature such that conscious knowledge about the agency of the robot has only little influence. To investigate this question, we performed an experiment in which participants performed tasks on a washing machine and received feedback from a robot about their energy consumption (e.g., "Your energy consumption is too high"), or factual, non-social feedback. This robot was introduced to participants as (a) an avatar (a human completely controlled all its feedback actions), or as (b) an independent robotic agent (that controlled all its own feedback actions), or as (c) a robot that performed only random behavior (that gave only random feedback). Also, to assess participant's conscious agency judgments, participants interacting with a robot filled out

a series of questions about the agency of that robot. Results indicated that participants consumed less energy when a robot gave them feedback than when they received factual feedback, independent of robot agency. In contrast, a separate agency measure indicated that the random feedback robot was ascribed the lowest agency ratings. This finding indicates that, at least on a conscious level, people were aware that the random feedback robot had less agency than the other two robots. However, notwithstanding this awareness of diminished agency, results did not provide evidence that the influence the utterances of each of the three robots on participants energy consumption choices differed. In all, these results suggest that the persuasive power of robot behavior is independent of consciously ascribing agency to a robot. Thereby, the current results provide us with more insight in the cognitive processes of persuasion by technology. As technology is omnipresent in the environment of people, these findings are of core relevance to the research area of environmental psychology. In line with the media equation hypothesis (Nass & Reeves, 1996), the current results suggest direct evidence that these cognitive processes of persuasion by technology are unconscious in nature. That is, on a conscious level, our participants were aware that specifically the random feedback robot had lower agency than the other two robots, and understood that it did not intend to give the feedback it gave (indeed the feedback was random feedback). However, these results suggest that independent of this conscious knowledge, the persuasive behavior of the robots remained effective, and thereby that its influence was unconscious and automatic in nature.