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Botsourcing and Outsourcing: Robot, British, Chinese, and German Workers Are for Thinking—Not Feeling—Jobs

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Technological innovations have produced robots capable of jobs that, until recently, only humans could perform. The present research explores the psychology of "botsourcing"—the replacement of human jobs by robots—while examining how understanding botsourcing can inform the psychology of outsourcing—the replacement of jobs in one country by humans from other countries. We test four related hypotheses across six experiments: (1) Given people's lay theories about the capacities for cognition and emotion for robots and humans, workers will express more discomfort with botsourcing when they consider losing jobs that require emotion versus cognition; (2) people will express more comfort with botsourcing when jobs are framed as requiring cognition versus emotion; (3) people will express more comfort with botsourcing for jobs that do require emotion if robots appear to convey more emotion; and (4) people prefer to outsource cognition- versus emotion-oriented jobs to other humans who are perceived as more versus less robotic. These results have theoretical implications for understanding social cognition about both humans and nonhumans and practical implications for the increasingly botsourced and outsourced economy.

Keywords: human-computer interaction, mind perception, anthropomorphism, outsourcing, emotion

During the American economic downturn, a *New York Times* editorial entitled, "How Did the Robot End up With My Job," described the replacement of human jobs with machines as a primary cause of unemployment (Friedman, 2011). Five days earlier, a similar editorial, "Will Robots Steal Your Job?", warned of a forthcoming "robot invasion" in the workplace (Manjoo, 2011). More generally, as technology advances, so too do concerns about a "workerless world," where robotic employment eliminates millions of jobs (Rifkin, 1995) and slows job recovery (Lyons, 2011; Sachs & Kotlikoff, 2012). The increasing use of robots in the workplace and the resulting job competition between humans and machines has shifted attention from the impact of outsourcing to the impact of botsourcing: shifting jobs not to human workers in another country, but from humans to robots. Our research addresses this issue, exploring how perceptions of robots as human impact perceptions of botsourcing jobs to robots and then uses these insights to inform how perceptions of humans from different countries as more or less robotic impact attitudes toward outsourcing jobs to those humans.

We use the *Oxford English Dictionary*'s definition of *robot*—"an intelligent artificial being typically made of metal and resembling in some way a human or other animal"—and define *botsourcing* as the use of robots or robotic technology to replace human workers. Although botsourcing has historically been associated with jobs in industrial domains such as factories, botsourcing is rapidly emerging in domains ranging from service to therapy to warfare (Friedman, 2011; Gates, 2007). This changing environment raises issues that the present research attempts to address: how people respond to botsourcing—including when botsourcing threatens their own jobs—and what factors might increase acceptance of this practice.

Addressing these questions requires answering, "What does it means to be human?" Research suggests two general categories of capacities that people consider essential to "humanness": agency—the capacity for thought and intention—and experience—the capacity for feeling and emotion (Gray, Gray, & Wegner, 2007; Knobe & Prinz, 2008; Robbins & Jack, 2006; see Haslam, 2006 for a parallel conceptualization of humanness). Although people consider some entities (e.g., God) to be high-agency/low-experience and other entities (e.g., dogs) to be high-experience/low-agency, adult humans appear to be the only entities that people consider to have high agency *and* experience (Gray et al., 2007). Agency and experience also conceptually map on to the two primary dimensions of social perception: competence and warmth (Fiske, Cuddy, Glick, & Xu, 2002; Gray, Young, & Waytz, 2012). As Heflick, Goldenberg, Cooper, and Puvia (2011, p. 573) note, the "view of warmth and competence as humanizing is consistent with research on the characteristics people use to describe the human mind, . . .experience and agency." Just as people use these dimensions in a different business context to evaluate brands (Aaker, Vohs, & Mogilner, 2010), the present research shows that people use similar dimensions to evaluate the humanness of robots (see also Powers & Kiesler, 2006).

Although agency/experience and competence/warmth are not identical constructs, their key similarities offer a distinction between two factors that we propose are crucial in predicting peo-

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ple's comfort with botsourcing. To avoid conceptual confusion, we use the more standard terms *emotion* and *cognition*—core elements of experience (warmth) and agency (competence), respectively—for the remainder of this article.

Although emotion and cognition both represent core humanness dimensions, emotion appears to have priority in people's judgments of what is human. Historical definitions of personhood from Darwin's (1872, 1965) distinction between humans and animals to artificial intelligence research on creating believable, living agents (Bates, 1994) suggest that emotion is the essence of humanity. More important, recent research suggests that people perceive emotion to be more essential to humanness than cognition. For example, people implicitly associate emotion-related words (vs. cognition-related words) to a stronger degree with human stimuli versus nonhuman stimuli (Gray & Wegner, 2012). Analogous research on warmth (associated with emotion) and competence (associated with cognition) shows that people's warmth is judged more quickly (Willis & Todorov, 2006), identified more easily (Ybarra et al., 2001), and exerts greater weight in social evaluations (Wojciszke, Dowhyluk, & Jaworski, 1998). Other research has even shown that perceiving a car to be interpersonally warm increases humanization of that car and decreases willingness to replace the car (Chandler & Schwarz, 2010). Based on this research, it appears that perceived emotion, rather than cognition, primarily predicts judgments of an entity's humanness.

The primacy of emotion (vs. cognition) for judgments of humanness suggests that people might believe that only humans are capable of performing jobs that involve emotion (vs. cognition). Indeed, people associate *emotion* words such as *sociable* and *friendly* with words related to animals and words related to the job of an artist (an emotion-oriented job), but associate *cognition* words such as *organized* and *conservative* with words related to robots and words related to a businessperson (a more cognition-oriented job; Loughnan & Haslam, 2007). These findings suggest that people differentially associate these capacities—cognition and emotion—with different classes of jobs, and most important, that people associate robots with cognition-oriented jobs more than emotion-oriented jobs. Therefore, we predicted people would support botsourcing more for cognition- versus emotion-oriented jobs. In particular, workers should experience more threat and discomfort with botsourcing for emotion-oriented jobs—implying that humans are no longer needed even for these traditionally human jobs—than cognition-oriented jobs, which may appear appropriate for robots.

Of course, not all jobs that organizations seek to botsource can be purely cognition-oriented; the automation of customer service, for example, is a paradigmatic case of efforts to replace humans with robots in a job usually expected to require empathy and responsiveness. Indeed, when consumers use online self-service technologies (such as when searching for flights), they rate the service more positively to the extent that they see the service as working hard for them (i.e., sympathetic to their needs; Buell & Norton, 2011; see also Morales, 2005). We therefore predicted that when considering jobs that *do* typically require emotion, people would be more comfortable botsourcing to robots that appear capable of emotion versus cognition.

Overview

The present work has three aims: (1) to demonstrate that comfort with botsourcing increases for emotion- versus cognition-oriented jobs (2) to demonstrate inductions that increase people's comfort with botsourcing, and (3) to demonstrate that these findings have implications for judgments of human outsourcing. The first two aims address central issues to the rise in robot employment; we then use the insights from these two aims to inform our third aim, which demonstrates an implication for research on social cognition more broadly.

Experiments 1 and 2 assess opinions of actual workers toward their own jobs being botsourced to test whether their discomfort toward botsourcing increases when robots are described as being capable of performing emotion- versus cognition-oriented jobs. Experiments 3–5 document inductions to increase people's comfort with botsourcing, such as framing the very same job as requiring more cognition than emotion (Experiment 3) and to increase perceptions of robots as emotional—as conveyed in robots' external features (Experiments 4 and 5). Finally, Experiment 6 extends these findings into the domain of human outsourcing to demonstrate that perceptions of other *humans*' robotic nature affect preferences for outsourcing jobs to people from countries deemed more or less robotic.

Experiment 1

Given people's lay theories regarding attributions of emotion and cognition toward humans and robots, Experiment 1 tests the hypothesis that people will prefer botsourcing for cognition- versus emotion-oriented jobs. This experiment and Experiment 2 assess these preferences by asking Amazon Mechanical Turk (MTurk) workers to evaluate their comfort with robots replacing them for various tasks. MTurk is an online marketplace in which willing individuals can complete various tasks—called Human Intelligence Tasks (HITs)—for money. In addition to hosting experiments, MTurk hosts HITs ranging from evaluating advertising materials to generating a list of Bach compositions. As a result of this range, some jobs involve more emotion and some involve more cognition. We asked participants to report their attitudes regarding robotic computer programs replacing them for tasks of each type, predicting that participants would express more discomfort being replaced for emotion- versus cognition-oriented tasks (Experiment 1).

Method

Participants. One hundred three Americans (61 men, two unreported, M_{age} =27.00) participated in the experiment via MTurk for a small monetary reward and completed the experiment using Qualtrics software.

Procedure. Participants read that they would be answering questions about robot workers replacing them on MTurk. They were also told that MTurk HITs come in two types: thinking (cognition-oriented) or feeling (emotion-oriented). We described thinking tasks by stating, "Some of these HITs involve thinking, cognition, and analytical reasoning" as well as "problem-solving, thought-listing, and generating thoughts" that "require the capacity for thinking and the ability to be rational." We described feeling

tasks by stating, "Some of these HITs involve feeling, emotion, and emotional evaluation" as well as "emotion processing, feeling-listing, and generating feelings" that "require the capacity for feeling and the ability to be emotional."

Participants then rated four statements for each task type with the word "feeling" replaced with "thinking" (1 = *strongly disagree*, 7 = *strongly agree*): "Outsourcing feeling tasks to robots . . . 'concerns me,' 'disturbs me a great deal,' 'poses a threat to me,' (all reverse-coded), and 'is a good idea.' " Averaging the four items for emotion-oriented and cognition-oriented tasks separately (αs $> .71$) produced composite scores for comfort with botsourcing.

Results

Workers experienced more comfort with botsourcing of cognition-oriented tasks ($M = 3.17$, $SD = 1.38$) than with botsourcing of emotion-oriented tasks ($M = 2.57$, $SD = 1.14$), $t(102) = 5.76$, $p < .0001$, $d = 1.06$. This finding suggests that when workers are faced with the prospect of their own jobs being botsourced, they experience more threat and discomfort with botsourcing for emotion-oriented versus cognition-oriented tasks.

Experiment 2

Experiment 2 asks separate groups of workers either to report their opinions toward botsourcing when their own jobs are described in emotion-oriented terms or to report their opinions toward botsourcing when their own jobs are described in cognition-oriented terms. Experiment 2 builds on Experiment 1 in several ways. Experiment 1 asked the same participants to evaluate their comfort with being replaced by robots in jobs requiring cognition *and* to evaluate their comfort with being replaced by robots in jobs requiring emotion, whereas Experiment 2 holds participants' work constant and manipulates whether that work is described as more cognition-oriented (for some participants) or emotion-oriented (for other participants). This experiment tests whether simply using different frames to describe the same jobs alters perceptions and preferences for botsourcing. Finally, Experiment 1 uses a within-subjects design, which may introduce demand effects by heightening the salience of the differences between jobs, whereas Experiment 2 uses a between-subjects design in order to test whether our effects emerge without as salient a comparison. As in Experiment 1, we predicted that workers who evaluated work described in cognition-oriented terms would support botsourcing more than workers who evaluated their work described in emotion-oriented terms.

Method

Participants. Two hundred sixty-six Americans (167 men, one transgender, seven unreported, $M_{age} = 26.49$) participated via MTurk as in Experiment 1.

Procedure. Participants read instructions similar to those in Experiment 1 and were randomly assigned to the emotion or cognition condition. In the emotion condition, participants were told that particular HITs for emotion-oriented tasks (worded as in Experiment 1) are currently being outsourced, whereas in the cognition condition, participants were told that particular HITs for cognition-oriented tasks (worded as in Experiment 1) are currently being outsourced. Then, participants in both conditions evaluated three statements (1 = *strongly disagree*, 7 = *strongly agree*) that assessed comfort with botsourcing, modified to include the term "feeling" or "thinking" based on condition: "Outsourcing these thinking tasks to robots . . .'will be effective,' 'is a great idea,' and 'is unwise,' " (reverse coded). Averaging these items produced a composite score for comfort with botsourcing ($\alpha > .79$).

Results

Workers who reflected on botsourcing for cognition-oriented tasks ($M = 2.39$, $SD = 1.19$) expressed more comfort than those who reflected on botsourcing for emotion-oriented tasks ($M = 1.75$, $SD = 0.96$), $t(264) = 4.82$, $p < .0001$, $d = 0.59$. This finding demonstrates that, as in Experiment 1, workers are more comfortable with the botsourcing of their own jobs when focusing on their job as consisting of cognition versus emotion. Expanding on Experiments 1 and 2, the subsequent experiments test inductions to increase support for botsourcing.

Experiment 3

Experiment 3 introduces a means for decreasing resistance to botsourcing, testing whether merely *framing* a job as requiring cognition versus emotion increases support. We expected people to be more comfortable replacing humans with robots when jobs were framed to require cognition than to require emotion.

Method

Participants. Fifty-four Americans (20 men, 4 unspecified, $M_{age} = 35.44$) participated via MTurk as in Experiment 1.

Procedure. All participants evaluated six jobs (heart surgeon, math teacher, computer programmer, accountant, reference librarian, and translator) in one of two conditions. In Condition A, the heart surgeon, computer programmer, and reference librarian job were described as involving emotion, whereas the three other jobs were described as involving cognition. Condition B simply reversed which jobs were described as involving emotion and cognition (see Appendix A). Thus, each participant read about three emotion-oriented jobs and three cognition-oriented jobs, with job held constant. For each job, participants answered three questions (1 = *not at all*, 7 = *very much*): "How much thought does the job require?" (a measure of perceived cognition required), "How much feeling does this job require?" (a measure of perceived emotion required), and "How comfortable would you be with robots replacing humans at this job?" (a measure of comfort). We computed *comfort-with-robot* ($\alpha > .76$), *emotion* ($\alpha = .68$), and *cognition* ($\alpha > .76$) scores for each job type by averaging scores for all emotion-oriented jobs and all cognition-oriented jobs separately.

Results

Mixed 2 (Condition: A or B) $\times$ 2 (job type: emotion- vs. cognition-oriented) analyses of variance revealed that people judged emotion-oriented jobs ($M = 4.73$, $SD = 1.41$) versus cognition-oriented jobs ($M = 3.99$, $SD = 1.20$) to require more emotion, $F(1, 52) = 15.43$, $p < .0001$, $\eta_p^2 = .23$, and cognition-oriented jobs ($M = 6.22$, $SD = 0.79$) versus emotion-oriented jobs

($M = 6.04$, $SD = 0.88$) to require more cognition, $F(1, 52) = 4.61$, $p < .05$, $\eta_p^2 = .08$.

Most important, participants again expressed more comfort replacing humans with robots for cognition-oriented jobs ($M = 4.01$, $SD = 1.32$) versus emotion-oriented jobs ($M = 3.34$, $SD = 1.67$), $F(1, 52) = 12.41$, $p = .001$, $\eta_p^2 = .19$ (*t* tests comparing *emotion, cognition, and comfort* across job type produced the exact same results; all *p*s $< .05$). No main effect of condition (all *p*s $> .25$) and no interaction (all *p*s $> .16$) emerged in any analyses. This lack of conditional effects suggests that regardless of job, participants were more comfortable with botsourcing jobs that were presented as requiring cognition versus emotion.

Because participants' perceptions of the emotion required for jobs are distinct from whether we designed jobs to require more emotion (Zhao, Lynch, & Chen, 2010), we tested whether differences in perceived emotion required mediated the relationship between job type and differences in comfort with botsourcing. Our independent variable was condition, coded as 1 for Condition A (where heart surgeon, computer programmer, and reference librarian were described in emotion-oriented terms), and 0 for Condition B (where math teacher, accountant, and translator were described in emotion-oriented terms). Our mediator in this case was the difference score of perceived emotion between jobs of each type. To compute this score for each participant, we averaged the emotion score for math teacher, accountant, and translator and subtracted this from the average emotion score for heart surgeon, computer programmer, and reference librarian. Our dependent variable was the difference score of comfort with botsourcing between jobs of each type. To compute this score for each participant, we averaged the comfort score for math teacher, accountant, and translator and subtracted it from the average comfort score for heart surgeon, computer programmer, and reference librarian. These emotion difference scores and comfort difference scores differed from 0 in the predicted direction. That is, for participants in Condition A, we found positive difference scores for emotion and negative difference scores for comfort ($M = .63$, $SD = 1.10$), $t(28) = 3.09$, $p = .005$, $d = .57$; $M = -.41$, $SD = 1.22$, $t(28) = 1.83$, $p = .078$, $d = .34$, demonstrating that these participants evaluated emotion-oriented jobs as higher on emotion and expressed lower comfort with botsourcing such jobs. For Condition B, the pattern was mirrored, with negative difference scores for emotion and positive difference scores for comfort ($M = -.88$, $SD = 1.71$), $t(24) = 2.58$, $p < .02$, $d = .51$; $M = .96$, $SD = 1.64$, $t(24) = 2.92$, $p < .01$, $d = .59$, demonstrating these participants also evaluated emotion-oriented jobs as higher on emotion and expressed less comfort with botsourcing such jobs.

We demonstrated mediation through bootstrapping analysis (Preacher & Hayes, 2008; 20,000 resamples). This analysis confirmed that condition—which counterbalanced job type—indirectly affected people's comfort with botsourcing for emotion- versus cognition-oriented jobs through an increased perception of the emotion required for emotion- versus cognition-oriented jobs (95% confidence interval = -1.38 to $-.37$; see Figure 1). In other words, descriptions of jobs that varied by condition produced expected differences in comfort with outsourcing for emotion- versus cognition-oriented jobs, and these differences were explained by differences in perceived emotion required for these jobs. These findings replicate and extend the results of Experiments 1 and 2: even when holding the actual job constant, participants were more willing to replace humans with robots for jobs framed as requiring thought versus emotion.

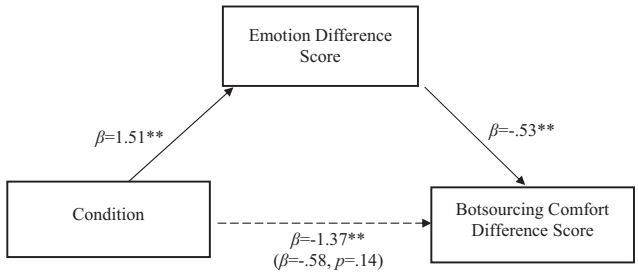

Figure 1. Bootstrapping analysis showing expected differences in comfort with outsourcing for emotion- versus cognition-oriented jobs. Conditions are coded as 1 and 0. ** $p \leq .01$.

Experiment 4

Experiment 3 offers one means of increasing support for botsourcing: framing jobs as requiring cognition. Some jobs, however, are strongly emotional in nature (Grant, 2007)—such as robot therapists that teach social interaction skills to autistic children (Robins, Dautenhahn, Te Boekhorst, & Billard, 2005). To assess whether support for botsourcing such emotion-oriented jobs can be increased, Experiment 4 focuses on features of the robot rather than the job, testing whether people will express greater comfort with botsourcing for a robot that appears capable of emotion versus cognition.

Method

Participants. One hundred fifty-three Americans (85 men, M_{age} =32.12) participated via MTurk as in Experiment 1.

Procedure. Participants viewed two robots depicted with facial attributes that, based on previous research, conveyed emotion (Robot W) and cognition (Robot C), respectively (Powers & Kiesler, 2006; see Appendix B). Robot W's face includes "baby-faced" features (e.g., small chin, wide eyes), whereas Robot C's face includes more mature and masculine features, known to increase attributions of traits related to emotion and cognition, respectively (Berry & McArthur, 1985; Oosterhof & Todorov, 2008).

Upon viewing the faces, participants selected Robot W or Robot C for five forced-choice questions (order randomized). As manipulation checks, participants answered, "Which robot is more capable of thought?" (assessing cognition) and "Which robot is more capable of feeling?" (assessing emotion). Most central to our hypothesis, participants answered, "Which robot would you feel more comfortable replacing humans with—for jobs such as a therapist, a social worker, or a preschool teacher?" (Pilot testing confirmed people saw these jobs as *emotion-oriented*.) We also assessed evaluations of warmth and competence, not discussed here.

Results

Binomial tests confirmed that 62% of participants considered Robot W to be more emotional than Robot C ($p = .001$), and 63%

also judged Robot C to be more cognitive than Robot W ($p<.01$). Most important, 59% of participants reported more comfort with the emotional robot for replacing humans in their jobs ($p < .04$). These results suggest that mere appearance alone can affect botsourcing preferences.

For completeness in exploring the effects of robot design, a follow-up experiment tested whether people prefer robots that appear capable of cognition for cognition-oriented jobs. One hundred forty-two Americans (91 men, $M_{age} = 28.49$) participated in an experiment nearly identical to Experiment 4, except that the question about comfort with botsourcing emphasized cognition-oriented jobs: "Which robot would you feel more comfortable using to replace humans in jobs such as a data analyst, engineer, or computer programmer?" (pilot testing confirmed people saw these jobs as cognition-oriented). Binomial tests again confirmed that 68% of participants considered Robot W to be more emotional than Robot C, ($p < .0001$), 63% judged Robot C to be more cognitive than Robot W, ($p < .01$), and 63% of participants reported more comfort with botsourcing using the cognitive robot ($p < .01$). Again, these findings demonstrate that people distinguished between the emotional and cognitive robot based on appearance alone. Taken together with Experiment 4, these results suggest that mere design features of robots can significantly influence people's feelings toward botsourcing, depending on the nature of the job. Just as people prefer more cognitive- versus emotion-based decision styles for complex- versus simple-choice tasks, respectively (Inbar, Cone, & Gilovich, 2010), so too do they seek to match the nature of the robot with the task it is to perform.

Experiment 5

Recent research suggests that when robots convey emotion, they evoke discomfort (Gray & Wegner, 2012), a finding that, at first blush, seems to conflict with the results of Experiment 4: if people think that only humans are capable of exhibiting emotion, it is unnerving to see a machine do so. However, Experiment 4 explores the case in which people are forced to select a robot to perform humanlike jobs that specifically *require* emotion, demonstrating a preference for the emotional robot. This suggests that the nature of the task critically moderates people's attitudes toward emotional robots. If a task requires emotion, then people may prefer an emotional robot versus a cognitive robot despite feeling discomfort toward the robot's appearance. Experiment 5 extends these findings by presenting people with two robots known to evoke differential attributions of emotion (and consequently differential levels of discomfort; Gray & Wegner, 2012), to demonstrate that people still prefer outsourcing *emotion-oriented jobs* to the more *emotional* robot in this case.

Method

Participants. One hundred sixty-seven Americans (117 men, one unreported, $M_{age} = 29.52$) participated via MTurk as in Experiment 1.

Procedure. Participants saw two robots depicted with facial attributes that, based on previous research, conveyed different levels of emotion (Robot W) and cognition (Robot C) and evoked high and low discomfort, respectively (see Appendix C). In particular, Gray and Wegner (2012) showed videos of these robots to participants (whereas we showed only still images) and demonstrated that participants reported Robot W was more capable of emotion than Robot C *and* that Robot W made them feel more uncomfortable than Robot C.

In the present experiment, participants first selected either Robot W or Robot C for two forced-choice questions about their comfort with botsourcing for emotion-oriented jobs (e.g., social worker) and cognition-oriented jobs (e.g., data analyst) from the previous experiment. On the next screen, participants answered a question to assess discomfort: "Which robot makes you feel more uneasy, unnerved and creeped out?"

Results

Binomial tests confirmed that 86% of participants expressed more comfort using Robot W for emotion-oriented jobs ($p < .0001$), and 71% expressed more comfort with using Robot C for more cognition-oriented jobs ($p<.0001$). A majority of people (57%, $p = .088$) also expressed more general discomfort with Robot W versus Robot C, consistent with prior research. The marginal nature of this effect compared with prior work (Gray & Wegner, 2012) may result from the current experiment presenting only still images instead of videos, which are more evocative for participants. Alternatively, a more interesting possibility is that considering the effectiveness of an emotional robot for an emotion-oriented job might actually increase people's general comfort with the robot. A follow-up examination of the data supports this possibility, revealing that 96% of people who preferred botsourcing emotion-oriented jobs to Robot C indicated that Robot W evoked more discomfort, whereas only 51% of people who preferred botsourcing emotion-oriented jobs to Robot W indicated that Robot W evoked more discomfort ($\chi^2 = 16.34$, $p < .0001$, $\Phi = .31$). Future research can assess more definitively whether the presence of robot employees actually alters perceptions of them. For now, we highlight the critical finding consistent with Experiment 4: People express more comfort with botsourcing emotion-oriented jobs to robots that appear capable of emotion and more comfort with botsourcing cognition-oriented jobs to robots that appear capable of cognition.

Experiment 6

Thus far we have assessed people's comfort with botsourcing, but our results also have implications for human outsourcing: the replacement of jobs by foreign workers. Recent research on American attitudes toward offshore outsourcing provides evidence of negative opinions largely driven by ethnocentrism and antiforeign sentiment (Durvasula & Lysonski, 2008; Mansfield & Mutz, 2013). Our results suggest this distaste toward outsourcing might be moderated by the extent to people consider a match or mismatch between stereotypes of foreign workers as either cognitive and emotional and whether the jobs under threat require these traits.

Countries vary on the extent to which their citizens are stereotyped as having or lacking traits associated with emotion and cognition; we test whether these perceptions influence comfort with outsourcing jobs to members of these countries. In particular, Experiment 6a tests whether people express differential levels of comfort outsourcing cognition- versus emotion-oriented jobs to

countries (Australia and China) known to differ on perceptions of robotic qualities. Experiments 6b and 6c test a similar hypothesis for otherwise similar countries (Spain and Germany; Ireland and England) that differ critically on perceived warmth and competence, akin to emotion and cognition (Heflick et al., 2011).

Experiment 6a

Method.

Participants. One hundred sixty-six Americans (101 men, five unreported, M_{age} =30.95) participated via MTurk as in Experiment 1.

Procedure. Participants evaluated the average citizen of Australia and China, two countries that research demonstrates people perceive as being differentially robotic. In particular, Australians evaluate Chinese people as rigid and mechanistic (traits related to robots), whereas Chinese evaluate Australians as animalistic (but not robotic; Bain, Park, Kwok, & Haslam, 2009). To confirm these perceptions, the present participants answered the following question about both countries: "How much do you consider the average citizen of [Australia/China] to be robotic—mechanistic, rigid, and programmatic?" (1 = *not at all*, 7 = *very much*). Then, participants were asked to imagine themselves as CEOs required to outsource jobs and answered the following questions about outsourcing for both Australia and China: "Would you prefer to outsource THINKING jobs to them, or FEELING jobs to them? Think about how effective they would be at both types of jobs" (1 = *definitely thinking jobs*, 7 = *definitely feeling jobs*). We predicted people would rate Australians as less robotic than Chinese citizens and would thus prefer outsourcing emotion- versus cognition-oriented jobs to them more than to Chinese citizens.

Results. Participants perceived Australians (M = 1.74, SD = 0.92) as less robotic than Chinese citizens (M = 4.05, SD = 1.71), $t(165) = 17.86$, $p < .0001$, $d = 3.93$, and expressed more comfort with outsourcing emotion- versus cognition-oriented jobs to Australians (M = 4.95, SD = 1.29) compared with Chinese citizens (M = 2.69, SD = 1.37), $t(165) = 12.74$, $p < .0001$, $d = 3.80$.

Next, we assessed whether perceptions of robotic nature mediated the effect of nationality on comfort with outsourcing. Following Judd, Kenny, and McClelland (2001), we satisfied the first criterion by demonstrating that our independent variable (nationality) predicted our proposed mediator (perceived robotic nature) and dependent variable (comfort with outsourcing), as the above analyses demonstrate. To satisfy the second criterion, we computed for each participant a *robotic perception* difference score (robotic ratings for Australians minus Chinese), a *comfort-with-outsourcing* difference score (comfort-with-outsourcing ratings for Australians minus Chinese), and a centered sum score for *robotic perceptions* (robotic ratings summed across job types, centered). We then regressed comfort-with-outsourcing difference scores on robotic perception difference scores and robotic centered sums (to avoid biased estimation). According to Judd et al. (2001), the significant −.60 slope for robotic perceptions, $t(163) = 5.11$, $p < .0001$, in tandem with the significant .87 intercept, $t(163) = 2.73$, $p < .01$ (and nonsignificant slope for centered sum score, $p = .86$), indicates partial mediation. In sum, participants expressed more comfort outsourcing emotion- versus cognition-oriented jobs to Australian versus Chinese citizens, a finding partially explained by differing perceptions of the robotic nature of citizens of these countries.

Experiment 6b

Experiment 6a tested our hypothesis for countries known to differ on perceptions of robotic character, yet of course these countries differ on numerous dimensions that may also explain differences in outsourcing preferences. Experiment 6b therefore relies on countries that are geographically closer and that previous research has demonstrated differ in terms of other traits related to robotic perceptions, competence and warmth.

Method.

Participants. One hundred sixty-seven Americans (110 men, one unreported M_{age} =28.96) participated via MTurk as in Experiment 1.

Procedure. Participants answered the same questions as in Experiment 6a, this time for citizens of Spain and Germany, two countries that previous research indicates evoke perceptions of high warmth and low competence and high competence and low warmth, respectively (Cuddy et al., 2009). Because these dimensions are also related to robotic perceptions—with robots associated with high competence and low warmth (Gray & Wegner, 2012), we predicted a similar pattern would emerge as in Experiment 6b: We predicted that participants would rate Spanish citizens as less robotic than German citizens and would thus prefer outsourcing emotion- versus cognition-oriented jobs to them more than to German citizens.

Results. As predicted, participants perceived Spanish citizens (M = 2.14, SD = 1.15) as less robotic than German citizens (M = 3.20, SD = 1.60), $t(166) = 9.84$, $p < .0001$, $d = 1.72$, and expressed more comfort with outsourcing emotion- versus cognition-oriented jobs to Spanish (M = 4.98, SD = 1.22) compared with German citizens (M = 2.65, SD = 1.27), $t(166) = 14.39$, $p < .0001$, $d = 4.18$. We then followed the same within-subjects mediation procedures as in the previous experiment, to assess whether robotic perceptions mediated the effect of country type on comfort with outsourcing. The significant −.41 slope for robotic perceptions, $t(164) = 3.39$, $p = .001$, combined with the significant 1.89 intercept, $t(164) = 9.38$, $p < .0001$ (and nonsignificant slope for centered sum score, $p > .67$), indicates partial mediation. In sum, participants expressed more comfort outsourcing emotion- versus cognition-oriented jobs to Spanish versus German citizens, a finding partially explained by differing perceptions of the robotic nature of these countries.

Experiment 6c

Experiment 6c sought to bolster the findings of Experiments 6a and 6b by testing the same hypothesis using countries with even greater geographic and demographic similarity that also evoke differential perceptions of warmth and competence.

Method.

Participants. One hundred sixty-four Americans (98 men, five unreported, M_{age} =28.84) participated via MTurk as in Experiment 1.

Procedure. Participants answered the same questions as in Experiment 6a, this time for citizens of Ireland and England (referred to as "the UK/England"), two countries that previous

research indicates evoke perceptions of high warmth and low competence and high competence and low warmth, respectively (Cuddy et al., 2009). As in Experiment 6b, we predicted that participants would rate Irish citizens as less robotic than English citizens and thus prefer outsourcing emotion- versus cognition-oriented jobs to them versus English citizens.

Results. Participants perceived Irish citizens ($M = 2.05$, $SD = 1.19$) as less robotic than English citizens ($M = 2.76$, $SD = 1.44$), $t(163) = 7.76$, $p < .0001$, $d = 1.21$, and expressed more comfort with outsourcing emotion- versus cognition-oriented jobs to Irish ($M = 4.57$, $SD = 1.41$) compared with English citizens ($M = 3.36$, $SD = 1.34$), $t(163) = 7.08$, $p < .0001$, $d = 1.97$. We then followed the same within-subjects mediation procedures as in the previous experiment. The significant $-.52$ slope for robotic perceptions, $t(161) = 3.52$, $p = .001$, combined with the significant .85 intercept, $t(161) = 4.32$, $p < .0001$ (and nonsignificant slope for centered sum score, $p > .82$), indicates partial mediation. In sum, participants expressed more comfort outsourcing emotion- versus cognition-oriented jobs to Irish versus English citizens, a finding partially explained by differing perceptions of the robotic nature of these countries.

In Experiments 6a–c, participants reliably evaluated some countries to be less robotic than others, and consequently expressed greater comfort with outsourcing emotion- versus cognition-oriented jobs to these countries versus countries perceived to be more robotic. Together these experiments show preferences toward botsourcing follow the same pattern as for outsourcing.

General Discussion

This research sheds light on the increasingly important issues of botsourcing and outsourcing, revealing three key findings. First, workers express more concern over botsourcing of their jobs when their jobs are described in emotion- versus cognition-oriented terms (Experiments 1 and 2). Second, this research provides two possibilities for increasing comfort with botsourcing: framing jobs as requiring more cognition than emotion (Experiment 3) and, for specifically emotion-oriented jobs, designing robots that appear capable of emotion (Experiments 4 and 5). Finally, this research demonstrates that people attribute robotic qualities differentially to different nationalities, and these attributions predict preferences for outsourcing emotion- versus cognition-oriented jobs (Experiment 6).

We used a variety of paradigms and measures across our experiments, leaving open questions for future research. We measure people's preferences toward botsourcing and outsourcing using a variety of measures: emotional responses (Experiment 1), general comfort levels (Experiments 3–5), and perceived effectiveness (Experiments 2 and 6). Although conceptually related, these operationalizations of attitudes vary in that some reflect more visceral judgments (e.g., feelings and comfort), whereas others reflect more cognitive judgments (e.g., effectiveness). Although we demonstrate similar patterns across these measures in response to our manipulations, future research should explore how these different dimensions may underlie different aspects of preferences toward botsourcing and outsourcing. We also note that although Experiments 1–3 asked participants to report how comfortable they would be with botsourcing of their job—a more general measure of their attitude toward the practice of botsourcing, Experiments 4–6 shifted to asking participants to select a particular robot or person for a job, a more specific measure that may not capture their general attitudes toward botsourcing and outsourcing. Future research should also explore whether selecting a specific robot or person for a specific job can also affect people's general attitudes toward botsourcing and outsourcing. Finally, we note that participants in our experiments are drawn exclusively from MTurk; although this population is useful because it may be particularly affected by botsourcing, MTurk participants have a particular experience with technology. Exploring whether being technologically savvy (e.g., Venkatesh & Davis, 2000) moderates attitudes toward botsourcing offers an interesting avenue for future research.

Theoretical and Practical Implications

Our research has implications for both theory and practice. First, our results provide insight into the nature of human–robot interaction, speaking to the uncanny valley hypothesis that states people will be repelled by robots that behave almost, but not fully like humans (Gray, & Wegner, 2012; Mori, 1970). The present research provides a critical moderator of uncanny valley effects: the nature of the task that the robot is to perform. As Experiment 5 demonstrates, people express some relative comfort using a robot with humanlike appearance for tasks that require emotion, but express relative discomfort for using such a robot for cognition-oriented tasks. This finding is an initial step toward establishing boundaries for uncanny valley effects.

Second, Experiments 6a–c contribute to a growing body of research demonstrating the benefits of using social cognition toward nonhumans to inform the study of social cognition toward humans. Recent research on anthropomorphism (Epley, Waytz, & Cacioppo, 2007; Kwan & Fiske, 2008), religious cognition (Norenzayan & Shariff, 2008), human–animal relationships (McConnell, Brown, Shoda, Stayton, & Martin, 2011), and human–robot interaction (Desteno et al., 2012) exemplify how "studying how people understand other agents—whether human or not—dramatically broadens the scope of psychological theory" (Waytz, Epley, & Cacioppo, 2010, p. 58). The present research adds to this burgeoning expansion of social psychology's study of nonhuman agents to inform social psychological processes among humans.

Finally, the present research contributes to literatures assessing the cognition–emotion distinction in terms of mind perception (Gray et al., 2007), social perception (Fiske et al., 2002), and conceptualizations of humanness (Haslam, 2006). Although existing research demonstrates that people indeed *judge* nonhuman entities such as robots, animals, and supernatural beings using these dimensions (Gray et al., 2007), the implications of the cognition–emotion distinction for prospective *interaction* with such nonhuman entities are less well explored. By investigating this context, the present research makes a key advance toward understanding how the cognition–emotion distinction affects the increasingly commonplace prospect of interaction with nonhumans in modern society.

Conclusion

Although people appear to be more accepting of botsourcing for cognition- versus emotion-oriented jobs, in specific cases people

may be surprisingly open to accepting robots even for emotion-oriented jobs (see Experiments 4–5). In fact, an early experiment in artificial intelligence suggests that the requirement to demonstrate emotion can be quite minimal (Weizenbaum, 1976); ELIZA, developed in the 1960s, was a chat interface designed to simulate a Rogerian psychotherapist, in which patients typed in responses and received typed responses from what they believed to be a human therapist. Using simple scripts, the "therapist" responded to statements by the patient such as "My mother hates me" with automated replies such as "Who else in your family hates you?" Patients became deeply attached to their "therapists," even *after* being informed that they had been chatting with a computer program. In short, although our results suggest that cognition-oriented jobs are easier to accept for botsourcing than emotion-oriented jobs, future research is needed to examine the factors that might lead people to accept botsourcing even for jobs that seem to require a cognitive *and* emotional human.

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Appendix A

Emotion- and Cognition-Oriented Job Descriptions (Experiment 3)

Emotion-Oriented Descriptions

Heart surgeon that performs triple-bypass surgeries. This job is one that requires being very compassionate toward one's patients.

Math teacher for high school students. This job is one that the ability to relate to young people.

Computer programmer that updates informational software. This job requires the ability to help and sympathize with people who are having difficulty with programming and software issues.

Accountant that keeps track of finances and transactions. This job requires the ability to establish good relationships with one's clients.

Reference librarian that assists patrons find appropriate sources for school reports, research, and so forth. This job requires understanding the needs of the library patrons and understanding how to assist them.

Translator that communicates English into other languages. This job requires the ability to capture the correct emotional tone across different languages and consider how translations affect others' moods and feelings.

Cognition-Oriented Descriptions

Heart surgeon that performs triple-bypass surgeries. This job is one that requires technical skill and precision.

Math teacher for high school students. This job is one that requires a lot of analytic skill to teach the students various formulas and algorithms.

Computer programmer that updates informational software. This job requires the ability to think through complex programming language and to work with new software.

Accountant that keeps track of finances and transactions. This job requires the ability to crunch numbers and analyze economic information.

Reference librarian that assists patrons find appropriate sources for school reports, research, and so forth This job requires an understanding of different call number systems and the complex online reference system used to locate materials.

Translator that communicates English into other languages. This job requires the ability to think of the perfect word at the perfect time to provide a proper translation.

(*Appendices continue*)

Appendix B

Depictions of Robots (Experiment 4)

Robot C

Robot W

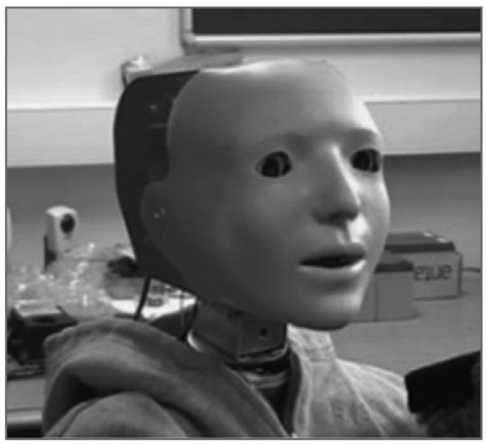
Figure B1. (Top) Robot C. (Bottom) Robot W. Reprinted from "The Advisor Robot: Tracing People's Mental Model From a Robot's Physical Attributes," by A. Powers & S. Kiesler, 2006, March 1–3, In *Proceedings of the First ACM Conference on Human–Robot Interaction*, p. 218. New York, NY: Association for Computing Machinery. Copyright 2006 by Association for Computing Machinery. Reprinted with permission from Sara Kiesler.

(*Appendices continue*)

Appendix C

Depictions of Robots (Experiment 5)

Robot C



Robot W

Figure C1. (Top) Robot C. (Bottom) Robot W. Reprinted from "Conscious Machines and Unconscious People: Unnerving Minds and the Essence of Humanity," by K. Gray & D. M. Wegner, 2012, *Cognition*, *125*, p. 127. Copyright 2012 by Elsevier. Reprinted with permission from Elsevier.

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