A Benefit of Thinking Like a Robot

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ABSTRACT
Picture a scenario in the not too distant future where home assistant robots provide social support such as engaging people in conflict reappraisal practices in the event of emotional conflicts. What should the robot say and/or do to effectively help people regulate emotions and navigate interpersonal conflicts? To begin to answer this question, this survey-based experiment investigated the anger reduction effects of conflict reappraisal from a robot third-party perspective. Results showed that reappraisal from a robot third-party perspective reduced anger relative to rumination, and shed light on how people's conceptions of a robot third-party perspective differed from that of a human third-party perspective.

CCS Concepts
• Human-centered computing→Human computer interaction (HCI)→Empirical studies in HCI

Keywords
Perspective taking from a robot's point of view; reappraisal; emotion regulation; social-psychological intervention.

1. INTRODUCTION
You are finally home after a long workday and commuting through heavy traffic. You are tired and hungry, and as you unlock the door, all you can think about is relaxing on the couch with a drink. However, what greets you upon entering is a kitchen sink full of dirty dishes and laundry strewn about the couch. You hear video game sounds coming from behind your roommate's door. Hot anger quickly rises in you as you move toward the door.

We often encounter such conflicts in our personal and professional lives. How we respond to them can affect our interpersonal relationships at home and work, as well as our health [1-2]. In the scenario above, pounding on your roommate's door is likely to be followed by exchanges of angry words and perhaps days of negativity. Alternatively, you could pause to reappraise the situation. Emotion regulation research shows that when people reappraise conflicts from a third-party perspective, they experience less anger than people who ruminate about the conflicts [5]. Perhaps after reappraising, you decide to instead invite your roommate to chat about each other's day while tidying up together. Yet another possibility, in the not too distant future, is that your home assistant robot senses your anger and approaches you with a suite of emotion regulation/conflict resolution tools.

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What should the robot say and/or do to effectively help you regulate your emotions and navigate the interpersonal conflict? To explore this question, we conducted a survey-based experiment to investigate whether in comparison to rumination, anger reduction can be achieved through reappraisal from a neutral third-party perspective when the third-party is a robot vs. a human. Based on previous literature, we excepted that reappraisal from a robot third-party perspective would reduce anger relative to rumination.

2. METHOD
2.1 Participants
Thirty undergraduates (age: $M = 20.03$, $SD = 1.43$) participated in this study, with 10 participants (gender balanced) randomly assigned to each of the three conditions: rumination, human third-party perspective, and robot-third party perspective. Participants received either course credit or $10 for participation.

2.2 Procedure
This survey-based experiment drew on previous conflict reappraisal method [5]. All sessions were administered in lab on lab laptops. Participants first rated (baseline) levels of positive (e.g., happy, amused) and negative emotions (e.g., angry, sad) they felt at the moment using a 7-point scale ranging from 1 (none) to 7 (a lot). They then recalled and wrote for 4 minutes about an event in the past month in which they became angry with someone. Following recall, participants rated levels of emotions they felt at the moment again. Depending on assigned condition, participants were then instructed to write for 4 minutes about their reappraisal of the anger event from one of three perspectives: (1) one's own perspective (rumination condition), (2) the perspective of a person trained to help people resolve conflicts (human third-party condition), and (3) the perspective of a robot programmed to help people resolve conflicts (robot third-party condition). Following this reappraisal task, participants rated levels of emotions they felt at the moment one last time. All emotion items throughout the survey were presented in random order.

2.3 Conflict Narrative Coding and Reliability
To explore how conceptions of a third-party perspective might differ between robot and human, drawing on established methods [3], a coding scheme for participants' conflict narratives was constructed from a random selection of half of the data (gender and condition balanced) and then applied to the entire dataset. We coded for the presence/absence of four overarching forms of reasoning:

Situational: An attribution to the circumstantial specifics of a situation as a cause of conflict (e.g., "During this event, before my time of the month, I got really irrationally angry at my significant other for getting food without me.").

Dispositional: An attribution to the internal characteristics of a person as a cause of conflict (e.g., "I was extremely agitated because she has always been a flaky person.").

Emotional: An appeal to the emotional quality of the conflict (e.g., "I had gotten really upset when he didn't tell me because I face a lot of abandonment by friends and significant others….").

Analytical: An exterior, detached reflection of the conflict characterized by objective facts (e.g., "Female, my mom, wants male, me, to attend event that is more important to female. Male wants to attend event that he considers to be more fun.").

Two blind coders were trained in the use of the coding scheme. A main coder coded all 30 conflict narratives; a second coder independently coded 9 narratives from the half of the dataset not used for coding scheme development, balanced across conditions. Inter-coder reliability was assessed using Cohen's kappa at $\alpha = .05$: $\kappa = .66$, $p < .001$, indicating substantial agreement [4]. Participants' recall and reappraisal narratives were coded separately but combined for analysis because in the reappraisal segment, many participants referred to what they wrote earlier in the recall segment. The combined narratives thus provided a more complete account of the conflicts as well as a more conservation measure of potential differences between conditions.

3. RESULTS

No significant gender differences were found for the measures reported here; data were collapsed for analysis. For the key anger measure, participants reported greater levels of anger after conflict recall ($M = 1.60$, $SD = 1.22$) compared with baseline ($M = 2.93$, $SD = 1.53$), $t(29) = -3.71$, $p = .001$, $d = 0.17$, indicating that our conflict recall procedure had worked as expected. Baseline anger was then subtracted from subsequent anger ratings for further analyses. A repeated measures ANOVA with time (after recall and after appraisal) as within-subjects factor and condition (rumination, human third-party, and robot third-party) as between-subjects factor yielded a significant main effect of time, $F(1, 27) = 10.87$, $p = .003$, partial $\eta 2 = .287$, and a significant Time x Condition interaction, $F(2, 27) = 3.63$, $p = .040$, partial $\eta 2 = .212$, both with Greenhouse-Geisser correction. The main effect of condition was non-significant. To follow up on the interaction, repeated measures ANOVAs per condition revealed that reappraisal from the human third-party perspective, $F(1, 9) = 6.00$, $p = .037$, partial $\eta 2 = .400$, and the robot third-party perspective, $F(1, 9) = 9.00$, $p = .015$, partial $\eta 2 = .500$, both with Greenhouse-Geisser correction, significantly lowered anger, whereas rumination did not (see Figure 1). No significant differences were found in composite scores of other emotions.

Percentages of participants per condition whose conflict narratives reflected the coded reasoning categories are reported in Table 1. Differences in category frequencies across conditions were examined using Freeman-Halton extension of Fisher's exact test for 2 (present and absent) x 3 (conditions) contingency table (two-tailed). Bonferroni adjustment for multiple comparison was made: $\alpha = .0125$. Significant difference between conditions was only found for the analytical category. Participants were significantly more likely to reflect analytically in the robot third-party condition than in the other two condition, $p = .001$.

4. DISCUSSION

This experiment investigated people's existing conflict reappraisal inclinations from a robot third-party perspective without actually employing a robot. Overall, participants were able to conceive of a robot's role in mediating emotional conflicts, and reappraisal from a third-party perspective can down regulate anger regardless of whether the third-party is a human or a robot. This anger reduction benefit of thinking like a robot seems to be driven by a unique tendency to adopt a detached and analytical approach of reinterpreting interpersonal conflicts. These findings can serve to guide the design of actual human-robot interaction that facilitate interpersonal emotional regulation and conflict resolution.

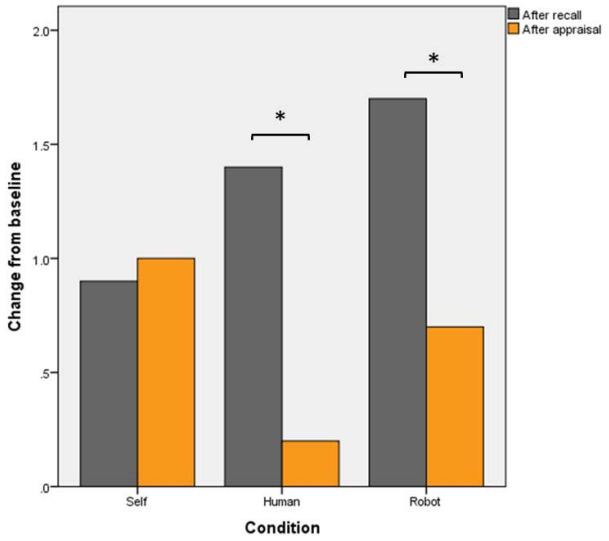

Figure 1. Anger experience after recall and reappraisal.

Table 1. Conflict Reasoning Categories (n = 10 per condition)

Category	Rumination	Human	Robot
Situational	70%	30%	60%
Dispositional	30%	40%	30%
Emotional	80%	90%	80%
Analytical	0%	0%	60%

Note. Percentages do not always add up to 100% as coding of multiple categories were possible for each conflict narrative.

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