Supplementary Materials

Self-Disclosure to a Robot: Only for Those Who Suffer the Most

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Abstract: With the rapid development of interactive technologies, social robots are an innovative method to improve the well-being of individuals. Earlier research showed that people easily self-disclose to a social robot even in cases where that was unintended by the designers. We report the technicalities of an experiment of self-disclosing in a diary journal or to a social robot after negative mood induction. In terms of negative mood reduction, we found that people who felt strongly negatively affected after being exposed to shocking earthquake footage also benefitted the most from talking to a robot rather than writing their feelings down. For people less affected by the treatment, a confidential robot chat or writing a journal page did not differ significantly.

Keywords: self-disclosure; social robots; diary; emotion theory; relevance; valence

1. Introduction

Our research question is whether social robots offer an alternative to traditional diary writing to "let off steam", particularly in coming to terms with negatively valenced emotions. Based on the literature (e.g., Pu, Moyle, Jones, and Todorovic, 2019), we expect that using social robots will be more effective than writing down ones feelings because the robot more closely resembles talking to a person (i.e., a virtual therapist).

We propose (H1) that a social robot that invites self-disclosure from its user decreases the level of negative emotions more than pencil-and-paper approaches do. As a medium (H2), a social robot that invites self-disclosure will be regarded as more relevant to the user's goals and concerns than pencil-and-paper approaches.

2. Method

2.1. Participants and Design

Voluntary participants (N = 45; M_{age} = 24.9, SD_{age} = 3.29, 55.6% female, Chinese nationality) were randomly assigned to a between-subjects experiment of self-disclosure after negative mood induction in a robot (n = 24; 54.2% female) vs. writing condition (n = 21; 57.1% female), not receiving any credits or monetary rewards. All participants had university training at the masters degree level, except for four doctorate degrees, three bachelors, and one with a diploma degree. Informed consent was obtained formally from all participants.

2.2. Procedure

Participants were brought in a dimly lit and shielded-off section of the experimenter room and were seated in front of a laptop. The experiment consisted of negative

mood induction and self-disclosure, after which participants filled out an online questionnaire in the Qualtrics environment for administration of surveys and experiments.

In the induction part, participants were confronted with a 10m and 6s long video compilation of three documentaries about a serious earthquake incident that happened in Sichuan, China, in 2008. Research has shown that viewing negative media, including videos, images, and texts, effectively induces negative emotions with an increasing activation of the aversive system (Bolls, Potter, and Lang, 2001; Lang, Shin, and Lee, 2005). In accordance with the review conducted by Siedlecka and Denson (2019), who found that video is the most effective means of mood induction, we prepared a video on earthquakes that actually took place in Sichuan, China, which made the contents culturally related to our participants and brought relevance and realness to the experience.

After the video, participants were asked to either talk to a robot about their experiences during the video or to write them down on a paper. This instruction took 30–40s. Neither the robot nor writing utensils were visible before self-disclosure—for which the participants had 10 minutes. The movements of the robot and text input were handled in remote control (Wizard of Oz), and the conversation was handled autonomously by our in-house developed AI chatbot (next section).

After the self-disclosure session ended, participants were asked to fill out a 30-item structured questionnaire (Appendix 1) and report on their assessment of the video clip and talking to the robot or writing the journal page. Items on the questionnaire were presented in blocks with pseudo-random sequences of items within blocks, which were different for each participant. We ended the questionnaire inquiring about demographic information. Upon completion, participants were thanked for their participation and debriefed.

2.3. Apparatus and Materials

2.3.1. Video Materials

The video materials for negative mood induction were 10 minutes and 6 seconds long and were composed of video excerpts from the following three Sichuan earthquake Internet documentaries:

无声也有情 (2018, May 7). **谨以此视频纪念四川汶川大地震十周年** (cut at 00:02-01:19) (Internet video in memory of the Wenchuan Sichuan earthquake tenth anniversary). Available from https://www.bilibili.com/video/av23087386/;

Dazzz2009 (2008, December 31). 512 地震**纪实** 都江堰 **实拍** 四川大地震 (cut at 01:20-01:59) (internet video record of 512 earthquake in Dujiangyan). Available from https://www.youtube.com/watch?v=Vz0nGbl81fM&list=PLf2PpWDjsx1d6rVUW0vaGFzhvIr_nRo_8&index=2;

Lantian777 (2008, May 16). 汶川**县城地震后** 10 分**钟画面曝光** (in full) (internet video ten minutes after Wenchuan Sichuan earthquake). Available from https://www.youtube.com/watch?v=PI5KL7nvU28.

2.3.2. Robot Embodiment

The robot was a Robotis DARwIn Mini, a 3D printable, programmable, and customizable miniature humanoid robot of 27 cm tall with Bluetooth connection to a laptop (Figure 1). The robot could stand up and move its arms while speaking through an AI chatbot.

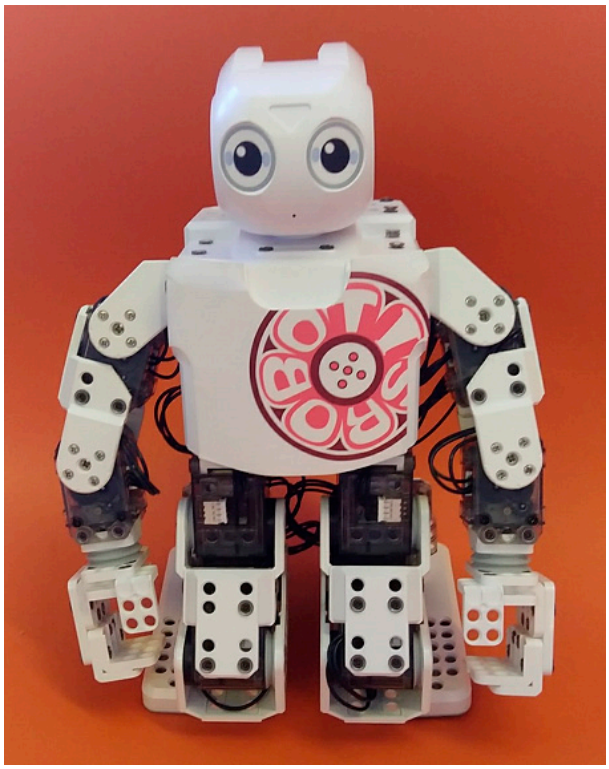

Figure S1. Robotis DARwIn Mini as the humanoid embodiment of our self-disclosure chatbot.

DARwIn Mini requires OS Android 2.3.3 (Gingerbread or greater), a 1.2 GHz Dual Core or greater, RAM 1GB or greater, iOS 6 or higher with a BT-410 Wireless Communication Module for iOS use. The actions DARwIn could execute during the experiment are tabulated in Table 1 and were controlled remotely.

Table S1. Action set of DARwIn Mini in the experiment.

Action code	Type	Description
1	Greets	Wave two hands when conversation starts
2	Left hand	Wave left hand
3	Right hand	Wave right hand
4	Up	Raise hand
5	Down	Put down hand

2.3.3. Self-Disclosure Chatbot

The DARwIn Mini cannot speak; therefore, we created our own chatbot, using DARwIn Mini as the humanoid embodiment of our self-disclosure AI chatbot. Next, we report on the development of both the hardware and software.

Hardware development: Two main components made up the hardware of our self-disclosure AI chatbot: the core board Raspberry Pi Zero (WH) (Figure 2) and the extension board that was connected to the speaker and camera. These two boards we engineered into an integrated circuit (Figure 3). In the actual experiment, we did not use the camera due to the long processing time of voice in combination with image. Hardware details are summarized in Table 2. Figure 4 offers an impression of the hardware prototype chatbot.

Table S2. Hardware components of the self-disclosure chatbot.

Component	Description
Raspberry Pi Zero WH	Core board
Internal cardboard frame	Internal frame with speaker, Raspberry Pi, and other parts
Extension board (designed by ourselves)	Integrated with internal cardboard frame and camera
Speaker	Audio devices
Display screen	Display devices
Transparent plastic shell	Chatbot casing
Battery	Power supply

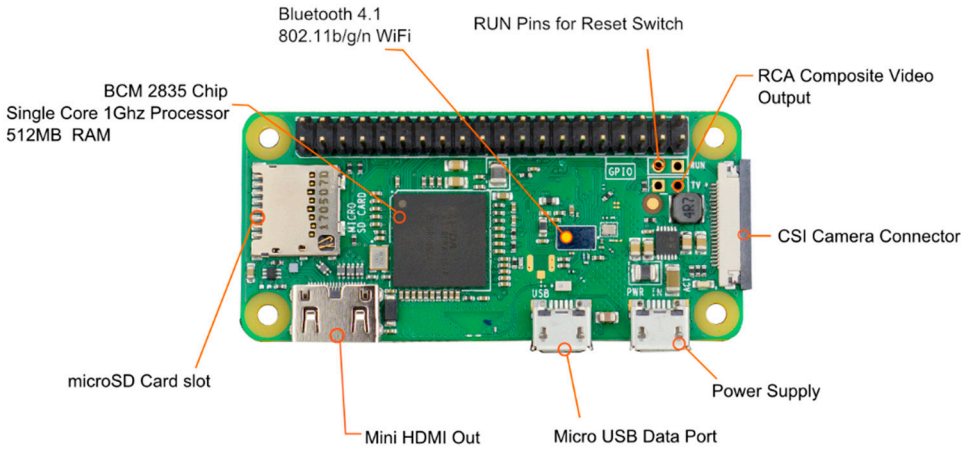

Figure S2. Raspberry Pi Zero (WH).

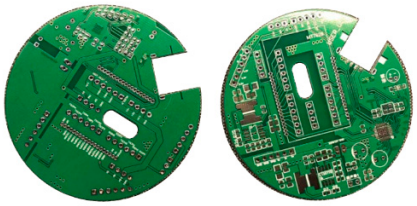

Figure S3. In-house-engineered integrated board.

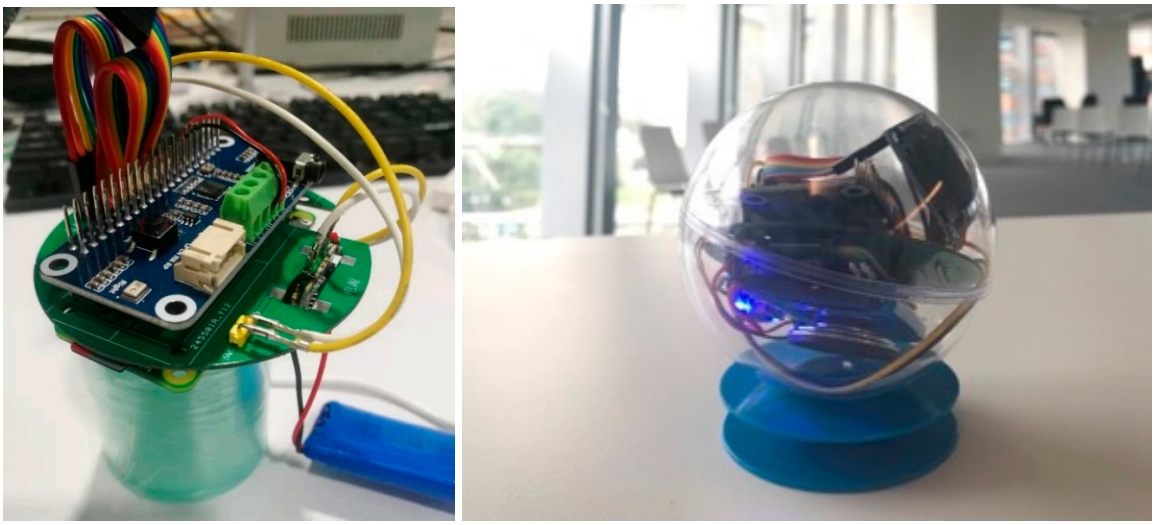

Figure S4. Hardware prototype of the chatbot.

Software development: To create a chatbot adjacent to the DARwIn Mini, we set up a homepage for test subjects to assess the chatbot system.[1] For website development, we used Semantic UI as the front-end framework[2] and Node.js as the back-end one.[3] We tentatively called the chatbot Meme and invited test subjects to share their secrets with Meme in our test environment (Figure 5). The chatbot on the website had speech recognition in Putonghua, Cantonese, and English, using a Turing robot API. We submitted the code to the GitHub repository.[4] Due to the size limitations of GitHub, the corpus was uploaded to Google drive. Readers can find the download address if they search for the readme.md file under the model folder.

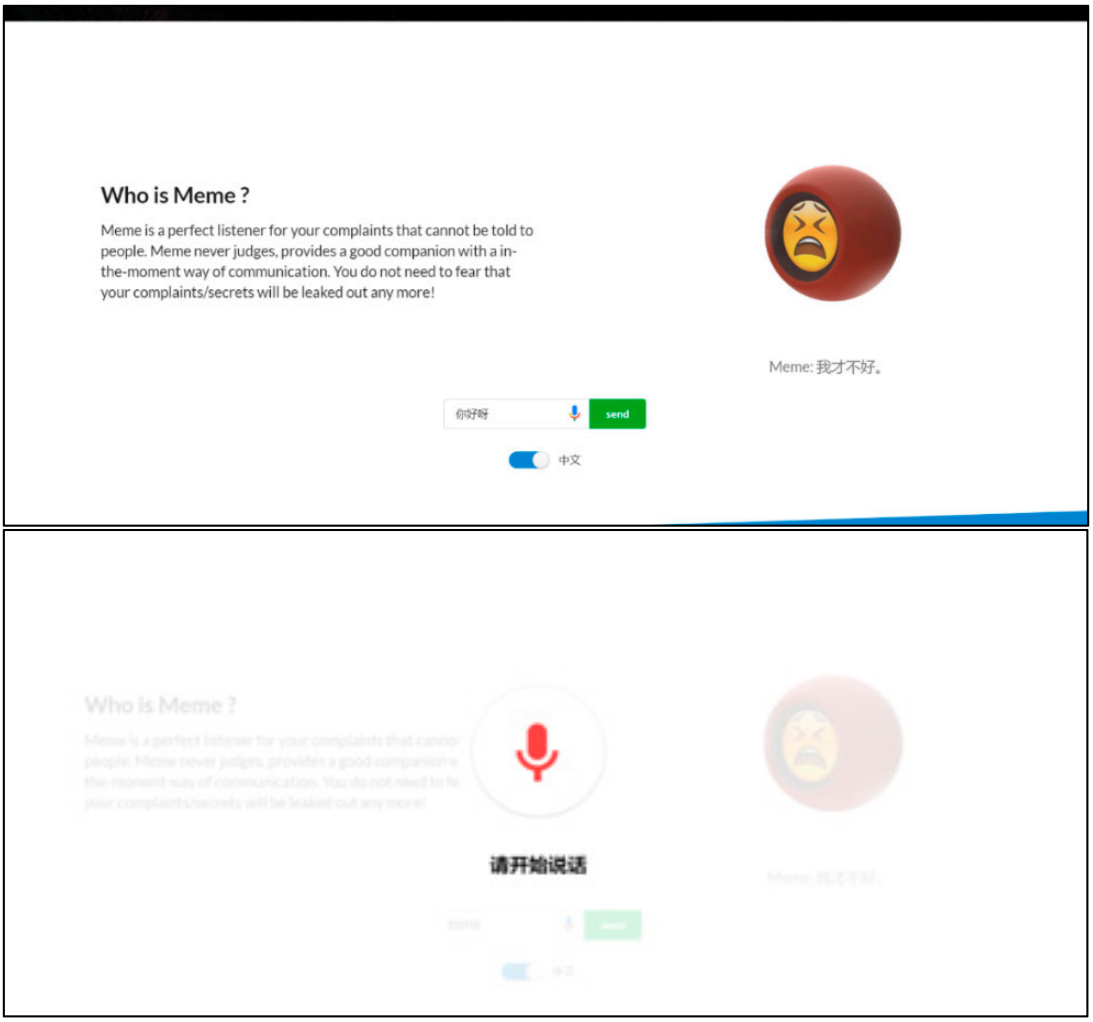

Figure S5. Chatbot test environment.

To increase the traffic on our website, we also created an official WeChat account and used Python to run a server in Google Cloud.[5] Figure 6 shows two screenshots of the app.

[1] www.roboticmeme.com
[2] https://semantic-ui.com/
[3] https://nodejs.org/en/
[4] https://github.com/Blackmamba-xuan/Meme
[5] https://cloud.google.com/

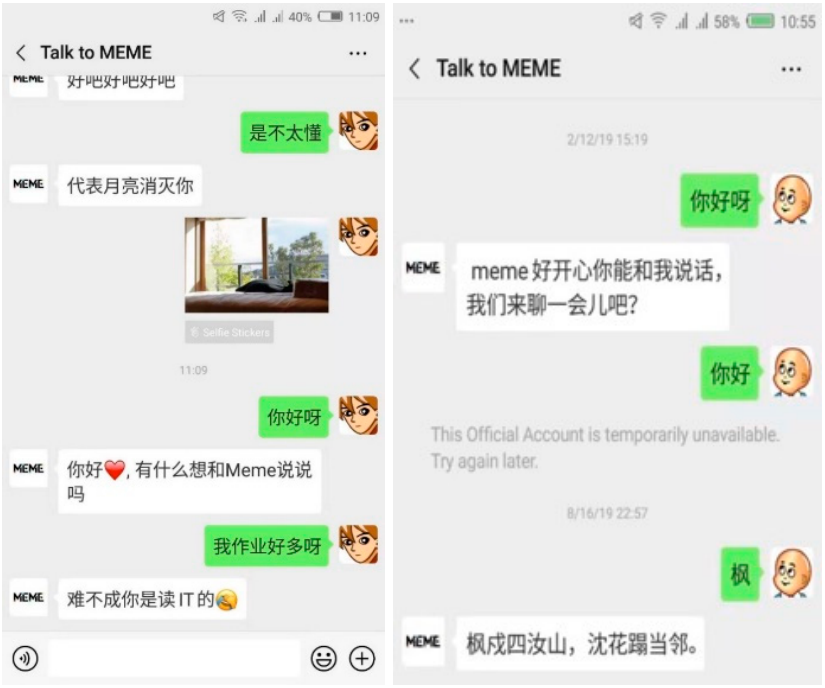

Figure S6. WeChat official account.

On WeChat, we used Chill chat with the Xiaohuangji corpus for information retrieval and as an extra, we could generate poetry through LSTM. An example of such a poem:

《江南》	*"South River"*
凉雨好阿兄，东风撼碎蝉。	Cool rain is good, brother, the east wind shakes the cicadas.
美人缝落尽，袖里认眠时。	When the beauties are fully sewn and sleep in their sleeves.
枫叶攒纤手，残花落玉池。	Maple leaves squeeze hands, the remaining flowers fall into a jade pool.
朝朝千里去，飞雪戏烟台。	Going thousands of miles, flying snow plays in Yantai.

Ours was a hierarchical chatting system, consisting of three layers: (1) a rule-based layer that focused on certain specific chatting tasks (Figure 7); (2) an information retrieval system that searched the answer from a corpus built from Weibo conversations and conversations about movies (Figure 8); (3) a generation layer that used the general-purpose encoder seq2seq as well as generative adversarial network, a machine-learning tool, to generate a response.[6] We adopted the *k*-means algorithm in sentence vector clustering. After many iterations of improvement, the final model could effectively answer a question.

[6] https://github.com/google/seq2seq; https://en.wikipedia.org/wiki/Generative_adversarial_network

```
def analyze(statement):
    for pattern, responses in psychobabble:
        match = re.match(pattern, statement.rstrip(".!"))
        if match:
            response = random.choice(responses)
            return response.format(*[reflect(g) for g in match.groups()])
```

```
    ['你不会自己去吗',
     '不帮，自己做去，哈哈哈哈']],

    [r'你(.*)岁(.*)',
     ['宝宝我4岁了，不是3岁孩子了',
     '你猜，猜对我给你写首诗',
     '不想说，不如你告诉我你多大了，哈哈']],

    [r'(.*)吃(.*)',
     ['吃吃吃，总想着吃会很胖的',
     '胖子，别吃啦']],

    [r'(.*)你(.*)可以(.*)做(.*)',
     ['恩恩，其实我可以写诗啊，原创哦~',
     '来我可以陪你聊聊天',
     '来假大山啊',
     "恩恩，给我一个字，给你来首诗"]],

    [r'(.*)你(.*)会(.*)',
     ['来，我可以写诗啊，原创哦~',
     '来，我可以陪你聊聊天',
     "给我一个字，会给你来首诗"]],
```

Figure S7. Rule-based: Eliza.py and regular expressions.

```
$ py control.py
D:\Msc_learn\homework_and_project\.env_h\lib\site-packages
unkize_serial
  warnings.warn("detected Windows; aliasing chunkize to ch
Building prefix dict from the default dictionary ...
Loading model from cache C:\Users\rico_\AppData\Local\Temp
Loading model cost 0.999 seconds.
Prefix dict has been built succesfully.
>>>你喜欢什么颜色
<<<('雨后天空的颜色', 1.0)
>>>你喜欢吃什么？
<<<('饼干，你要买给我吗', 1.0)
>>>我好穷啊。
<<<('叫叔叔回来请吃饭', array([[0.87111111]]))
>>>你好可爱呀！
<<<('我哪有可爱一大把年纪了', array([[0.88840998]]))
>>>你还很年轻
<<<('那就别宅着了？出去走走呗！', array([[1.]]))
>>>我们一起去爬山吧？
<<<('差不多啦。不过是去外地啦。', array([[0.82634101]]))
>>>可以做我女朋友吗？
<<<('当然想啦，求之不得呀宝贝儿~', array([[0.99382934]]))
>>>
```

Figure S8. Information retrieval from Xiaohuangji corpus.

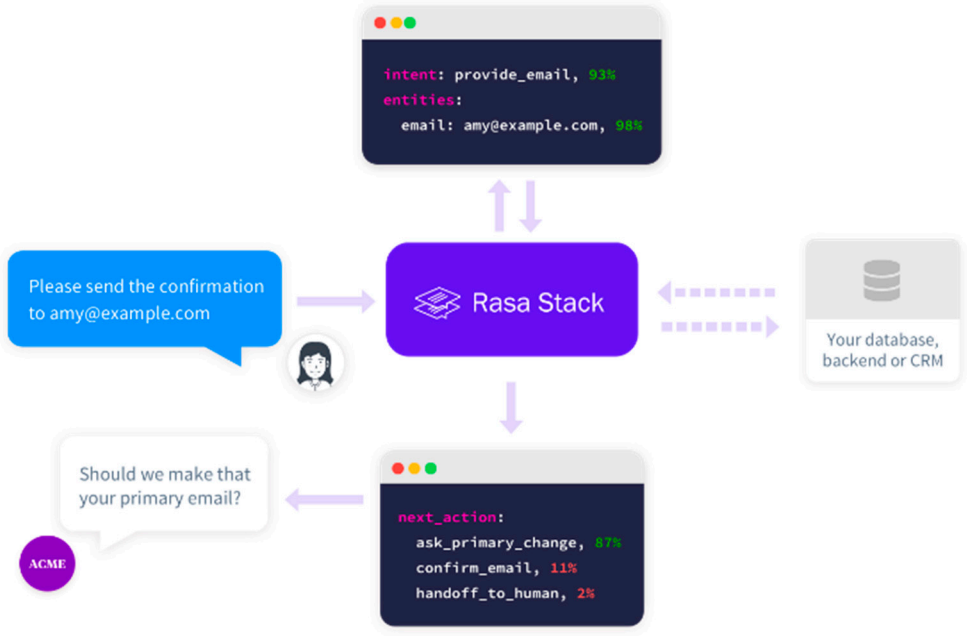

Figure S9. Framework for Natural Language Understanding (NLU).

For Natural Language Understanding (NLU), we installed a Rasa stack and so made the conversation somewhat more contextualized (Figure 9).[7] For Rasa to estimate what a user means to say, we classified a number of conversational topics that had to do with negative experiences. Therefore, we analyzed the contents of a complaining website and ran a spider program to catch the users' comments (Figure 10). Then, we conducted data mining for hot topics (Figure 11). A screenshot of the training set is shown in Figure 12.

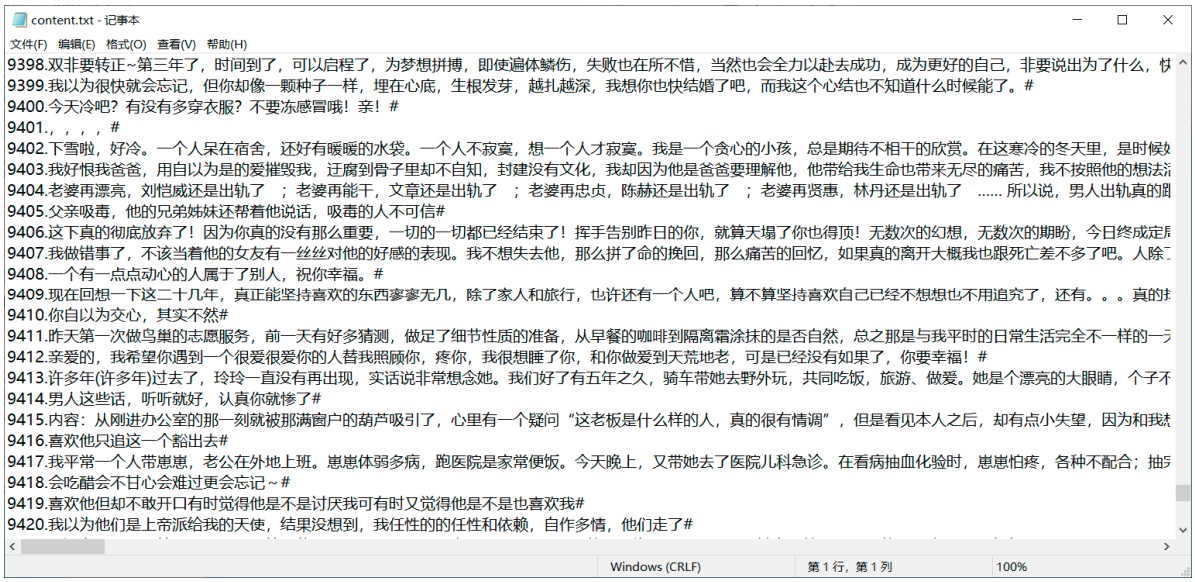

Figure S10. Users' comments and complaints.

[7] https://rasa.com/

```
import requests
from bs4 import BeautifulSoup

index = 1
tagIndex=1
contentFile=open('content.txt','wb+')
topicFile=open('topic.txt','wb+')
for i in range(1,1000):
    r = requests.get('http://6our.com/best?&p='+str(i))
    # print(r.text)
    soup = BeautifulSoup(r.text, 'lxml')
    blockDiv = soup.find_all("div", class_='block untagged')
    for block in blockDiv:
        contentDIV = block.find_all("div", class_='content')[0]
        tagDiv = block.find_all("div", class_='tags')
        content = contentDIV.text.strip()
        tag = ''
        if (len(tagDiv) != 0):
            tag = ''
            aList = tagDiv[0].select("a")
            for a in aList:
                tag += a.text.strip() + '-'
                tagStr=str(tagIndex)+'.'+a.text.strip()+'\r\n'
                topicFile.write(tagStr.encode('utf-8'))
                tagIndex = tagIndex + 1
        contentStr=str(index) + '.' + content + '#' + tag+'\r\n'
```

Figure S11. Data mining for hot topics.

Figure S12. Training data set for the Rasa system.

For training, we sampled a 2-year record of almost 500 pages and nearly 10,000 comments. Then, we tokenized these utterances and identified the high-frequency items ("hot topics"). An impression of the results is depicted in Figure 13: people worried most about unrequited love, emotions, relationship, family, love, homosexual love, cheating, love crush, the self, life, work, making love (sex), being disappointed in love, only one person, feelings, loss, life, cheering up, marriage, troubles and worries, loneliness, depression, study, entry exams to university and college, secrets, and love in relationships.

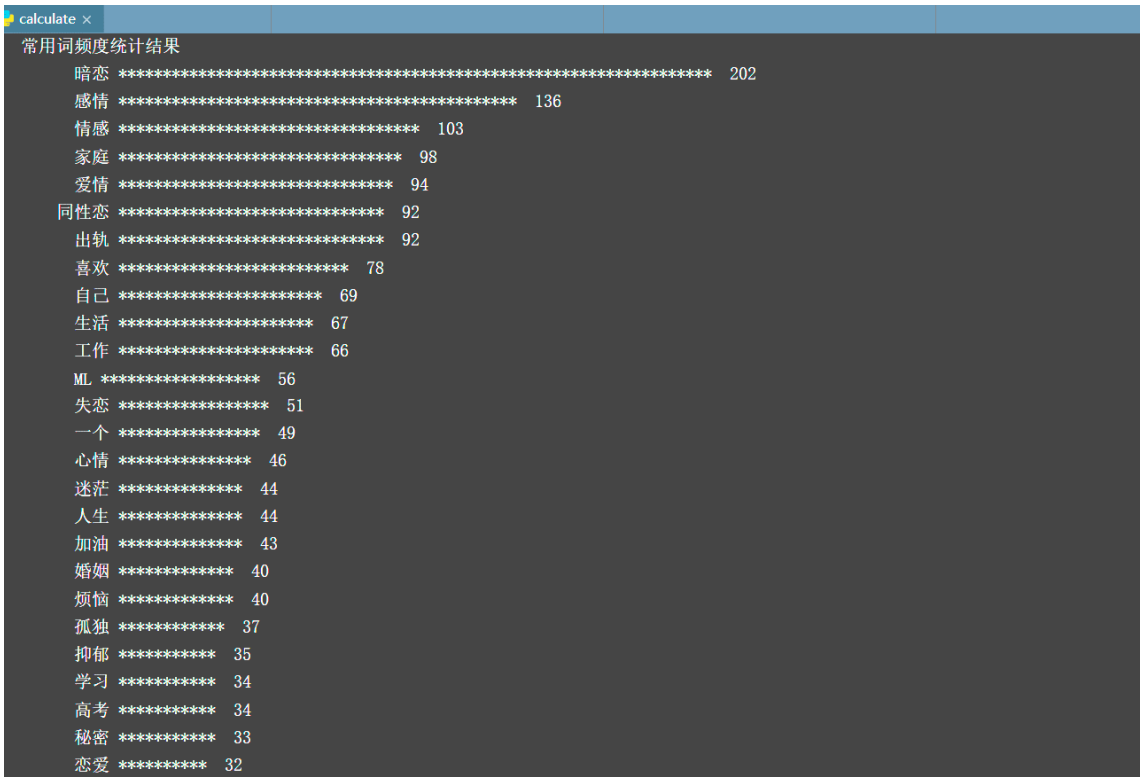

Figure S13. Frequency statistics for hot topics to complain about.

The complete set-up of the self-disclosure AI chatbot is shown in Figure 14. The sing, movie, poetry, and weather options were not used in the actual experiment.

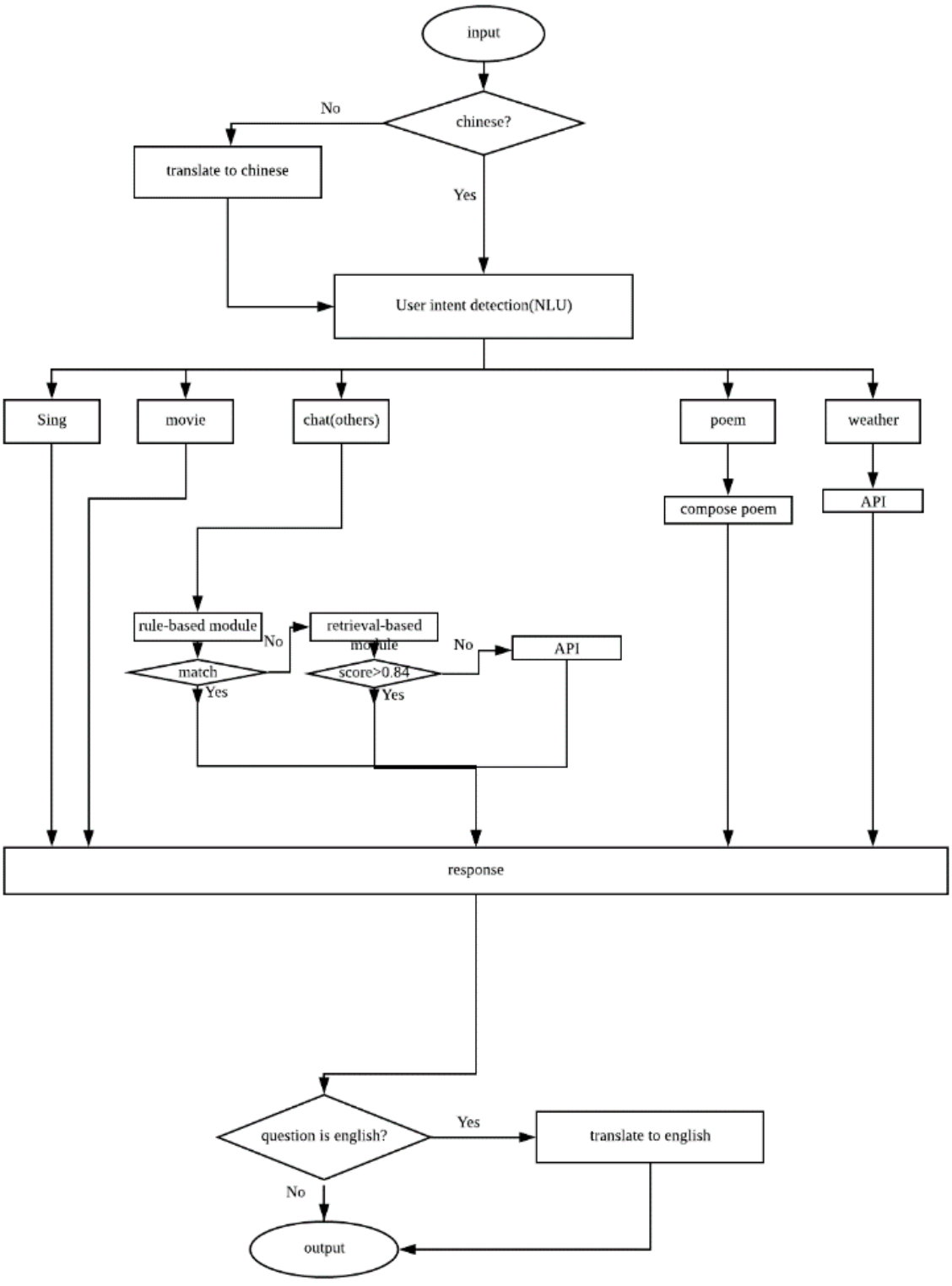

Figure S14. Flowchart for our self-disclosure AI chatbot.

For the experiment, we installed our chatbot system in a voice kit that stood behind the DARwIn Mini (Figure 15). We did not install voice-recognition software due to its inefficiency (i.e., slow and inaccurate). Therefore, a confederate not visible to the participant inputted the participant's utterances.

Figure S15. Voice kit vocalizing the "thoughts and feelings" of DARwIn Mini.

Information processing and replying to the participants was carried out autonomously by our AI. Figure 16 exhibits the interaction flow.

The robot first introduced itself (translation from the Chinese): "Hi, I am MEME. I am a social robot. Nice to meet you. I want to help people. Please forgive my slow response because I am still learning to be a good robot. How do you feel today?". Depending on what the participant said, the robot chose from the following questions that were embedded in the chatbot program. To personalize the responses, not all questions were posed to each participant and not all participants were asked the exact same questions:

1 What troubles you? You can talk to me.
2 Can you say more about it?
3 What is the happiest thing in your life?
4 Imagine you can go anywhere tomorrow, where will you go?
5 What is your favorite thing?
6 Can you tell me the most interesting experience you had?
7 What can I do to make you happy?
8 Do you want to talk about something else?
9 What do you think?
10 What do you think is the most beautiful thing in the world?
11 How do you think about that?
12 Can I know why?

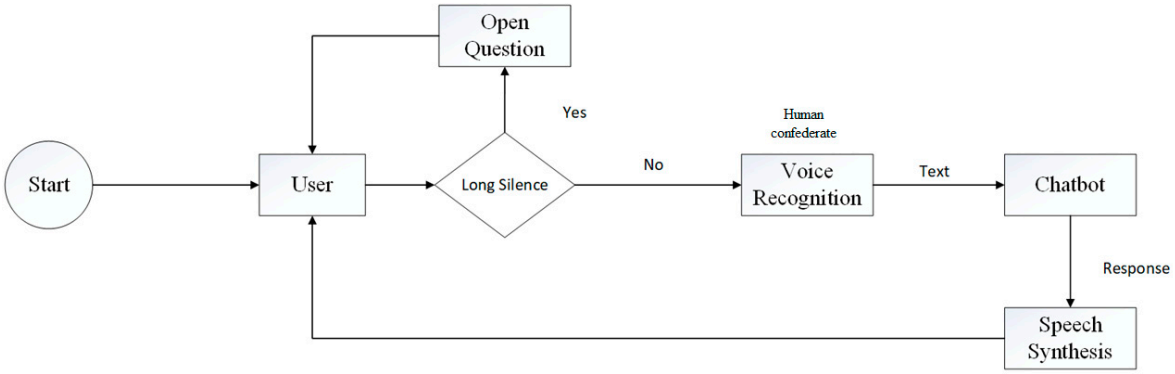

Figure S16. Human–robot interaction flowchart.

Together, the DARwIn Mini standing in front of the voice kit carrying our self-disclosure AI chatbot made up the "robot condition" in our experiment. Figure 17 shows the final set-up.

Figure S17. DARwIn Mini was placed in front of the voice kit with self-disclosure AI chatbot.

2.4. Measures

Two versions of a structured questionnaire were appropriate to one of two conditions: talking with the robot or journal writing on a piece of paper (Appendix 1). The questionnaire was constructed from emotion literature (e.g., Scherer, 2013; Frijda, 2007; Russell, 2003) and ran four measurement scales: Valence after the movie but before treatment (robot or writing), Valence after treatment, Relevance, and Novelty as a control variable. We also inquired about demographics.

Items were Likert-type statements followed by a 6-point rating scale (1 = strongly disagree, 6 = strongly agree). One half of the items on each measurement scale consisted of four indicative statements and the other half of counter-indications. Blocks of related items were offered in pseudo-random order, which was different for each participant. Items within blocks also were pseudo-randomly presented to each participant.

The measurement scale "Valence before treatment" (*ValB*) consisted of four indicative items (*Vb1i*, *Vb2i*, *Vb3i,* and *Vb4i*), for example, "I feel good" (*Vb1i*) and of four counter-indicative items (*Vb5c, Vb6c, Vb7c,* and *Vb8c*), for example, "I feel bad" (*Vb5c*). We used the same items for measurement of Valence after talking to the robot or writing on paper but adjusted the wording to the situation. Thus, "Valence after treatment" (*ValA*) also had four indicative and four counter-indicative items (*Va1i, Va2i, Va3i, Va4i, Va5c, Va6c, Va7c, Va8c*). Relevance of robot or writing to goals and concerns (i.e., personal emotion regulation) was measured with two indicative items (e.g., "… is useful") (*Re1i, Re2i*) and two counter-indicative items (e.g., "… is meaningless") (*Re3c, Re4c*).

To control for a possible confounding of the robot as a novel means to regulate emotions, a Novelty scale was composed of three indicative items (e.g., "… is new") (*No1i, No2i, No3i*) and three counter-indicative items (e.g., "… is commonplace") (*No4c, No5c, No6c*).

Demographics included information about the participant's gender (*De1*), age (*De2*), education level (*De3*), and country (*De4*). At the end of the questionnaire, participants could leave their comments. The raw scores to items are tabulated in Table 3.

Table S3. Raw scores to the items on the measurement scales (not reverse-coded) (N = 45).

R/W	Vb1i	Vb2i	Vb3i	Vb4i	Vb5c	Vb6c	Vb7c	Vb8c	Va1i	Va2i	Va3i	Va4i	Va5c	Va6c	Va7c	Va8c	Re1i	Re2i	Re3c	Re4c	No1i	No2i	No3i	No4c	No5c	No6c
R	2	2	1	1	5	4	6	5	4	4	3	4	1	1	1	1	4	4	4	4	4	4	2	6	4	3
R	1	1	2	1	6	6	6	6	4	4	5	2	2	5	2	5	4	4	4	4	5	5	3	4	4	2
R	3	3	4	3	4	4	4	4	5	5	5	5	2	2	2	2	4	4	2	3	4	4	4	4	5	3
R	2	2	2	1	5	5	4	4	4	4	3	3	3	3	4	4	3	4	3	4	4	4	4	4	4	3
R	2	3	3	3	2	2	2	2	2	2	3	2	2	2	2	2	4	4	4	3	4	5	3	4	3	2
R	3	2	4	2	4	4	3	3	4	4	4	4	2	2	3	2	4	4	2	2	4	4	2	5	4	4
R	2	2	3	2	4	4	4	4	4	4	4	4	2	2	3	3	3	3	4	4	4	4	3	4	3	2
R	2	2	4	4	5	3	5	5	4	4	4	4	3	3	3	4	4	3	3	4	5	4	3	2	3
R	5	6	5	6	2	1	2	2	5	5	6	5	2	1	2	1	5	4	1	1	5	6	5	3	3	1
R	2	2	2	2	5	4	6	5	5	5	5	5	2	2	2	2	2	5	6	2	2	6	6	6	2	2
R	2	1	1	1	5	5	5	4	5	4	5	4	1	1	1	1	4	4	3	1	5	5	4	3	3	1
R	1	1	1	1	5	5	4	4	5	4	4	4	2	3	2	2	6	6	1	1	5	6	5	1	2	3
R	1	1	2	1	5	5	5	5	5	5	5	4	1	2	2	2	5	5	3	3	5	5	3	4	3	1
R	5	4	4	4	2	2	2	2	5	5	4	5	2	2	2	1	4	4	2	2	4	5	3	4	3	3
R	4	1	1	1	3	3	4	2	4	5	5	4	3	2	2	1	6	6	2	1	5	5	5	4	2	1
R	1	1	1	1	6	6	6	6	5	5	5	5	2	2	2	2	5	4	2	2	4	4	5	3	3	2
R	5	6	5	5	1	1	5	1	5	5	6	6	1	1	1	1	5	5	2	5	4	3	3	4	5	3
R	1	1	1	1	6	5	6	5	4	4	4	4	2	1	3	3	2	2	5	5	2	2	1	6	5	5
R	5	5	4	3	1	1	1	1	6	1	5	6	1	1	1	1	5	5	1	2	5	3	4	4	5	3
R	2	2	2	2	5	4	5	4	5	4	4	4	2	1	2	1	5	4	2	2	5	6	4	3	1	2
R	1	1	1	3	4	5	4	3	2	1	3	2	4	4	2	2	2	2	4	5	4	4	2	4	3	4
R	3	3	3	3	2	3	5	4	3	2	3	4	2	4	3	3	4	2	4	2	4	4	2	4	3	2
R	2	1	1	1	5	6	5	4	4	4	4	4	2	3	3	4	4	4	3	3	4	4	3	4	5	4
R	3	2	2	3	3	3	5	4	4	4	4	4	3	3	4	3	4	4	2	3	5	5	4	3	3	2
W	2	2	1	1	4	3	5	5	4	4	4	4	2	2	3	3	4	5	3	3	2	1	4	3	5	3
W	2	1	1	1	6	6	6	6	4	4	4	4	3	3	3	3	4	4	3	3	4	2	5	3	4	1
W	3	1	5	1	5	5	5	4	2	1	2	1	2	1	5	4	5	5	3	3	2	3	2	2	2	2
W	2	2	2	2	4	4	5	3	2	2	3	4	5	4	5	3	4	5	2	4	2	2	2	5	5	2
W	1	1	1	2	5	4	5	5	3	3	4	4	2	2	3	2	6	6	1	1	3	2	2	4	5	1
W	2	1	4	4	6	5	4	5	4	4	5	4	2	2	2	4	5	5	1	1	4	4	5	1	2	3
W	2	1	5	4	4	4	4	4	3	2	4	2	2	2	2	4	5	4	2	2	2	2	3	3	4	2
W	2	2	2	2	5	4	5	5	3	5	3	2	2	2	4	3	4	3	4	2	4	3	5	3	2	2
W	3	2	5	5	3	2	2	2	3	3	5	4	1	2	2	2	6	5	1	2	5	4	3	2	2	1
W	2	2	1	1	2	4	1	1	1	1	1	1	1	1	1	2	2	5	5	2	2	4	3	5	3
W	5	2	2	2	2	2	5	5	4	2	1	1	2	1	3	2	3	2	3	3	2	2	5	1	4	2
W	3	3	3	3	4	4	3	4	4	4	4	4	3	3	3	4	4	4	3	3	3	3	4	4	4	3
W	3	2	6	1	4	1	3	3	4	5	4	3	2	2	2	2	1	1	6	6	2	4	2	2	4	4
W	3	3	3	3	4	4	4	4	4	4	4	4	3	3	3	3	3	3	4	4	3	1	4	3	6	4
W	1	2	6	2	2	4	1	4	3	6	3	3	1	1	1	1	4	4	2	2	1	2	5	1	2	1
W	3	2	3	1	6	5	6	6	2	2	2	1	5	5	5	6	2	2	5	5	2	1	4	2	5	3
W	3	3	3	3	3	3	3	3	4	3	4	4	3	3	3	3	4	4	2	2	3	3	4	2	5	3
W	1	1	1	1	5	4	5	5	3	1	3	2	4	4	4	4	2	2	5	5	3	3	3	3	5	4
W	2	2	4	5	4	5	5	3	4	5	6	4	3	2	2	4	5	5	1	1	3	3	5	3	1	1
W	1	1	5	4	5	4	4	4	3	4	4	5	2	3	2	2	5	5	2	2	5	4	4	2	2	1
W	2	2	3	3	5	4	5	4	4	4	5	5	3	3	4	3	4	4	3	2	3	2	4	3	4	3

Note: R = robot, W = writing.

Before reliability analysis, we reverse-coded (1→6, …, 6→1) the counter-indicative items on the two Valence scales (*Vb5cr*, *Vb6cr*, *Vb7cr*, and *Vb8cr*) and (*Va5cr*, *Va6cr*, *Va7cr*, and *Va8cr*), Relevance (*Re3cr* and *Re4cr*), and Novelty (*No4cr*, *No5cr*, and *No6cr*). For the variables of theoretical interest, all measurement scales, with all items included, achieved good to very good reliability in the first run (Cronbach's $\alpha \geq .82$). This was true for the separate subscales of Valence (4 items each) and for their combination (*ValB* and *ValA*, 8 items each), as well as for Relevance (4 items). The control variable of Novelty had Cronbach's $\alpha = .75$ in the first run (all items), and yet we found that if we removed *No4cr*, we could increase the reliability to Cronbach's $\alpha = .77$. *No4cr* stated that "talking to robot/writing is predictable". However, in the writing condition, the participants considered it strange to ask for the "predictability" of the blank sheet in front of them. Therefore, we removed *No4cr* from the scale (5 items remaining). Results are compiled in Table 4.

Table S4. Results of the reliability tests.

Scale	# Items	Alpha	Standardized Alpha	Scale mean	SD
MValBi	4	.82	.82	2.40	1.08

MValBc	4	.90	.90	4.00	1.22
MValB_all	8	.91	.91	2.70	1.07
MValAi	4	.87	.88	3.75	1.04
MValAc	4	.87	.88	2.43	0.93
MValA_all	8	.88	.86	4.16	0.81
MRel	4	.94	.94	4.09	1.16
MNov	5	.77	.77	3.78	0.88

Table 5 shows a PCA with varimax rotation on Valence, Relevance, and Novelty. It seems that indicative items formed a positive-Valence subscale as the counter-indicative items clustered into a negative-Valence subscale. Only *Va7cr* ("I have negative feelings") had a balanced spread between the two subscales. Due to its theoretical importance, however, we kept this item and placed it in the negative-Valence subscale. Items on the Relevance scale neatly fell in line as intended. Novelty showed some spread over both Valence and Relevance. However, because this was a control variable, we kept the scale intact and will observe in the Results section its tendency to coalesce with variables of theoretical interest.

Table S5. Principal components analysis with rotated factor loadings (varimax).

Standardized loadings (pattern matrix) based upon correlation matrix

	RC1	RC2	RC3	h2	u2	com
Va1i	0.79	-0.07	0.21	0.68	0.32	1.2
Va2i	0.71	-0.02	-0.09	0.51	0.49	1.0
Va3i	0.76	0.15	0.12	0.61	0.39	1.1
Va4i	0.78	0.03	0.30	0.69	0.31	1.3
Va5cr	0.20	0.22	0.80	0.73	0.27	1.3
Va6cr	-0.07	0.10	0.84	0.72	0.28	1.0
Va7cr	0.62	0.18	0.53	0.70	0.30	2.1
Va8cr	0.49	0.18	0.61	0.64	0.36	2.1
Re1i	0.19	0.85	0.26	0.83	0.17	1.3
Re2i	0.33	0.74	0.22	0.71	0.29	1.6
Re3cr	0.25	0.78	0.30	0.76	0.24	1.5
Re4cr	0.10	0.82	0.09	0.69	0.31	1.1
No1i	0.76	0.42	-0.11	0.76	0.24	1.6
No2i	0.58	0.36	-0.13	0.49	0.51	1.8
No3i	0.29	0.47	-0.51	0.56	0.44	2.6
No4cr	-0.25	0.66	-0.37	0.64	0.36	1.9
No6cr	-0.02	0.74	0.03	0.55	0.45	1.0

	RC1	RC2	RC3
SS loadings	4.24	4.23	2.79
Proportion Var	0.25	0.25	0.16
Cumulative Var	0.25	0.50	0.66
Proportion Explained	0.38	0.38	0.25
Cumulative Proportion	0.38	0.75	1.00

Mean item complexity = 1.5
Test of the hypothesis that 3 components are sufficient.

The root mean square of the residuals (RMSR) is 0.09
with the empirical chi square 72.64 with prob < 0.88

Fit based upon off diagonal values = 0.94> fs <- factor.scores(y,fit)
> fs
$scores

```
        RC1       RC2       RC3
0  0.18162334 -1.2541913  1.8488756
0  0.55555323 -0.5247723 -1.4982430
0  1.08475670 -0.5126924  0.1873716
0 -0.15704623 -0.7837692 -1.3523288
0  0.12415988 -0.6327407  0.6745548
0  0.34674253 -0.2378908 -1.0453941
0  1.51253607  1.0558962 -0.7329299
0  0.74655918  0.4370271  0.9105045
0  0.71722149  1.5544635 -0.6225180
0  0.91880382  0.1260751  0.5799294
0  0.92909158 -0.3821653  0.5287668
0  0.85381069  1.2332883 -0.2918666
0  1.29787874 -0.7105512  1.6193620
0 -0.26971222 -2.9434996  1.1483241
0  0.72582113  0.2579284  1.7760812
0  0.64681097  0.4826684  0.4554635
0 -0.57841083 -0.2718089  0.2810230
0 -0.02445907  0.1386890 -1.0179596
0 -3.03036506  0.8179739  0.5804690
0 -1.11675828  1.2004502  1.1805388
0  0.08178814  1.1959045 -0.4865028
0 -1.62465786  0.5586195  0.5852824
0 -0.73279760  0.1052427 -0.7468910
0 -0.34978531  1.4583869  0.8074416
0 -2.06861791  0.1004976  0.2717079
0 -0.01707449 -0.5140845 -0.8245002
0 -0.07761579 -1.2989444 -0.7630102
0 -1.16197005 -1.6265014 -1.7080094
0  0.11365187  1.0716555 -0.2947409
0  0.05563341 -0.2736703 -0.8136524
0  0.31682794  0.1725157 -1.2371493

$weights
             RC1         RC2         RC3
Va1i   0.216842845 -0.094162941  0.008811844
Va2i   0.218713670 -0.065061643 -0.106819000
Va3i   0.196193085 -0.027922199 -0.031062582
Va4i   0.195685001 -0.067994648  0.041819338
Va5cr -0.041995576  0.023918223  0.297957507
Va6cr -0.114764008  0.012332600  0.345606740
Va7cr  0.113190718 -0.018526123  0.146479238
Va8cr  0.064809567 -0.007897466  0.194263491
Re1i  -0.044746623  0.208034100  0.063971477
Re2i   0.009402136  0.167073776  0.037712315
Re3cr -0.026438381  0.180800701  0.079702937
Re4cr -0.050806384  0.210455702  0.006664050
No1i   0.195631093  0.050186436 -0.130058904
No2i   0.152992537  0.050227085 -0.121693927
No3i   0.093767431  0.114725558 -0.245368652
No4cr -0.095496026  0.210095813 -0.138304949
No6cr -0.072682230  0.201078937 -0.004489390

$r.scores
             RC1         RC2         RC3
RC1 1.000000e+00 2.389582e-15 4.198166e-15
RC2 2.282896e-15 1.000000e+00 3.926547e-15
RC3 4.199332e-15 3.845882e-15 1.000000e+00
```

We then calculated the means across the items on a scale (Table 4) and performed an outlier analysis for Valence, Relevance, and Novelty. We found that participant 9 was an outlier in *MValB* and participant 39 was an outlier in *MValA*. Participants 5 and 21 were outliers for *MValAi*. Participants 39, 27, 38, and 33 were outliers in *MValAc* (see Figure 18). There were no outliers in *MNov*, *MRel*, *MValBc,* and *MValBi*. We performed our effects analysis with and without those outliers.

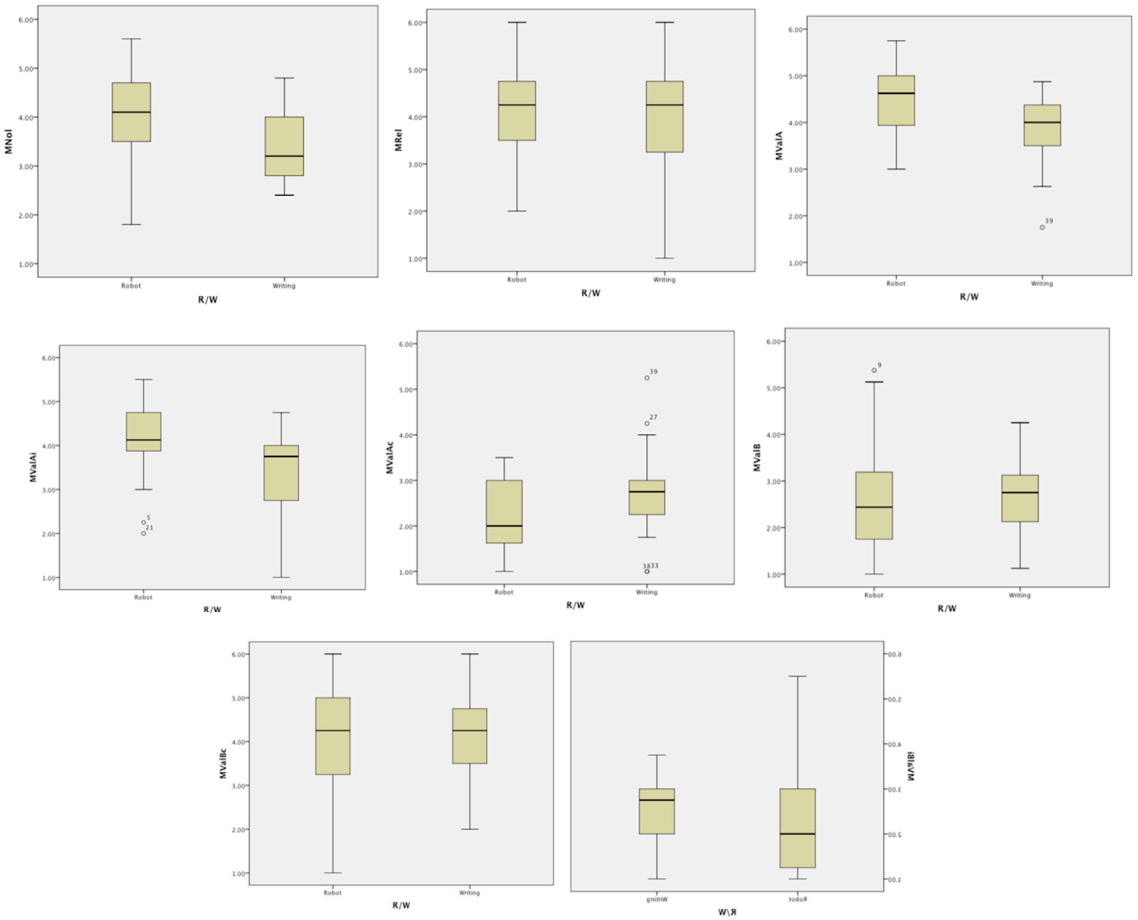

Figure S18. Outliers for mean scale values: *MValB*, *MValA*, *MValAi*, and *MValAc*.

3. Results

3.1. Demographics

We checked the countries that participants came from (*De4*). Only participant 31 reported she was from Africa; the rest were from China. Inspection of the scatter plot, however, showed that number 31 was not in the zone of outliers. Therefore, we decided to treat this person as one of the same sample and did not treat her differently in the analysis.

Next, we checked whether age (*De2*) was correlated with the eight dependent variables (*MRel*, *MNov*, *MValB*, *MValA*, *MValBi*, *MValBc*, *MValAi*, and *MValAc*). We calculated Pearson bivariate correlations (two-tailed) and found no significant relations of age with *MRel*, *MNov*, *MValB*, *MValA*, *MValAi*, *MValAc*, and *MValBc* (Table 6). Age had a near-significant weak negative correlation with *MValBi* (*sig*.= .08). In all, we concluded that age did not have effect on the variables of theoretical interest, except maybe for *MValBi*, indicating that with higher age, people became less positive.

Table S6. Bivariate Pearson correlations with age.

	r		*sig.*	
MRel	.09		.55	
MNov	.04		.80	
MValB		-.23		.13
MValA		-.08		.62
MValBi	-.27		.08	
MValBc	.17		.28	
MValAi	.02		.91	
MValAc	.15		.32	

Next, we examined whether gender (*De1*) was influential for the eight dependent variables (*MRel*, *MNov*, *MValB*, *MValA*, *MValBi*, *MValBc*, *MValAi*, and *MValAc*). We ran a MANOVA (Pillai's Trace) to check the effect of gender but we found no significant effects ($V = .11$, $F_{(7,37)} = .68$, $p = .688$).

Interestingly, gender did exact an effect on the experience of Novelty ($F_{(1,41)} = 4.18$, $p = .047$, $\eta_p^2 = .09$). Throughout, females experienced more Novelty ($M = 4.03$, $SD = .83$) than did males ($M = 3.50$, $SD = .87$). However, Novelty was a control variable in our experiment and was not of theoretical interest. Therefore, we concluded that gender did not have a significant effect on the variables theoretically related to our hypotheses.

Among all participants, there were four with doctorate degrees, three with bachelor's degrees and one with a diploma degree. The rest all had master's degrees. We found that participant 39, who had a doctorate degree, was also one of the outliers to the scale means. Thus, we excluded this participant from the effect analysis of educational background.

We put the seven participants with a degree other than a masters in one group and randomly chose seven other participants (who were not outliers) with a masters degree in the other group. We performed an independent samples t-test to check whether education had effect on the eight dependent variables that related to our theoretical hypothesis. We ran this test five times, each time with a different set of participants with masters degrees and found that, in certain group comparisons, educational background did have effect on *MValBc, MValA, MValAi*, *MValAc*, and *MNov*. Therefore, we made two data sets, one with all 45 participants (24 in the robot group and 21 in the writing group) and the other with 31 participants (17 in the robot group and 14 in the writing group), excluding the outliers and the participants with a non-masters degree as educational background. These separate sets were used to assess our hypotheses.

3.2. Manipulation Check: Emotional Effects after Negative Mood Induction and after Treatment

We wanted to control whether any emotion at all was provoked by the shocking video footage of the earthquake and whether the treatment (robot or writing) evoked any change in emotion at all. Alternatively, did everything remain at level 1 (no emotions reported)?

For $N = 45$, we ran a one-sample t-test (two-tailed) with 1 as the test value to see if any negative (or positive) emotions occurred after mood induction as well as after treatment. For positive valence after the earthquake clips, *MValBi* showed that $t = 8.67$, $p < .00001$. For negative valence after the earthquake clips, *MValBc* resulted in $t = 16.44$, $p < .00001$. For positive valence with $n = 31$, *MValBi* was $t = 7.00$, $p < .00001$. For negative valence with $n = 31$, *MValBc* resulted in $t = 15.38$, $p < .00001$. Thus, more negative than positive mood was induced by the clips, as intended.

For $N = 45$, after treatment (robot or writing), positive valence *MValAi* obtained $t = 17.83$, $p < .00001$, while for negative valence, *MValAc*, $t = 10.35$, $p < .00001$. For $n = 31$, positive valence *MValAi* was $t = 18.65$, $p < .00001$ and negative valence *MValAc*, $t = 9.39$, $p < .00001$. In other words, more positive than negative emotions were felt after either talking to a robot or writing a diary page, as intended.

To check whether before/after effects of treatment actually occurred, we also ran paired-samples t-tests (two-tailed) in both data sets $N = 45$ and $n = 31$. Note that these are not tests of our hypotheses but a mere inspection if anything happened at all.

For the difference between *MValBc* and *MValAc* with $N = 45$, $t = 9.34$, $p < .00001$. For the difference between *MValBc* and *MValAc* with $n = 31$, $t = 9.42$, $p < .00001$, so that we may conclude that participants after treatment became less negative (*MValBc* was significantly larger than *MValAc*).

For the difference between *MValBi* and *MValAi* with $N = 45$, $t = -7.16$, $p < .00001$. For the difference between *MValBi* and *MValAi* with $n = 31$, $t = -7.24$, $p < .00001$, so that we may conclude that participants after treatment became more positive. Whether through a robot or through writing, treatment had an effect in the expected direction.

3.3. Effect of Media (Robot vs. Writing) on Valence and Relevance

To analyze the changes in Valence after talking to a robot or writing a diary page, we computed three mean difference scores: for overall Valence, $\Delta Val = MValA - MValB$; for positive Valence, $\Delta ValP = MValAi - MValBi$; and for negative Valence, $\Delta ValN = MValAc - MValBc$. In Table 7, ΔVal, $\Delta ValP$, $\Delta ValN$, *MRel*, and *MNov* are shown for the two conditions (robot vs. writing). The top half of Table 7 shows the averages for the entire sample ($N = 45$); the bottom half shows the suspected cases that were excluded ($n = 31$).

Table S7. Valence, Relevance, and Novelty for robot and writing.

	Robot			**Writing**		
	Mean	***SD***	***n***	***Mean***	***SD***	***n***
ΔVal	1.77	1.26	24	1.11	0.81	21
ΔValP	1.75	1.31	24	0.89	1.06	21
ΔValN	1.78	1.30	24	1.32	0.84	21
MRel	4.19	0.99	24	3.98	1.33	21
MNov	4.10	0.86	24	3.42	0.77	21
			$N = 45$			
ΔVal	1.98	1.11	17	1.33	0.83	14
ΔValP	1.99	1.08	17	1.05	1.17	14
ΔValN	1.97	1.27	17	1.61	0.76	14
MRel	4.35	0.96	17	4.27	1.08	14
MNov	4.13	0.95	17	3.53	0.78	14
			$n = 31$			

3.3.1. Effects on General Valence and Relevance

Next, we performed a General Linear Model (GLM) Multivariate analysis of Media (2: robot vs. writing) on *ΔVal* and *MRel* (grand mean scores), with *MNov* as a covariate. We did this for $N = 45$ and $n = 31$ separately.

For the data set where $N = 45$, with Novelty as a covariate, we did not find significant multivariate effects ($V = .09$, $F_{(2,41)} = 1.98$, $p = .151$, $\eta_p^2 = .09$). Therefore, no significant effect of Media was found on *ΔVal* ($F_{(1,42)} = 2.04$, $p = .161$, $\eta_p^2 = .05$) and neither on *MRel* ($F_{(1,42)} = 1.64$, $p = .207$, $\eta_p^2 = .04$). However, we did find multivariate effects for *MNov* ($V = .39$, $F_{(2,41)} = 12.92$, $p = .000$, $\eta_p^2 = .39$), which covaried quite strongly with *MRel* ($F_{(1,42)} = 25.91$, $p < .001$, $\eta_p^2 = .38$).

With Novelty excluded from the analysis, the pattern of multivariate effects was similar as before ($V = .09$, $F_{(2,42)} = 2.09$, $p = .136$, $\eta_p^2 = .09$). Officially, we should have stopped our search here. Yet, when we looked into the main effect of Media on *ΔVal*, we did see that without Novelty, the effect became significant ($F_{(1,43)} = 4.23$, $p = .046$, $\eta_p^2 = .09$). As a trend, beneath the surface, it seemed that talking to a robot ($M_{\Delta Val} = 1.76$, $SD = 1.25$)

had a more positive impact on Valence (bipolar conception) than did writing ($M_{\Delta Val}$ = 1.10, *SD* = .81) after negative mood induction.

For the data set where $n = 31$, with Novelty as a covariate, Media (robot vs. writing) did not exert any significant multivariate effects on Δ*Val* or *MRel* ($V = .09$, $F_{(2,27)} = 1.32$, $p = .285$, $\eta_p^2 = .09$). Novelty (*MNov*) covaried with other variables ($V = .38$, $F_{(2,27)} = 8.33$, $p = .002$), but this was significant for *MRel* alone ($F_{(1,28)} = 15.40$, $p = .001$, $\eta_p^2 = .36$). With Novelty discarded in the analysis, the pattern of results did not change. Without the outliers, even the shimmer of a positive change in valence caused by robots or writing remained absent.

3.3.2. Effects on Positive Valence, Negative Valence, and Relevance

For $N = 45$, we ran two GLM repeated measures of Media (two conditions) on within-subjects factor (Δ*ValP* vs. Δ*ValN*), with *MRel* and *MNov* separately as covariates. We found no significant multivariate effects on unipolar valence (Δ*ValP* vs. Δ*ValN*), nor for the interaction with Media ($V = .05$, $F_{(1,42)} = 2.02$, $p = .162$, $\eta_p^2 = .05$), *MRel* as a covariate ($V = .02$, $F_{(1,42)} = .71$, $p = .406$, $\eta_p^2 = .02$), and *MNov* as a covariate ($V = .00$, $F_{(1,42)} = .004$, $p = .951$, $\eta_p^2 = .000$).

With *MRel* included, we did find a marginally significant main effect of Media across Δ*ValP* and Δ*ValN* (non-unipolar Valence): $F_{(1,42)} = 3.79$, $p = .058$, $\eta_p^2 = .08$. With *MNov* included, however, that main effect was not even marginally significant: $F_{(1,42)} = 2.04$, $p = .161$, $\eta_p^2 = .05$. This pattern of results remained the same without the covariates, except that as before the effect of Media across Δ*ValP* and Δ*ValN* (non-unipolar Valence) became significant: $F_{(1,43)} = 4.23$, $p = .046$, $\eta_p^2 = .09$.

For $n = 31$, we again ran two GLM repeated measures of Media (two conditions) on (Δ*ValP* vs. Δ*ValN*), with *MRel* and *MNov* as separate covariates, respectively. As before, we found no significant multivariate effects on (Δ*ValP* vs. Δ*ValN*) ($V = .03$, $F_{(1,28)} = .78$, $p = .162$, $\eta_p^2 = .03$), nor for the interaction with Media ($V = .09$, $F_{(1,28)} = 2.63$, $p = .116$, $\eta_p^2 = .09$), *MRel* as a covariate ($V = .01$, $F_{(1,28)} = .30$, $p = .588$, $\eta_p^2 = .01$), and *MNov* as a covariate ($V = .004$, $F_{(1,28)} = .13$, $p = .725$, $\eta_p^2 = .004$). Without the emotional outliers, the main effect of Media on the unipolar conception of Valence (Δ*ValP* vs. Δ*ValN*) remained absent ($F_{(1,28)} = .3.14$, $p = .087$, $\eta_p^2 = .10$). Without the covariates, the pattern of these results did not change.

In all, we saw that the only "unofficial" significant effect we could establish for the theoretical variables was with $N = 45$, without *MNov* as a covariate, in a bipolar conception of Valence (Δ*Val*). We wondered, then, how this could be the case since the mood induction and the treatment had been so successful according to the t-test (Section 3.2).

3.4. Effect of Media on Valence and Relevance for Those who Felt Most Negative

In clinical trials, it is good practice to contrast a control group with a treatment group and measure the effects of a drug or medical device (e.g., Friedman, Furberg, and DeMets, 2010, p. 2). We attempted the same but now with depressed people (after mood induction), using two different media (robot vs. pen and paper). However, another approach in clinical research is to try a drug on healthy volunteers vs. patient volunteers and this is what we so far failed to recognize: some of the participants may not have been affected much by the mood induction and therefore did not need treatment or comfort from our robot or journal writing; after all, they were not distressed, they did feel the emotion but were "immune to the affliction", so the treatment was superfluous, a subsample ceiling effect.

Therefore, we performed a median split for both $N = 45$ and $n = 31$ data sets on the variable *MValBc* (negative Valence). In the data set with $N = 45$, with the outliers included, 23 participants indicated that they felt the most negative. Twelve of them were in the robot condition and 11 in the writing condition.

For $n = 31$, without the outliers, 17 participants felt the most negative, 10 of whom talked to a robot after viewing the footage and seven completed the writing task. Table 8 provides the means and SDs for Δ*Val*, Δ*ValP*, Δ*ValN*, *MRel*, and *MNov* for talking to a ro-

bot or writing a journal page for those participants who felt very negative after watching the earthquake video.

Table S8. Valence, Relevance, and Novelty of the most negatively affected participants in the robot and writing conditions (n = 40).

	Robot			Writing		
	Mean	***SD***	***n***	***Mean***	***SD***	***n***
ΔVal	2.74	0.83	12	1.56	0.84	11
ΔValP	2.68	0.84	12	1.31	1.16	11
ΔValN	2.79	0.96	12	1.77	0.75	11
MRel	4.17	1.04	12	4.25	1.31	11
MNov	3.27	0.92	12	4.52	0.56	11
With emotional outliers: n = 23						
ΔVal	2.65	0.80	10	1.69	0.83	7
ΔValP	2.55	0.81	10	1.42	1.21	7
ΔValN	2.75	0.95	10	1.96	0.78	7
MRel	4.13	0.80	10	1.70	0.83	7
MNov	3.45	1.02	10	4.49	0.64	7
Without emotional outliers: n = 17						

3.4.1. Valence as a Bipolar Scale in High-Negative Subjects

For n = 23, the GLM multivariate on *ΔVal* and *MRel* showed that, with Novelty (*MNov*) as a covariate, Media (robot vs. writing) exerted significant multivariate effects (V = .46, $F_{(2,19)}$ = 8.09, p = .003, η_p^2 = .46). Media had a significant and moderately strong univariate effect on *ΔVal* ($F_{(1,20)}$ = 8.80, p = .008, η_p^2 = .31) but not on *MRel* ($F_{(1,20)}$ = 2.16, p = .16, η_p^2 = .10).

MNov also showed significant multivariate effects (V = .47, $F_{(2,19)}$ = 8.42, p = .002, η_p^2 = .47) on *MRel* alone ($F_{(1,20)}$ = 16.85, p = .001, η_p^2 = .46), not on *ΔVal* (F < 1, p = 459).

After removing *MNov* as a covariate, we found that Media still evoked multivariate effects (V = .40, $F_{(2,20)}$ = 6.79, p = .006, η_p^2 = .40), substantiated by a significant and moderately strong effect of Media on *ΔVal* ($F_{(1,21)}$ = 11.51, p = .003, η_p^2 = .35). There was no significant effect on *MRel* ($F_{(1,21)}$ = .03, p = .867, η_p^2 = .001).

With emotional outliers included, then, talking to a robot ($M_{\Delta Val}$ = 2.74, SD = .83) had a more positive impact on Valence (bipolar conception) than did writing ($M_{\Delta Val}$ = 1.56, SD = .84) after negative mood induction.

For n = 17, without outliers, the GLM multivariate on *ΔVal* and *MRel* showed that, with Novelty as a covariate, significant multivariate effects were established (V = .38, $F_{(2,13)}$ = 3.94, p = .046, η_p^2 = .38). There was a main effect close to being significant of Media on *ΔVal* ($F_{(1,14)}$ = 4.07, p = .063, η_p^2 = .23), but not on *MRel* ($F_{(1,14)}$ = 2.23, p = .157, η_p^2 = .14).

Multivariate effects for *MNov* were significant (V = .44, $F_{(2,13)}$ = 5.16, p = .022, η_p^2 = .44), again for covarying with *MRel* ($F_{(1,14)}$ = 10.87, p = .005, η_p^2 = .44) but not with *ΔVal* ($F_{(1,14)}$ = .15, p = .700, η_p^2 = .01).

After removing *MNov* as a covariate, we found that no significant multivariate effects were present any more (V = .30, $F_{(2,14)}$ = 3.04, p = .080, η_p^2 = .30), although "under the surface" the between-subjects effects showed a significant effect of Media on *ΔVal* ($F_{(1,15)}$ = 5.64, p = .031, η_p^2 = .27) into the expected direction: Robot ($M_{\Delta Val}$ = 2.65, SD = .80) was higher than Writing ($M_{\Delta Val}$ = 1.69, SD = .83). There was still no significant effect of Media on *MRel* ($F_{(1,15)}$ = .074, p = .790, η_p^2 = .005).

3.4.2. Positive and Negative Valences as Two Unipolar Scales in High-Negative Subjects

For n = 23, we ran two GLM repeated measures of Media (two conditions) on a within-subjects factor (*ΔValP vs. ΔValN*) with *MRel* and *MNov* separately used as covariates. Multivariate tests showed that no significant effects occurred for *ΔValP vs. ΔValN*

(V = .02, $F_{(1,20)}$ = .36, p = .555, η_p^2 = .02). The height of positive and negative valence did not differ. The interaction of (*ΔValP vs. ΔValN*) with Media was also not significant (V = .04, $F_{(1,20)}$ = .78, p = .387, η_p^2 = .04), nor was *MRel* as a covariate (V = .003, $F_{(1,20)}$ = .06, p = .815, η_p^2 = .003; $F_{(1,20)}$ = 3.78, p = .066, η_p^2 = .16). However, the main effect of Media was significant ($F_{(1,20)}$ = 13.54, p = .001, η_p^2 = .40), showing that robots exerted higher levels of undifferentiated Valence (non-unipolar) than writing on paper. We repeated the test but with Novelty as the covariate, but *MNov* did not significantly contribute to any of the effects.

Then, we did the same for the data set of n = 17. We ran two GLM repeated measures of Media (two conditions) on within-subjects factor (*ΔValP vs. ΔValN)* with *MRel* and *MNov* as separate covariates. Multivariate tests showed that no significant effects were obtained for *ΔValP vs. ΔValN* (V = .008, $F_{(1,14)}$ = .11, p = .749, η_p^2 = .008). Here, as well, the heights of positive and negative valences did not differ. The interaction of (*ΔValP vs. ΔValN*) with Media was also not significant (V = .03, $F_{(1,14)}$ = .48, p = .498, η_p^2 = .033), nor was *MRel* as a covariate (V = .000, $F_{(1,14)}$ = .06, p = .936, η_p^2 = .000). Yet, the main effect of Media remained significant ($F_{(1,14)}$ = 5.98, p = .028, η_p^2 = .30). Repeating the analysis with Novelty as the covariate did not change these results (V = .011, $F_{(1,14)}$ = .16, p = .695, η_p^2 = .011) except for the main effect of Media, which now came close to being significant ($F_{(1,14)}$ = 4.07, p = .063, η_p^2 = .23).

3.4. Exploratory Analysis: Gender and Novelty

In the previous section, we saw that Novelty mainly affected Relevance, indicating that a medium becomes more relevant the newer it is to those who are emotionally affected but not too much. In Section 3.1, we found in turn that Novelty was affected by gender. Therefore, we explored the Media × gender effects on Novelty with Univariate ANOVA for both data sets N = 45 and n = 31. The research question was if robots were newer to females than to men or v.v.?

With N = 45, only the main effects were significant: robots (M = 4.10, SD = .87) were perceived as newer than writing (M = 3.41, SD = .77) ($F_{(1,41)}$ = 9.50, p = .004, η_p^2 = .19). This was independent of gender. Females (n = 24, M = 4.03, SD = .83) experienced more novelty than did males (n = 21, M = 3.50, SD = .87) ($F_{(1,41)}$ = 5.98, p = .019, η_p^2 = .13), irrespective of the medium (Figure 19).

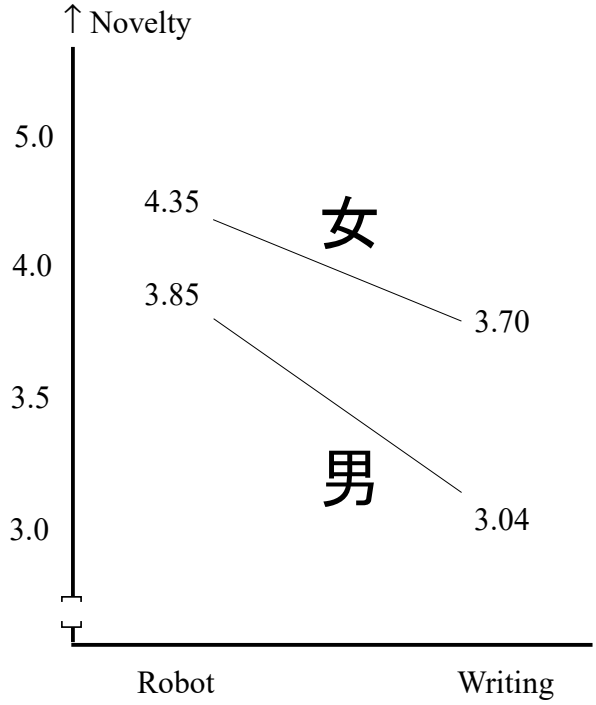

Figure S19. Effects of gender (女: female, 男: male) and Media on Novelty (N = 45).

With n = 31, only one main effect was significant: females (n = 15, M = 4.23, SD = .74) experienced more novelty than males (n = 16, M = 3.51, SD = .95) ($F_{(1,27)}$ = 5.35, p = .029, η_p^2 = .17), and medium showed no significant effects ($F_{(1,27)}$ = 2.98, p = 0.95). In sum, females experienced more novelty but not particularly with respect to robots.

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Appendix 1

Structured questionnaires for self-disclosure to a robot or on paper in Chinese and English.

1.1. Robot Chinese

先生/女士你好：

感謝您參與我們的實驗。這裡我們希望花費你短短幾分鐘回答幾條問題。

你有權隨時終止填寫問卷而不需作出任何解釋。你可電郵至_euphie.duan@connect.polyu.hk 與我們的首席調查員 Euphie 討論這個研究項目。

當你點擊以下按鈕，即表示同意你是 18 歲以上人士，並自願參與此項目。你了解你有權隨時及以任何原因終止參與這項研究。由參與者提供的數據將會作匿名處理，分析後的結果會記載在此研究的論文中。

這項研究是由香港理工大學監督。

感謝你的參與。

Social Robot MEME 團隊

- o 我同意參與這項研究
- o 我不同意參與這項研究

I. 在看了这段影片后，请如实告诉我们您的感受:
Vb1i 我感覺良好

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb2i 我覺得舒服

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb3i 我有產生正面積極的情緒

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6
Vb4i 我感到樂觀

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb5c 我感覺不好

完全不同意 不同意 有點不同意 有點同意 同意 完全同意

1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb6c 我感到不適

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb7c 我有產生負面的情緒

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb8c 我感到悲觀

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

II. 與機器人聊天後，您感覺如何？

Vb1i 我感覺良好

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb2i 我覺得舒服

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb3i 我有產生正面積極的情緒

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6
Vb4i 我感到樂觀

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb5c 我感覺不好

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb6c 我感到不適

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb7c 我有產生負面的情緒

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb8c 我感到悲觀

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

III. 我認為與機器人聊天對我的情緒調控
Re1i 有用
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Re2i 有效
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Re3c 無效
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Re4c 沒用
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

IV. 我認為與機器人聊天這種方式
No1i 是新穎的
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No2i 是原創的
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No3i 是意想不到的
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No4c 是在我的預想之內的
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No5c 是普通的
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No6c 是老土的
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

V. 其它信息
De1 性別

女
男
其它

De2 年齡

De3 學歷 (最高學歷或現時正修讀)

小學或以下
中學
大專 / 副學士 / 文憑
大學本科
碩士

博士或以上

De4 種族

亞洲
非洲
歐洲
北美洲
南美洲
澳洲/大洋洲
南極洲

感謝你填寫這份問卷。
如果你對這份問卷有任何問題或想要補充，請寫在以下空格。

Social Robot MEME 團隊

1.2. Robot English

Dear Sir/Madam,

Thank you for your time for our experiment. We would like to ask you to answer a few questions. Answering these questions will only take a few minutes.

You have the right to withdraw at any point during the study, for any reason, and without any prejudice. If you would like to contact the Principal Investigator in the study to discuss this research, please e-mail Euphie via euphie.duan@connect.polyu.hk.

By clicking the button below, you acknowledge that your participation in the study is voluntary, you are 18 years of age, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason. The data provided by the participants of the study will be processed and published anonymously in the results sections of the paper.

This study is supervised by The Hong Kong Polytechnic University.

Thank you for your participation.

With kind regards,
Team Social Robot MEME

- o I agree to participate in this study
- o I do not agree to participate in this study

I. After seeing the film samples

Vb1i I feel good

Totally disagree Disagree Disagree a little Agree a little Agree Totally agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb2i I am well

Totally disagree Disagree Disagree a little Agree a little Agree Totally agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb3i I have positive feelings

Totally Disagree Agree a Totally

disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb4i I am optimistic

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb5c I feel bad

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb6c I am unwell

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb7c I have negative feelings

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb8c I am pessimistic

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

II. After talking to the robot

Vb1i I feel good

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb2i I am well

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb3i I have positive feelings

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb4i I am optimistic

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb5c I feel bad

Totally disagree Disagree Agree a little Totally disagree Disagree a little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb6c I am unwell

Totally disagree Disagree Agree a little Totally disagree Disagree a little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb7c I have negative feelings

Totally disagree Disagree Agree a little Totally disagree Disagree a little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb8c I am pessimistic

Totally disagree Disagree Agree a little Totally disagree Disagree a little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

III. To regulate my emotions, talking to the robot is

Re1i Talking the robot is useful

Totally disagree Disagree Agree a little Totally disagree Disagree a little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Re2i Taliking to the robot is worthwhile

Totally disagree Disagree Agree a little Totally disagree Disagree a little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Re3c Talking to the robot is worthless

Totally disagree Disagree Agree a little Totally disagree Disagree a little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Re4c Talking to the robot is useless

Totally disagree Disagree Agree a little Totally disagree Disagree a little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

IV. Talking to a robot

No1i Talking to a robot is novel

Totally disagree Disagree Agree a little Totally disagree Disagree a little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No2i Talking to a robot is original

Totally disagree Disagree Disagree a little Agree a little Agree Totally agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No3i Talking to a robot is unexpected

Totally disagree Disagree Disagree a little Agree a little Agree Totally agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No4c Talking to a robot is predictable

Totally disagree Disagree Disagree a little Agree a little Agree Totally agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No5c Talking to a robot is commonplace

Totally disagree Disagree Disagree a little Agree a little Agree Totally agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No6c Talking to a robot is old-fashioned

Totally disagree Disagree Disagree a little Agree a little Agree Totally agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Other information

De1 Gender

Female
Male
Other

De2 Age

De3 What is your highest completed education or current education level?

Primary school or below
Secondary school
Post-secondary school / Associate Degree / Diploma
University undergraduate
Master degree
Doctoral degree or above

De4 Ethnicity

Asia
Africa
Europe
North America
South America
Australia/Oceania
Antarctica

If you have any further questions or remarks about this questionnaire, please let us know.
You can write your feedback below.

Kind regards,

Social Robot MEME
euphie.duan@connect.polyu.hk

2.1. Writing Chinese

先生/女士你好：

感謝您參與我們的實驗。這裡我們希望花費你短短幾分鐘回答幾條問題。

你有權隨時終止填寫問卷而不需作出任何解釋。你可電郵至_euphie.duan@connect.polyu.hk 與我們的首席調查員 Euphie 討論這個研究項目。

當你點擊以下按鈕，即表示同意你是 18 歲以上人士，並自願參與此項目。你了解你有權隨時及以任何原因終止參與這項研究。由參與者提供的數據將會作匿名處理，分析後的結果會記載在此研究的論文中。

這項研究是由香港理工大學監督。

感謝你的參與。

Social Robot MEME 團隊

- 我同意參與這項研究
- 我不同意參與這項研究

I. 在看了这段影片后，请如实告诉我们您的感受:
Vb1i 我感覺良好

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb2i 我覺得舒服

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb3i 我有產生正面積極的情緒

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6
Vb4i 我感到樂觀

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb5c 我感覺不好

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb6c 我感到不適

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb7c 我有產生負面的情緒

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb8c 我感到悲觀

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

II. 将自己的情緒寫出來後，您感覺如何？

Vb1i 我感覺良好

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb2i 我覺得舒服

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb3i 我有產生正面積極的情緒

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6
Vb4i 我感到樂觀

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb5c 我感覺不好

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb6c 我感到不適

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb7c 我有產生負面的情緒

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb8c 我感到悲觀

完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

III. 我認為書寫對我的情緒調控
Re1i 有用
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Re2i 有效
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Re3c 無效
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Re4c 沒用
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

IV. 我認為書寫這種方式
No1i 是新穎的
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No2i 是原創的
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No3i 是意想不到的
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No4c 是在我的預想之內的
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No5c 是普通的
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No6c 是老土的
完全不同意 不同意 有點不同意 有點同意 同意 完全同意
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

V. 其它信息
De1 性別

女
男
其它

De2 年齡

De3 學歷 (最高學歷或現時正修讀)

小學或以下
中學
大專 / 副學士 / 文憑
大學本科
碩士
博士或以上

De4 種族

亞洲
非洲
歐洲
北美洲
南美洲
澳洲/大洋洲
南極洲

感謝你填寫這份問卷。
如果你對這份問卷有任何問題或想要補充，請寫在以下空格。

Social Robot MEME 團隊
euphie.duan@connect.polyu.hk

2.2. Writing English

Dear Sir/Madam,

Thank you for your time for our experiment. We would like to ask you to answer a few questions. Answering these questions will only take a few minutes.

You have the right to withdraw at any point during the study, for any reason, and without any prejudice. If you would like to contact the Principal Investigator in the study to discuss this research, please e-mail Euphie via euphie.duan@connect.polyu.hk.

By clicking the button below, you acknowledge that your participation in the study is voluntary, you are 18 years of age, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason. The data provided by the participants of the study will be processed and published anonymously in the results sections of the paper.

This study is supervised by The Hong Kong Polytechnic University.

Thank you for your participation.

With kind regards,
Team Social Robot MEME

- o I agree to participate in this study
- o I do not agree to participate in this study

I. After seeing the film samples

Vb1i I feel good

Totally disagree Disagree Agree a little Totally disagree Disagree a little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb2i I am well

Totally disagree Disagree Agree a little Totally disagree Disagree a little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb3i I have positive feelings

Totally disagree Disagree Agree a little Totally disagree Disagree a little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb4i I am optimistic

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb5c I feel bad

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb6c I am unwell

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb7c I have negative feelings

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb8c I am pessimistic

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

II. After writing down my feelings

Vb1i I feel good

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb2i I am well

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb3i I have positive feelings

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb4i I am optimistic

Totally Disagree Agree a Totally
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb5c I feel bad

Totally disagree Disagree Agree a little Totally agree
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb6c I am unwell

Totally disagree Disagree Agree a little Totally agree
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb7c I have negative feelings

Totally disagree Disagree Agree a little Totally agree
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Vb8c I am pessimistic

Totally disagree Disagree Agree a little Totally agree
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

III. To regulate my emotions, writing is

Re1i Writing is useful

Totally disagree Disagree Agree a little Totally agree
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Re2i Writing is worthwhile

Totally disagree Disagree Agree a little Totally agree
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Re3c Writing is worthless

Totally disagree Disagree Agree a little Totally agree
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Re4c Writing down my feeling is useless

Totally disagree Disagree Agree a little Totally agree
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

IV. How do you think of writing down your feelings?

No1i Writing is novel

Totally disagree Disagree Agree a little Totally agree
disagree Disagree a little little Agree agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No2i Writing is original

Totally disagree Disagree Disagree a little Agree a little Agree Totally agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No3i Writing is unexpected

Totally disagree Disagree Disagree a little Agree a little Agree Totally agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No4c Writing is predictable

Totally disagree Disagree Disagree a little Agree a little Agree Totally agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No5c Writing is commonplace

Totally disagree Disagree Disagree a little Agree a little Agree Totally agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

No6c Writing is old-fashioned

Totally disagree Disagree Disagree a little Agree a little Agree Totally agree
1 ------- 2 ------- 3 ------- 4 ------- 5 ------- 6

Other information

De1 Gender

Female
Male
Other

De2 Age

De3 What is your highest completed education or current education level?

Primary school or below
Secondary school
Post-secondary school / Associate Degree / Diploma
University undergraduate
Master degree
Doctoral degree or above

De4 Ethnicity

Asia
Africa
Europe
North America
South America
Australia/Oceania
Antarctica

If you have any further questions or remarks about this questionnaire, please let us know.

You can write your feedback below.

Kind regards,

Social Robot MEME
euphie.duan@connect.polyu.hk

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