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To Move or Not to Move? Social Acceptability of Robot Proxemics Behavior Depending on User Emotion

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***Abstract*— Various works show that proxemics occupies an important role in human-robot interaction and that appropriate proxemic interaction depends on many characteristics of humans and robots. However, there is none that shows the relationship between an emotional state expressed by a user and a proxemic reaction of the robot to it, in a social interaction between these interactants. In the current experiment (N = 82), we investigate this using an online study in which we examine which proxemic response (i.e., approaching, not moving, moving away) to a person's expressed emotional state (i.e., anger, fear, disgust, surprise, sadness, joy) is perceived as appropriate. The quantitative and qualitative data collected suggests that the robot's approach was considered appropriate for the expressed fear, sadness, and joy, whereas moving away was perceived as inappropriate in most scenarios. Further exploratory findings underline the importance of appropriate nonverbal behavior on the perception of the robot.**

I. Introduction

Do you have a smart speaker at home with a virtual assistant like Google Assistant, Alexa or Siri? Then you live in one of the growing number of households where such smart speakers are being used. Their application range from processing easy voice commands to supporting everyday tasks (e.g., playing music, reminders, or timers) or providing social services that might reduce people's loneliness [1]. Due to the way smart speakers work, they are often limited to auditive interactions and they are fixed to a location where they have been positioned. These are disadvantages that robots do not have due to their stronger embodied presence. Physically embodied social robots enable interactive social communication using various communication channels, e.g., verbal and nonverbal communication or proxemics.

These capabilities enable robots to impact many areas of our daily lives in the future, just as smart speakers do today. But for that to happen, social robots must be designed in such a way that users not only tolerate them, but also accept them. To achieve this ultimate goal, robots must be able to engage in socially and emotionally adequate interactions. This can be facilitated or hindered by a robot's capability to move in physical space, as such movement transports meaning [2]. This is linked to the idea that movement in physical space represents a form of nonverbal communication. Edward T. Hall [3] coined this proxemics.

In this paper, we investigate the relationship between an emotion expressed by a human and the subsequent spatial interaction (i.e., approaching, no movement, or moving away) of a social robot and how this robot behavior affects perceived social adequacy of the behavior, the robot's perceived likeability, and uncanniness. To test this, we use the robot platform "VIVA", a humanoid robot specifically designed to interact with humans in a social manner.

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II. Related Work

A. Proxemics

Proxemics, i. e., the spatial interaction as a non-verbal form of communication, is something humans naturally engage in during interactions with fellow humans in everyday life [3]. It is quite common for humans to maintain a certain physical distance when others are co-present or move to close to one's "comfort zone", meaning that they - by accident or on purpose - enter our personal space. When this happens, people may experience discomfort. Analogously, however, once a robot enters the personal space of humans, this might result in similar mixed feelings. Accordingly, previous research has provided evidence for the fact that robots' proxemics behaviors may better match the distances chosen to maintain smooth and comfortable in human-human interactions [4], [5]. However, what represents an adequate social distance between humans and robots? Previous research has tried to gain insights into this empirical issue. A common paradigm investigates human responses to robot approach behavior, i.e., researchers monitor when exactly a human stops the robot, or if and when the human moves towards the robot. Moreover, previous research has explored determinants of proxemics behaviors in human-robot interaction (HRI): among these are characteristics of the robot such as voice [6], body pose [7], expressed emotion [8], or gaze direction [9], but also characteristics of the human such as previous experience with robots [6], ownership of pets [9], personality traits [10], body pose [7], and also culture [11]. The work by Narayanan et al. has also considered user emotion for their socially-aware navigation [12]. However, this is not done in a direct interaction between a person and a robot, but rather it is used to avoid other persons.

In many of the existing studies, proxemics studied in isolation, with the primary focus on the "right" physical distance depending on various factors. Yet, in everyday interactions, proxemics behaviors merely represent one among other means of indirect, nonverbal communication, serving to complement other communication channels. For example, a verbal encouragement has a much stronger effect on a person if you simultaneously approach that person than if you remain standing. For such kind of interaction, it is necessary to recognize the emotional state of one's interaction partner. With the help of modern approaches such as machine learning based methods, the existing sensory technology of robots can be extended. Consequently, the robot may not only process spatial information, but also may interpret the emotion expression of the human interaction partners [13], [14]. Accordingly, the robot can adapt its spatial behaviors to the emotional status of the interactant.

It is an open research issue as to how to construct such constellation. That is, it needs to be investigated what such an interaction should ideally look like and how this impacts the acceptance of robots in society.

B. Affective Human-Robot Interaction

Non-verbal emotional feedback such as emotional facial expressions or movements play an important role in the interaction between humans [15]. Based on this information, one can quickly and reliably assess the state of the interaction (e.g., whether a person is interested, scared, or hostile). In addition, nonverbal emotion displays also affect our interaction with others. For example, the extent to which we sympathize with others depends on their ability to resonate with us and to respond with empathy [16], [17].

Nonverbal communication likewise represents an important source of information in human-robot interaction. To illustrate, a vast amount of existing literature has focused on (1) the robots' facial expression of emotions (for a review, consult [15], [18]) and (2) the robots' ability to recognize facial emotions of humans (e.g., [19], [20]). Humans tend to prefer robots that have the ability to recognize human emotions and which are able to express emotions [21]. Currently, however, there are only a few robots that can indeed perceive or express emotions. For instance, the KAPPA [22] is able to recognize emotions based on facial expressions and can express itself six basic emotions. The Minotaur robot [23] can interact with humans using gestures, speech, and facial expressions. Tsiourti et al. [24] investigated the influence of multimodal emotional reactions (i.e., body language and voice) of a robot on user perception. They found that users perceived the robot as less empathetic when it showed incongruent behaviors. This affected their liking towards the robot. The authors point out that it is important that robots use multimodal, congruent behaviors when interacting with humans.

Therefore, in addition of using facial expressions, proximity behavior could be used by the robot to show a congruent and therefore appropriate behavior towards humans. The proximity behavior of the robot should due to the reciprocity nature of social interactions be related to the emotional state of the human counterpart (e.g., forward movement when user is happy, distancing when the user is angry).

But what proximity behavior is an appropriate reaction? Our study contributes to answer this question. We investigate which proximity behavior of a robot (i.e., approaching, no movement, or moving away) is appropriate depending on the emotional expression of the human counterpart.

III. The Present Experiment

In the present experiment, we investigated the role of robot proxemics behaviors in response to specific user emotions. Concretely, we explored the perceived social adequacy of the robot's reaction. We did so by showing participants six animated videos of human-robot interactions. In each video, the human protagonist verbally expressed one of the basic emotions (i.e., anger, fear, disgust, surprise, sadness, or joy) and the robot VIVA randomly showed one of three proximity-related behaviors (a=approaching, b=no movement, c=moving away). The following hypotheses were tested:

- **H1a-6a**: When the protagonist expresses *[emotion]*(emotion: anger = 1a, fear = 2a, disgust = 3a, surprise = 4a, sadness = 5a, joy = 6a) and the robot approaches the user, this behavior is evaluated as appropriate.
- **H1b-6b**: When the protagonist expresses *[emotion]*(emotion: anger = 1b, fear = 2b, disgust = 3b, surprise = 4b, sadness = 5b, joy = 6b) and the robot does not move, this behavior is evaluated as appropriate.
- **H1c-6c**: When the protagonist expresses *[emotion]*(emotion: anger = 1c, fear = 2c, disgust = 3c, surprise = 4c, sadness = 5c, joy = 6c) and the robot moves away, this behavior is evaluated as appropriate.

As preregistered[1], we operationalized *appropriate* using three criteria: (1) The mean social acceptability is significantly higher than four, (2) the mean likeability is significantly higher than four and (3) and the perceived uncanniness is significantly lower than four.

Using G*Power, we estimated a required sample size of n = 27 for a t-test against a constant with 80% power and an alpha of 5%. The calculation of correlations requires larger sample sizes: To be able to calculate exploratory correlations, we will stop data collection at 82 complete responses (calculation for two-tailed correlations with 80% power, alpha = 5%, medium-size effect).

IV. Method

A. Participants and Design

As preregistered, 82 participants were recruited online to participate in a study concerning the design of the newly developed social robot VIVA. We intended to exclude participants who indicated not having participated meticulously, but this criterion did not apply to any participant. The data of 82 participants were included in the analysis (24 female, 58 male; M_{age} = 26.67, SD_{age} = 7.32). All participants

[1] `https://aspredicted.org/i8xn2.pdf`

were students (55 Psychology, 22 other). Participants rated six human-robot interaction scenarios, that is, one scenario per emotion (IV1 (within): anger, fear, disgust, surprise, sadness, joy), while the robot behavior was randomized (IV2 (between): approaching, no movement, moving away), respectively.

B. Experimental Manipulation

To manipulate robot proxemics behavior and user emotion, we provided a series of animated videos. The manipulation consisted of three videos depicting human-robot interaction, with the robot approaching, not moving, or moving away from the human protagonist. For each emotion condition, we presented an introductory text, describing an interaction and an emotional reaction by the protagonist. Each participant saw one video per emotion (six videos in total), while the respective robot behavior (approaching, no movement, or moving away) was chosen at random. All the scenarios described in the videos and the protagonist's emotional reaction to the robot can be found in the appendix. Subsequently, in every interaction, the robot responded with "I understand". This was done to keep the verbal level constant across all conditions.

Further, protagonist gender was matched to participant gender. Participants indicating a non-binary gender identity would have been shown a random protagonist, however, in this sample all participants identified as either male of female.

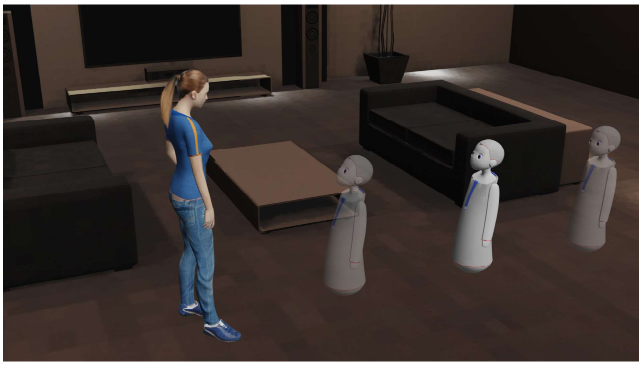

Fig. 1. The image shows the perspective in the videos (example for female participants) and the positioning of the robot to the person. The transparent robots in the image show the positions after approaching or moving away from the person.

C. Measures

Attitudes towards robots are not always clearly positive or negative, but rather ambivalent, calling for a multi-method approach in analyzing user feedback [25]. We therefore measured social appropriateness of the robots behavior, robot likeability, and uncanniness as the main variables of interest. Social appropriateness is defined as the degree to which users understand a robots behavior and perceive it as predictable [26]. Further, robot likeability is the degree to which the robot appears sympathetic and well-meaning [27]. In order to account for the multidimensional nature of attitudes, we further assessed perceived robot uncanniness [28]. Considering the ambivalent and multidimensional nature of attitudes by utilizing multiple measures provides a comprehensive look on attitudes and potential attitudinal conflict (subjective ambivalence. cf. [29]. Unless otherwise specified, all items were assessed on a scale from 1 (not at all) to 7 (very).

1) Social Adequacy: We measured the perceived social adequacy of the robot's behavior using one self-generated item: "How socially appropriate do you find VIVA's non-verbal behavior (here: VIVA's movement) in the situation depicted in the video?".

2) Likeability: We measured the robots likeability using six items (five items adapted from [27] and one item from [30]), e.g., "VIVA is likeable".

3) Uncanniness: We measured the perceived uncanniness of the robot using three items from [28] (i.e., uncomfortable, insecure, frightened), with which participants indicated to what degree the robot evoked certain feelings while watching the interaction in the video.

4) Exploratory Variables: After each scenario we additionally measured perceived robot agency and experience using four items adapted from [31], e.g., "VIVA is able to understand how other people feel". Further, to assess attitudinal conflict, which is a prevalent characteristic of attitudes towards robots [25], we employed a measure of subjective ambivalence (i.e., perceived attitudinal conflict) concerning the interaction using three items adapted from [29], e.g., "To what degree do you have conflicting thoughts or feelings concerning this interaction?", and social adequacy of the robots verbal behavior using one self-generated item: "How socially appropriate do you find VIVA's verbal behavior (what VIVA says) in the situation depicted in the Video?". In addition, participants were given the opportunity to provide reasons for their judgements of verbal and nonverbal adequacy via free-form feedback. Further, after all videos were evaluated, we assessed individual variables, such as contact intentions towards the robot using five items adapted from [32], e.g., "To what degree would you like to meet VIVA?", trust towards the robot using four items adapted from [33], e.g., evaluating the robot as dishonest vs. honest, subjective ambivalence concerning robots in general using three items from [29], e.g., "To what degree do you have conflicting thoughts or feelings concerning robots in general?", loneliness using the five item UCLA Loneliness scale in the German version [34], e.g., "I feel isolated from others.", and technology commitment using eight items adapted from [35], e.g., "Modern technologies make me curious". Concerning demographics, we assessed gender, age, student status, and area of study. Finally, we assessed previous robot contact by asking whether participants had contact with a robot before and if so, with which one and in what context, and included an attention check.

D. Procedure

After providing informed consent, participants were instructed to evaluate the social adequacy of the robot's behavior. We included definitions of social adequacy and social robots and a short description of the VIVA robot's functionality. We then assessed demographics in order to provide participants with videos matching their gender in order to facilitate immersion. Participants then watched the first human-robot interaction video and evaluated verbal and nonverbal social adequacy, likeability, perceived uncanniness, perceived agency, and experience, and subjective ambivalence concerning the interaction. After evaluating all six scenarios, we assessed contact intentions, trust, subjective ambivalence towards robots, loneliness, technology commitment, previous robot contact, and an attention check.

V. Results

A. Quantitative Data

We used the statistical software R to conduct analyses and performed the analyses according to the preregistration. Thus, we first tested whether approaching (H1a-6a), no movement (H1b-6b), or moving away (H1c-6c) would be an appropriate reaction for the emotion shown by the protagonist. Importantly, a behavior is deemed as "appropriate" when the following criteria are fulfilled: We assumed that a robot behavior is viewed as adequate when the mean social adequacy would be significantly higher than the scale mean (4), likeability would be rated significantly higher than four, and uncanniness would be rated significantly lower than four. To test this, we performed a total of 54 (6 emotions x 3 behaviors x 3 scales) one-sided t-tests to test the values against the scale mean of four. To prevent alpha-error cumulation, we only interpreted p values below .001 as significant, according to a Bonferroni Correction. For a complete overview of the data refer to table in appendix. The results of the tests show that the robot's likeability was not rated higher than four in any of the scenarios and thus, according to our assumption, none of the robot's reactions can be rated as appropriate (see figure 3). However, all of the scenarios shown (except for H4c, i.e., moving away in case of surprise) were rated significantly lower than four for uncanniness (see figure 4). An analysis of the ratings of perceived social adequacy revealed above average ratings for approach (H1a-6a) after the shown emotions fear (H2a) and sadness (H5a) (see figure 2). That is, the respective behaviors were rated as socially adequate.

1) Exploratory Analyses: Concerning the exploratory variables, we used Person correlation analyses to explore the statistical relationship of perceived social adequacy with the other variables with an adjusted alpha of $p < .001$. Perceived social adequacy of the robot behavior correlated significantly with contact intentions ($r(80) = .42$, $p < .001$), trust ($r(80) = .46$, $p < .001$), likeability ($r(80) = .62$, $p < .001$), agency/experience ($r(80) = .64$, $p < .001$), and perceived social adequacy of the nonverbal behavior ($r(80) = .67$, $p < .001$). The correlations with objective ambivalence($r(80) = .32$, $p = .004$), technology commitment ($r(80) = .04$, $p = .704$), loneliness ($r(80) = -.04$, $p = .711$), subjective ambivalence towards the VIVA robot ($r(80) = -.18$, $p = .100$), subjective ambivalence towards robots in general ($r(80) = -.13$, $p = .242$), and uncanniness ($r(80) = -.14$, $p = .209$) were non-significant.

B. Qualitative Data

In order to gain further insight into participant's evaluations of the respective robot behavior, we analysed the qualitative responses where participants had the opportunity to explain their rating of social adequacy. The following statements refer to the non-verbal behavior of the robot. The statements were cleaned of generic statements such as "the robot does not move" or "moves away from the person" without further explanation to leave the statements that show what the participants interpreted into the robot's movement.

1) Anger: Participants who saw the robot's approach response rated the behavior as "empathetic", "reassuring", and also that the approach 'speaks for trust'. On the other hand, several comments were also made that the "approach would not have been necessary" or "why it [the robot] was approaching the person". One comment even described the approach as "inappropriate". In videos without movement, there were no comments. When the robot moved away, some people showed understanding for the action, since "danger arises from the emotion of anger" or, when the word "angry" is used, the robot "may be assuming aggression" or the robot "may be frightened". However, the behavior was also described as "escape-like" and " exaggerated".

2) Fear: The robot's approach when the protagonist showed fear was perceived as "succoring" by several participants. No movement resulted in comments that "the robot could have moved towards to provide comfort" and "VIVA remains still instead of moving towards the person", but that the robot "at least did not move away". Moving away was described as "dismissive", "disinterested", "not supportive", "not empathetic". The robot probably "doesn't want to have anything to do with the problem" and "a human wouldn't do that".

3) Disgust: For disgust, participants provided very few comments overall. Approaching was described "as if VIVA wanted to comfort me". Moving away was interpreted as "[the robot] is also disgusted" and was described as "an acceptable reaction to disgust". However, one comment also stated that disgust "does not require any particular movement towards/away from a person".

4) Surprise: Approaching on surprise was commented that the robot comes closer "to give comfort". However, one person also wrote that there was "no reason" for the robot to move closer. No movement was described as being "disinterested" and "apathetic". However, the most comments were made when the robot was moving away. Here the robot was described as "unemotional" because it "does not assist" the person. The "avoiding instead of approaching the person" and "distancing, although the person may be afraid" were taken negatively and it was said that the robot should have "physically assisted" the person or that it would have been better to "just stand still".

5) Sadness: A total of five of eight comments interpreted coming closer when showing sadness as "giving comfort",

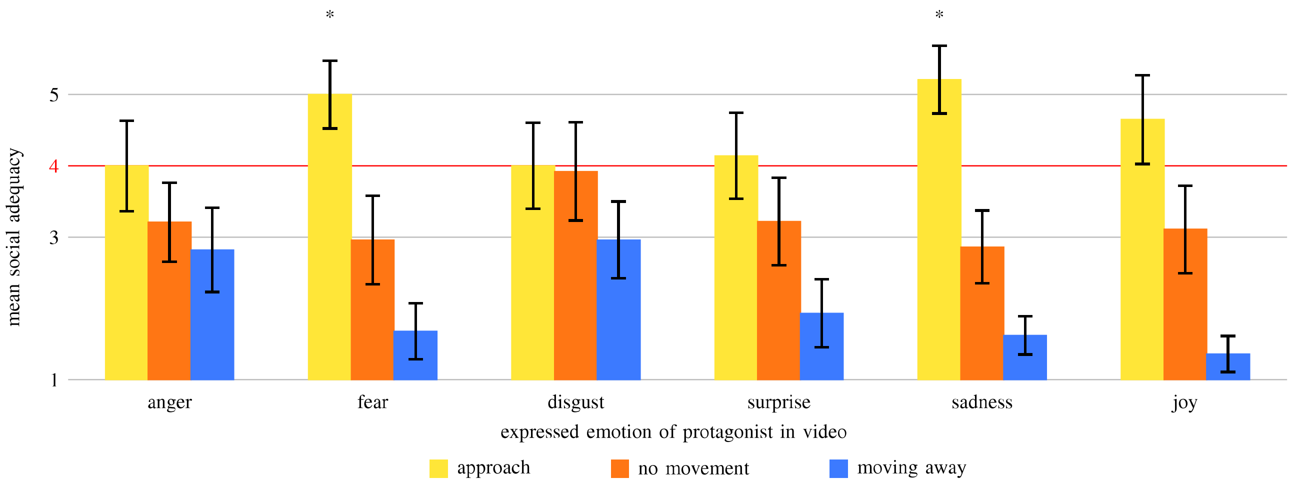

Fig. 2. Overview of mean values for each expressed emotion of the protagonist and corresponding proxemic interaction of the robot for the scale social adequacy. Error bars denote 95% confidence intervals. Scale ranges from 1 to 7. $*p < .001$ against mean score of 4.

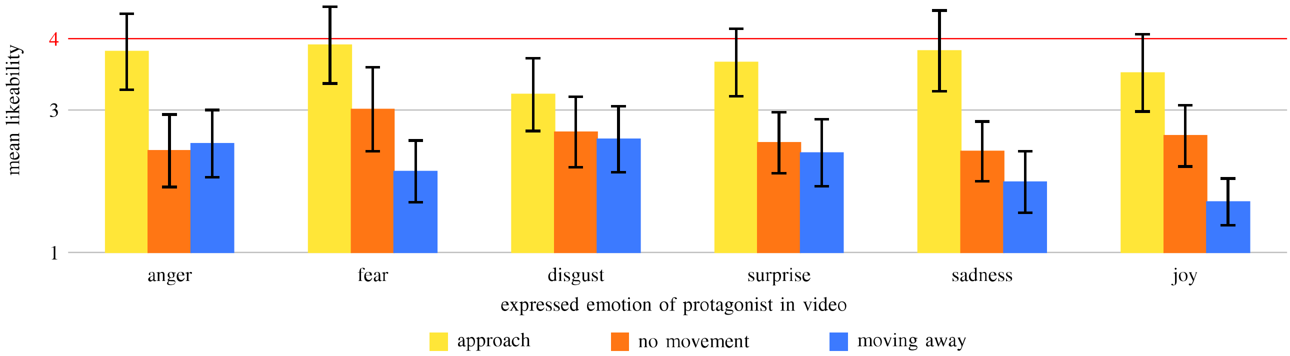

Fig. 3. Overview of mean values for each expressed emotion of the protagonist and corresponding proxemic interaction of the robot for the scale likeability. Error bars denote 95% confidence intervals. Scale ranges from 1 to 7. $*p < .001$ against mean score of 4.

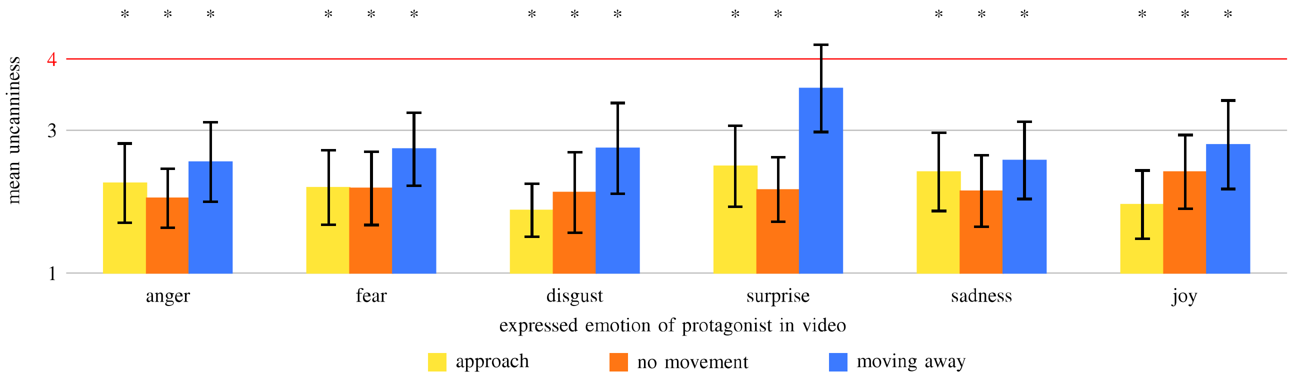

Fig. 4. Overview of mean values for each expressed emotion of the protagonist and corresponding proxemic interaction of the robot for the scale uncanniness. Error bars denote 95% confidence intervals. Scale ranges from 1 to 7. $*p < .001$ against mean score of 4.

but one comment described it as "showing pity" and one was questioning "why the robot was approaching". Only one comment described standing still as "not sympathetic". Moving away, on the other hand, was perceived negatively, and it was described that "no empathy is visible" in the robot and that the robot "retreats when the person is sad and needs closeness". It was also commented that the robot "should move towards the person".

6) Joy: After showing joy, approach behavior was interpreted as "shares the joy" and the robot "shares the joy". No movement was interpreted as "reducing distance would have been expected" and that the behavior was "very unemotional" and "cold". Participants' comments also reflected a desire for "shared joy" through movement. "By rolling away, VIVA eludes further interaction" and the robot "signalizes not wanting to continue the conversation" was commented when moving away. The robot rolling away "as if the person had done something bad" during joy was not well received and it was mentioned that the robot should "join in the joy".

VI. Discussion and Conclusion

In order for robots to communicate with humans in the same way that humans communicate with each other, they must acquire skills that we humans are naturally capable of. As we argued at the beginning, this includes appropriate verbal and nonverbal responses to sensed emotions of the human counterpart. In the context of this work, we have focused on proxemics as part of nonverbal communication. With the help of the described study, we aimed to identify appropriate spatial responses (i.e., approach, no movement, moving away) to an expressed person's emotion. While we stated in the preregistration that a reaction was appropriate if the social adequacy rating of the nonverbal behavior and the likability rating were significantly higher than the mean rating (i.e., four on a scale of one to seven), as well as the uncanniness being significantly lower than the mean rating, the results showed that none of the reactions were able to satisfy these conditions. This was mostly due to the fact that none of the robot behaviors could reach the required rating in likability. This could be due to a variety of reasons, such as the robot not being perceived as likable enough overall, or the robot only saying "I understand" and not verbally being more specific about the particular emotion shown by the human counterpart. While we were able to reduce any influence of the verbal statement on the rating of the nonverbal behavior in this way, the rating of the robot's likability may have suffered as a result. Consequently, if we remove the sympathy rating as a criterion, a total of two behaviors would meet the criteria for appropriateness. These two behaviors are in both cases the approach to the expressed emotions fear and sadness.

To get a better understanding of how participants in our study feel about each of the robot's behaviors, we have analyzed the open-ended responses provided by our research participants. These revealed very few positive comments, whereas a wide range of comments was produced for aspects that were perceived in a negative way or that reflected a lack of comprehension. For example, none of the reaction options by the robot were deemed appropriate within the scenario in which the human expressed anger. This was reflected in both qualitative and quantitative data. If, on the other hand, the protagonist demonstrated fear, approaching was found to be an appropriate reaction, as shown by the quantitative data, but it also revealed clearly in the qualitative data that approach was perceived as comforting, while moving away was perceived very negatively. The same applies to the two emotions sadness and joy, where the quantitative data already show a clear tendency (even if not significant for joy) which is supported by the qualitative data. Here, too, moving away was criticised in both cases and no movement was not perceived positively either. Approach behavior, on the other hand, was interpreted as comforting or as if the robot wanted to share joy. Disgust was the emotion for which the fewest comments were produced overall. Accordingly, no clear tendency towards a specific spatial reaction by the robot can be inferred and quantitative results match this observation. None of the various robot behaviors were rated above average on social adequacy for disgust. That is, based on the current data, no behavior was found particularly acceptable following disgust, and further research might be necessary to determine a more suitable robot behavior.

Exploratory findings underlined the importance of an adequate nonverbal robot behavior for likeability, trust, behavioral intentions towards the robot (contact intentions), and mind attribution (agency/experience). Dispositional variables such as technology commitment, loneliness, and a general ambivalence towards robots did not correlate with the perceived social adequacy of the robot behavior. Therefore, features of the robot seem to be more important for the perception of social adequacy than individual differences. Furthermore, the ambivalence measures did not correlate significantly with the perceived social adequacy of the robot behavior. Therefore, increasing the robots behavior adequacy does not seem to be a promising strategy in attenuating the inherent evaluative conflict in robot-related attitudes. However, the causal relationships between those variables should be investigated through experimental manipulation in future studies.

Overall, the results of the study suggested that moving away or approaching a person can potentially increase robot acceptance by ameliorating social adequacy of the robot's behavior if the person expressed a certain emotion. Therefore, attention should be paid to the capability of adaptive proxemics behavior when developing social robots. In particular, moving away should be avoided, especially for the emotions joy, fear, and sadness, but also for surprise, because this behavior is perceived as inadequate. No movement seems to have no particularly negative or positive effect on all of the emotions shown. With the help of an approach, however, the robot can show its empathy during the emotions joy, fear, and sadness. When the person shows anger, it seems to depend on what the anger is directed against. If the person is angry at the robot, moving away seems to be fine, whereas approaching or not moving seems more appropriate if the anger is directed at something else. In the case of disgust, no special reaction seems to be necessary.

A. Strengths/Limitations and Future Work

To our knowledge, the current experiment is the first to investigate the interaction between user emotion and a robot's proxemics behavior in a HRI scenario. We conducted a pre-registered online multi-method experiment, using both quantitative and qualitative data. In this experiment, we implemented use cases that are of applied value, as these were formulated in the context of the development of our new robot platform "VIVA". This way, we tried to increase external validity besides the constraints associated with online, scenario-based research. This, in fact, likewise represents a limitation of the current work. Due to the global Covid-19 pandemic, our research could not be realized in a laboratory environment using actual HRI in a virtual reality setup. Nonetheless, we are convinced that the paradigm used and the associated results may prove helpful in designing real-life interaction studies and might be developed further and in more detail in future work. On a descriptive level, robot approach was evaluated as more appropriate than no movement or moving away for all emotions. This might indicate, that approach behavior is always perceived as favorable, independent of the user emotion. Future research should manipulate robot behavior experimentally and test whether those differences are significant and generalizable. One factor that always plays a role in proxemic interactions and should be further investigated is the culture of the user. So while the findings apply to Central Europe, they may differ significantly in other cultures, so further studies in other cultural areas are therefore necessary. Also, while we have looked at proxemics in isolation in this setting, future studies might be interested in, for example, combining it with other interaction channels of the robot (e.g., verbal, facial expressions, or gestures).

B. Conclusion

In this paper, we reported an online study in which we investigated how different instances of robot proxemics behavior (i.e., approaching, not moving, moving away) that were displayed after a human expressed a certain emotional state. That is, we explored how such robot response behaviors affected subsequent judgments of the robot and the HRI scenario. Our results indicate that approaching was considered particularly appropriate when the human interaction partner had for the expressed fear, sadness, or joy. On the contrary, moving away was perceived an inadequate robot behavior in most of the scenarios. In addition, we found that features of the robot seem to be more important for the perception of social adequacy than individual differences. However, further research with more diverse settings is needed to strengthen the findings.

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APPENDIX

Anger You walk into the living room after a long day and want to watch a movie. When you press 'play', your streaming service freezes, and you snort angrily and frown.
"This thing makes me angry!"

Fear You are at home going over a very important presentation that is scheduled for the next day. Thinking about the upcoming situation, you get scared and draw your eyebrows together in worry.
"I'm afraid of the presentation tomorrow."

Disgust You are in the kitchen and want to cook. When you take the cheese out of the fridge and see that it's moldy, you frown and pucker your mouth in disgust. You walk into the living room and say to VIVA:
"The cheese is moldy, how disgusting."

Surprise You are at home and listening to the radio. When you hear a rumble from another room, you make a surprised face and look around.
"I heard something and I was frightened."

Sadness You are at home and want to take your old favorite mug out of the cupboard. When you accidentally drop the mug, you sigh in dismay.
"I dropped my favorite mug and I'm sad because now it's broken."

Joy You come home happy after a successful day and meet VIVA in the living room. When you see VIVA rolling up, you are happy and smile at VIVA.
"I am cheerful, I had a successful day."

Approach (H1a-6a)						
Scale	Emotion	M	SD	t	df	p
social adequacy	anger	4.00	1.65	0.00	25	.500
	fear	5.00	1.28	4.15	27	$< .001^*$
	disgust	4.00	1.63	0.00	27	.500
	surprise	4.14	1.63	0.46	27	.323
	sadness	5.21	1.29	4.99	27	$< .001^*$
	joy	4.65	1.62	2.05	25	.025
likability	anger	3.82	1.39	−0.66	25	.742
	fear	3.91	1.49	−0.32	27	.623
	disgust	3.22	1.38	−2.99	27	.997
	surprise	3.67	1.28	−1.35	27	.906
	sadness	3.83	1.53	−0.58	27	.715
	joy	3.52	1.41	−1.74	25	.953
uncanniness	anger	2.26	1.45	−6.15	25	$< .001^*$
	fear	2.20	1.41	−6.75	27	$< .001^*$
	disgust	1.88	1.00	−11.18	27	$< .001^*$
	surprise	2.50	1.53	−5.20	27	$< .001^*$
	sadness	2.42	1.48	−5.68	27	$< .001^*$
	joy	1.96	1.24	−8.35	25	$< .001^*$

No movement (H1b-6b)						
social adequacy	anger	3.21	1.50	−2.77	27	.995
	fear	2.96	1.61	−3.28	25	.996
	disgust	3.92	1.79	−0.22	25	.586
	surprise	3.22	1.63	−2.49	26	.990
	sadness	2.86	1.38	−4.38	27	1
	joy	3.11	1.66	−2.84	27	.996
likability	anger	2.43	1.37	−6.03	27	1
	fear	3.01	1.53	−3.28	25	.996
	disgust	2.69	1.29	−5.16	25	1
	surprise	2.54	1.13	−6.71	26	1
	sadness	2.42	1.13	−7.40	27	1
	joy	2.64	1.16	−6.20	27	1
uncanniness	anger	2.05	1.12	−9.18	27	$< .001^*$
	fear	2.19	1.34	−6.88	25	$< .001^*$
	disgust	2.13	1.47	−6.49	25	$< .001^*$
	surprise	2.17	1.20	−7.94	26	$< .001^*$
	sadness	2.15	1.35	−7.22	27	$< .001^*$
	joy	2.42	1.40	−6.00	27	$< .001^*$

Move away (H1c-6c)						
Scale	Emotion	M	SD	t	df	p
social adequacy	anger	2.82	1.59	−3.93	27	1
	fear	1.68	1.06	−11.63	27	1
	disgust	2.96	1.45	−3.77	27	1
	surprise	1.93	1.27	−8.49	26	1
	sadness	1.62	0.70	−17.44	25	1
	joy	1.36	0.68	−20.61	27	1
likability	anger	2.53	1.27	−6.14	27	1
	fear	2.14	1.16	−8.47	27	1
	disgust	2.59	1.25	−5.99	27	1
	surprise	2.40	1.24	−6.72	26	1
	sadness	1.99	1.13	−9.12	25	1
	joy	1.71	0.89	−13.67	27	1
uncanniness	anger	2.56	1.50	−5.08	27	$< .001^*$
	fear	2.74	1.38	−4.85	27	$< .001^*$
	disgust	2.75	1.72	−3.84	27	$< .001^*$
	surprise	3.59	1.62	−1.30	26	.102
	sadness	2.58	1.41	−5.1591	25	$< .001^*$
	joy	2.80	1.67	−3.80	27	$< .001^*$

$^* p < .001$