The intimacy of heart beat communication

Irene A. Kuling
Eindhoven University of Technology
Den Dolech 2
5600MB Eindhoven NL
i.a.kuling@student.tue.nl

Joris H. Janssen
Eindhoven University of Technology &
Philips Research
Den Dolech 2
5600MB Eindhoven NL
j.h.janssen@tue.nl

Wijnand A. IJsselsteijn
Eindhoven University of Technology
Den Dolech 2
5600MB Eindhoven NL
w.a.ijsselsteijn@tue.nl

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Abstract
Heart beat communication is hypothesized to be an intimate cue. Moreover, as with other nonverbal cues, we expect that hearing someone's heart beat triggers unconscious nonverbal compensation strategies like increasing interpersonal distance. In line with this, we found that hearing someone's heart beat increases the kept interpersonal distance. We conclude that heart beat communication increases the feeling of intimacy and can therefore be employed in connectedness devices.

Keywords
Connectedness, Heart beat communication, Nonverbal behavior, Intimacy

ACM Classification Keywords
J.4 Social and Behavioral Sciences: Psychology, H.4.3 Communications Applications

Introduction
In this era of technology, people are used to fly all over the world, work day and night, and try to keep their social contacts up-to-date by text messages on digital devices. However, people are social animals, and close intimate interactions are needed for our well-being and

health [4] [5]. Therefore, when people are far from each other intimacy supporting devices could be useful.[1] A promising solution is a device which uses heart beat communication. Werner, Wettach & Hornecker [8] showed with their united-pulse ring that people are interested in heart beat communication devices and that they expect that it would give a very powerful feeling of intimacy. We also expect this, because heart beat communication decreases physical and psychological distance between the communicators. Physical distance is decreased as a physical signal of the other is brought closer to the perceiver. Psychological distance is decreased as it gives information about the emotional state of the other [7].

In this study, we wanted to find objective evidence for heart beat being an intimacy cue, similar to interpersonal distance and eye contact [2]. Following equilibrium theory [1], if heartbeat is indeed perceived as an intimate cue, we would expect it to influence behavior in order to maintain an overall equilibrium of intimacy. For example, the perceptible presence of a heartbeat signal of another could affect the interpersonal distance kept between people. We performed an experiment where we examined the interpersonal distance participants kept between them and a confederate, while participants heard the sound of a heart beat. They were either told that the heart beat was directly measured from the confederate or that it was a pre-recorded sound which might be recognized as a sound of a heart beat used in movies. We expected that perception of another's heart beat will make the situation more intimate. Therefore, we expected that interpersonal distance will be larger when participants have the illusion of hearing the other's heart beat compared to a prerecorded sound.

[1] Intimacy can be compared to the feeling of connectedness one has with one specific person [3].

Confederate pretest

Experimental setup

Two male undergraduates, age 19 and 22, both with a height of 188 cm, were pretested on 7-point scale for 8 perceived characteristics that could potentially be relevant to non-verbal communication: dominance, friendliness, attractiveness, submissiveness, looking frightening, determinedness, playfulness, calmness. We chose to use only male participants and male confederates to exclude between-gender variance. Participants of the pretest were all male, were not familiar with the confederates, and did not join in the main experiment. All participants (N=22; age M=25.68, SD= 8.05) filled out the questionnaire. Half of the participants started with the questions about confederate 1, the other half started with confederate 2.

Results & Discussion

The results of the characteristics were analyzed using a paired-samples t-tests. Confederate 2 scored significantly higher on the characteristics age (t_{21}=-7.483, $p<.05$, $r=.85$) and dominance (t_{21}=-2.826, $p<.05$, $r=.52$). Confederate 1 scored much higher on playfulness (t_{21}=3.648, $p<.05$, $r=.62$). On the other characteristics there were no significant differences.

The results of the questionnaire indicate that confederate 2 is older, more dominant and less playful than confederate 1. Intimate cues can stimulate compensation (more distance) or reciprocity (less

distance). According to the discrepancy-arousal theory of Cappella & Green in Anderson et al. [1], this depends on if a certain 'intimacy threshold' is crossed or not. In this study, we expect that this threshold will be crossed to a greater extent for confederate 2 than for confederate 1, because of their differences.

Main experiment

Participants and Design

Forty male undergraduates (age M=23.05, SD= 3.31) took part in the experiment. Participants received a payment of 3 Euros.

Participants were randomly assigned to either a condition in which they thought they heard the heart beat of the confederate (sound[real]) or they thought to hear just a heartbeat- like sound (sound[fake]). We used a between-subject design to avoid learning effects and familiarity with the confederate and the task. In both conditions the participants heard exactly the same sound, an artificial heart beat of 70 bpm. Only the instructions were different.

Confederates

Each confederate recruited the participants for the trials with the other confederate. During the experiment the confederate stood at a fixed position. His hands were placed on his back. His gaze was fixed to the wall, while the participant entered the room. When the participant was in the starting position, the confederate kept his gaze on the eyes of the participant during the whole trial. The confederates were extensively trained to behave the same way every trial.

Procedure

After being recruited by one of the confederates, the participants signed an informed consent form and filled out a biographical questionnaire outside the experiment room. Next, they entered the room where they were introduced to the experimenter but not to the confederate. In the sound[real] condition, the experimenter explained that the participant would be wearing headphones presenting the sound of the heart beat of the confederate. In this condition, the confederate was equipped with a mobile heart beat measuring device to make the illusion of listening to the confederate's heart beat more convincing. In the sound[fake] condition, the experimenter explained that the participant would hear a sound that might be recognized as a heart beat sound as used in movies. After a 10 second period in which the participant got used to the sound, the experimenter told the participant that he should walk towards the confederate to a distance "as close as is comfortable" for him. The participants had to keep their gaze at the eyes of the confederate during the whole trial and had to remain at the final location for 30 seconds. The distance between the back of the heel of the confederate and the back of the heel of the participant was measured.

After the trial, the participants filled out some open-ended questions asking them about the purpose of the study and the perception of the sound/heart beat. At the end, the participants were debriefed about the experiment and received their payment. The experiment took approximately 10 minutes.

Results

The results for the interpersonal distance were analyzed with an ANCOVA. The height of the participants was taken into account as covariate, because approaching someone who is larger is different than approaching someone who is smaller [6].

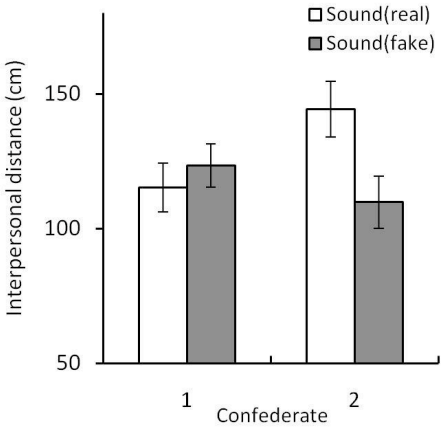

Figure 1: Interpersonal distance between participant and confederate. The left bars shows the means distances for confederate 1, de right bars for confederate 2. The different colors represent the two sound conditions. Errors bars depict +/- 1 SE.

There were no main effects found for either Sound illusion (real/fake) ($F(1,30) = 1.85$, ns, $r = .20$) or Confederate ($F(1,30) = 1.299$, ns, $r = .12$). There was an interaction effect Sound illusion × Confederate ($F(1,30) = 5.006$, $p<.05$, $r = .41$). See Figure 1 for means and SEs. Post hoc tests showed a floor effect for one of the confederates ($F(1,16) = 0.456$, ns, $r = 0$). For the other confederate the expected effect was found ($F(1,16) = 5.628$, $p<.05$, $r = .56$).

In the answers of the open-ended questions the participants evaluated the sound of the heart beat as a natural and intuitive representation. In addition, they were not aware of the purpose of the experiment.

Discussion

In this study the relation between (the illusion of) hearing the other's heart beat and interpersonal distance was investigated. Based on equilibrium theory, we expected that interpersonal distance would be larger when participants have the illusion of hearing the other's heart beat compared to a prerecorded sound because hearing the other's heart rate is an intimate experience. The results showed that this happened for one the confederates. For the other confederate a floor effect was found. This latter effect can be explained through the results of the pre experiment and the discrepancy-arousal theory. In this study, the arousal threshold is crossed for confederate 2, but it is not crossed for confederate 1. Therefore, people compensate their behavior by keeping more distance for confederate 2, but not for confederate 1.

This study is an elaboration to the study of Werner et al. [8]. They found that people are interested in heart beat communication and are willing to use heart beat communication devices for personal contacts. We found that hearing another's heart beat can be regarded as an intimacy cue. The self-report results indicate that representing the heart beat as a sound is an intuitive and natural representation. As heart beat communication increases the feeling of intimacy, devices that are designed to enhance social connectedness or intimacy could potentially be enriched by heart beat communication.

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