

Supplementary Material for the Publication

“Towards Designing Privacy-Compliant Social Robots for Use in Private Households: A Use Case Based Identification of Privacy Implications and Potential Technical Measures for Mitigation”

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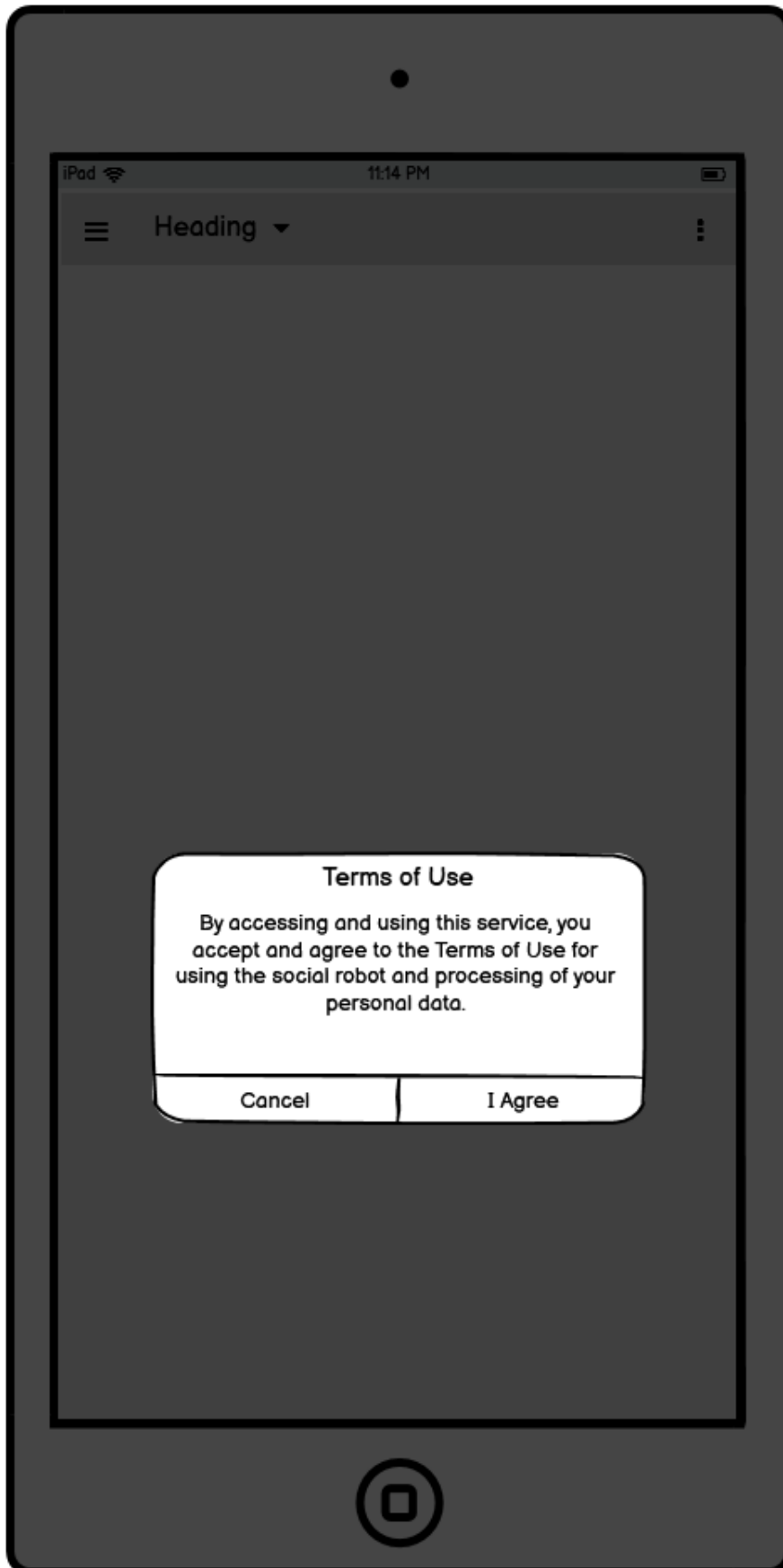
1 Introduction

This document supplements the publication “Towards Designing Privacy-Compliant Social Robots for Use in Private Households: A Use Case Based Identification of Privacy Implications and Potential Technical Measures for Mitigation” (Horstmann et al. 2020) which was accepted and presented at the IEEE RO-MAN 2020 conference. In section 2, you can find the mock-ups of all screens from the proposed app concept, in higher resolution. This includes also screens that are not shown in the paper and those that were not included in the evaluation. In section 3, additional qualitative comments made by participants during the interview are provided, to give an expanded overview of opinions regarding the four app screens which are shown in the paper. Section 4 presents the questionnaire which was used for quantitatively evaluating the app mock-ups. Lastly, section 5 summarises the quantitative results obtained for the fourteen 5-point Likert scale questionnaire items.

2 Proposed app mock-up

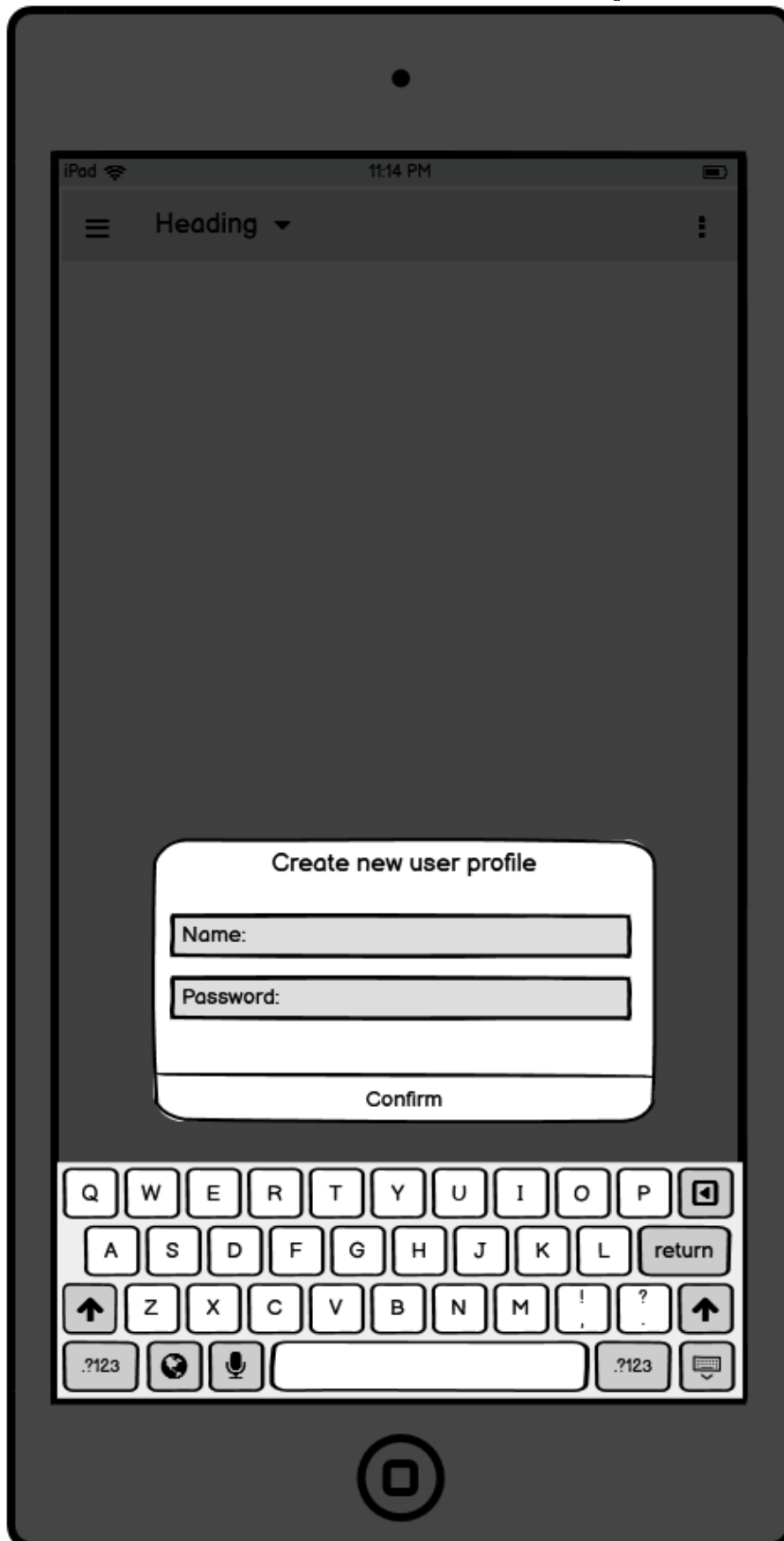
(Note: Translated from German.)

Screen: Terms of Use



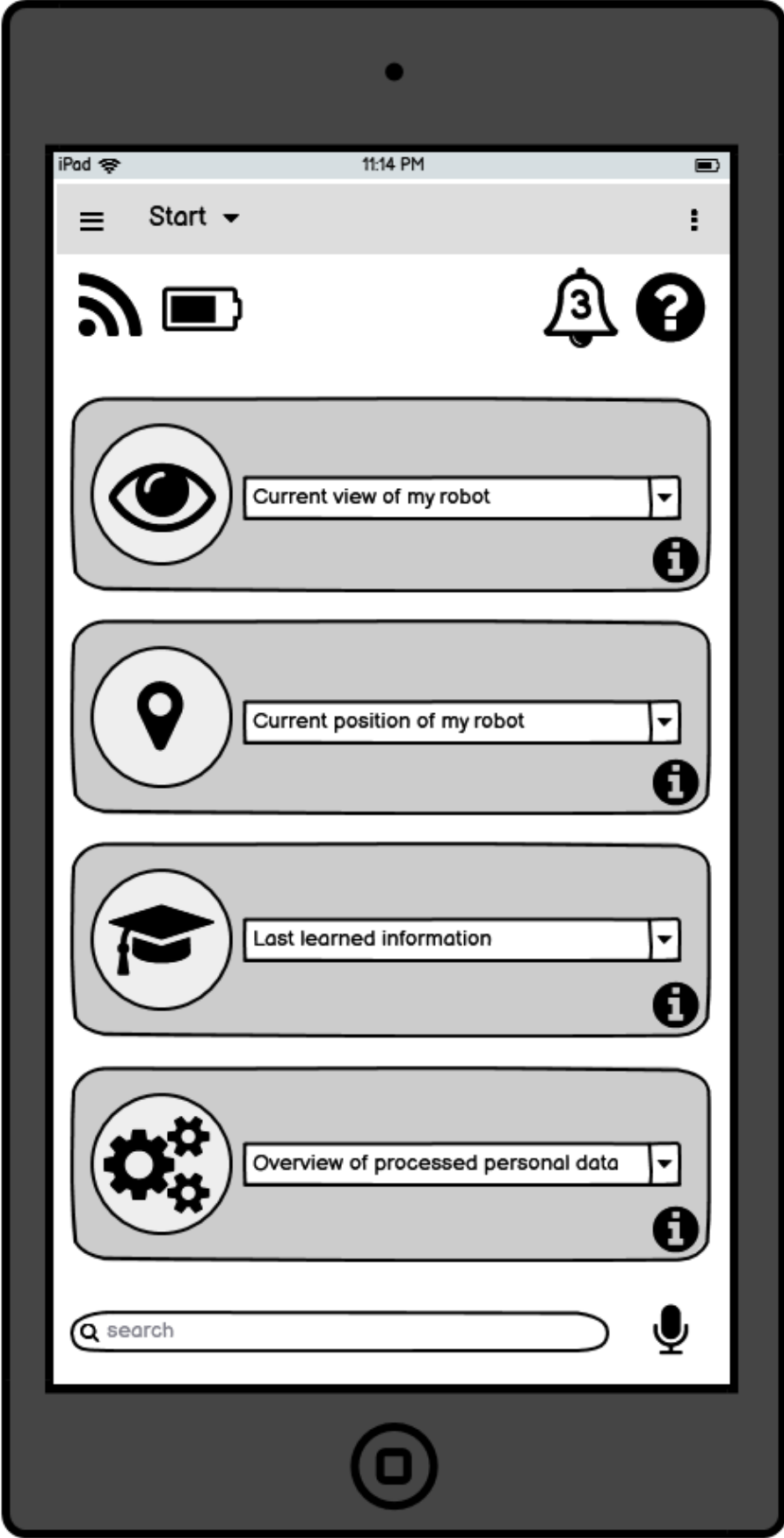
(Note: This screen was not part of the evaluation.)

Screen: Create new user profile

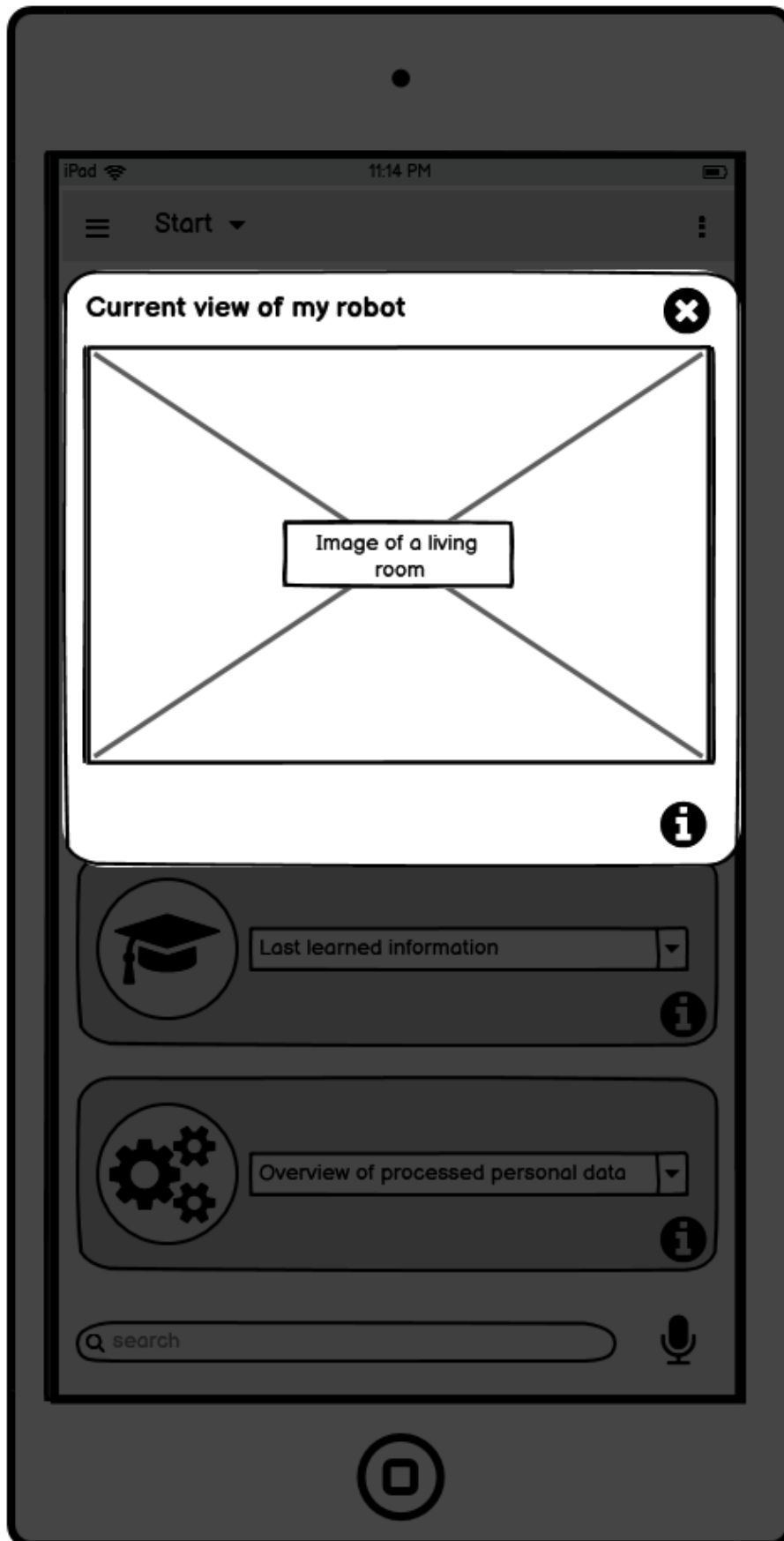


(Note: This screen was not part of the evaluation.)

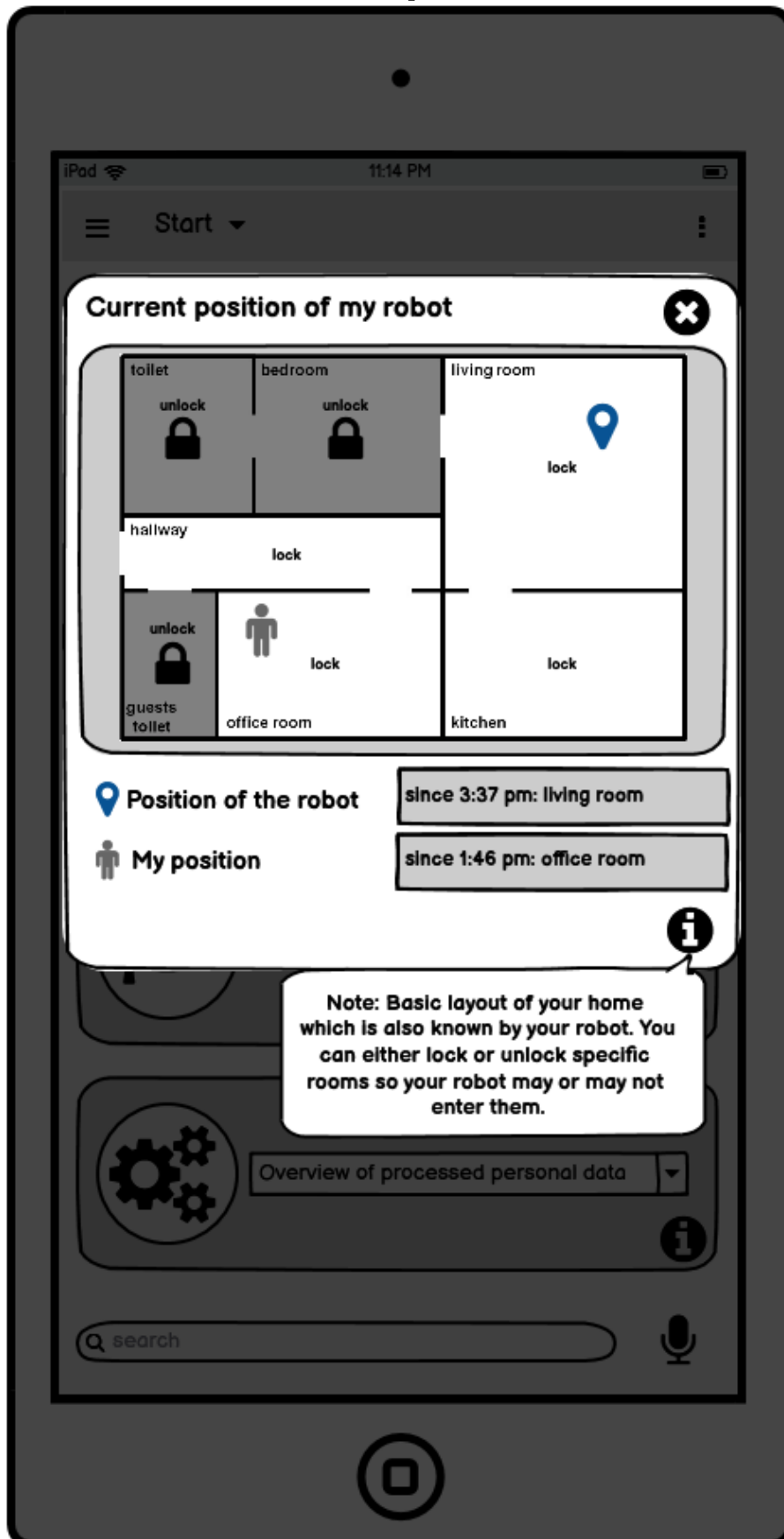
Screen: Start



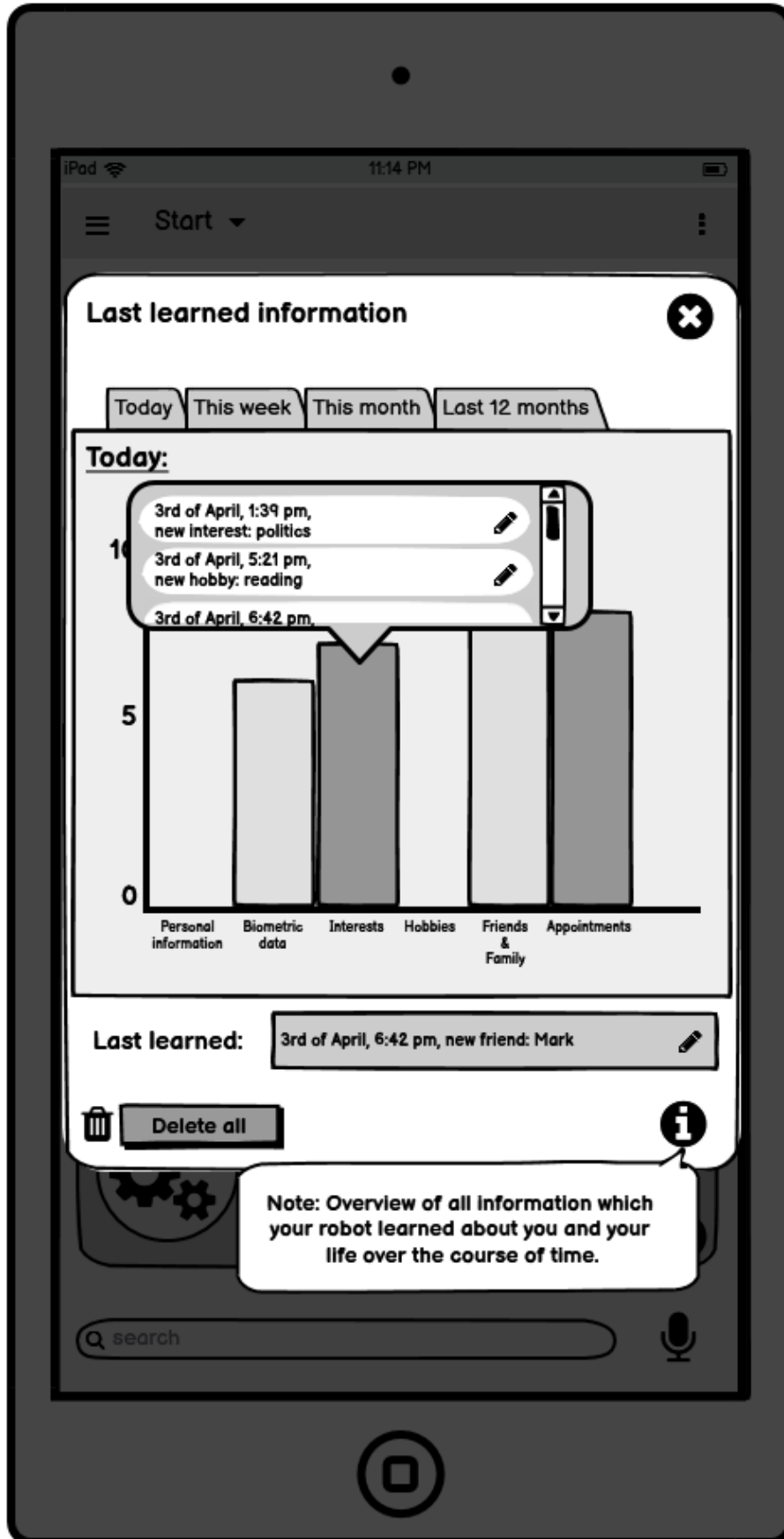
Screen: Current view of robot



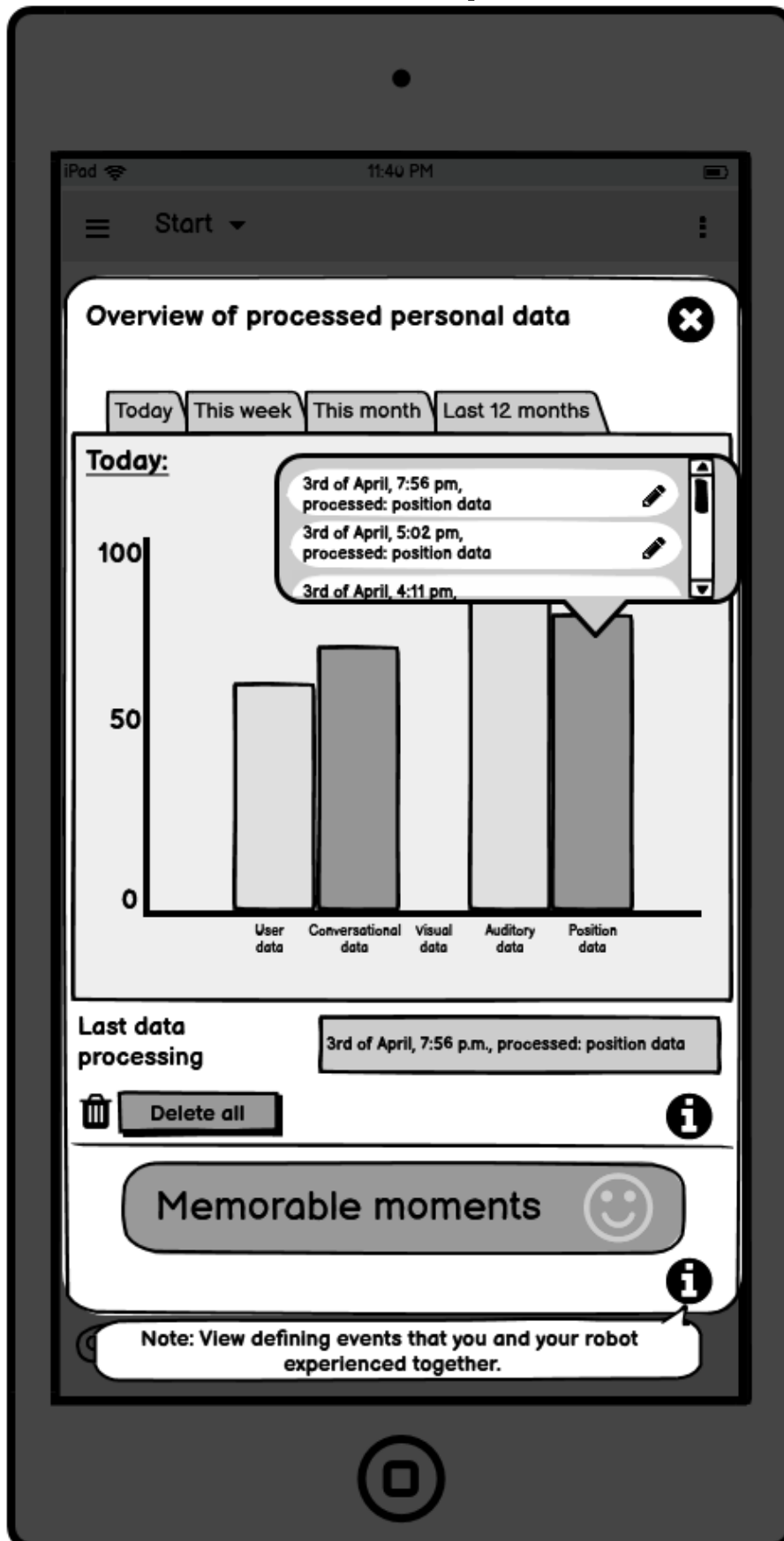
Screen: Current position of robot



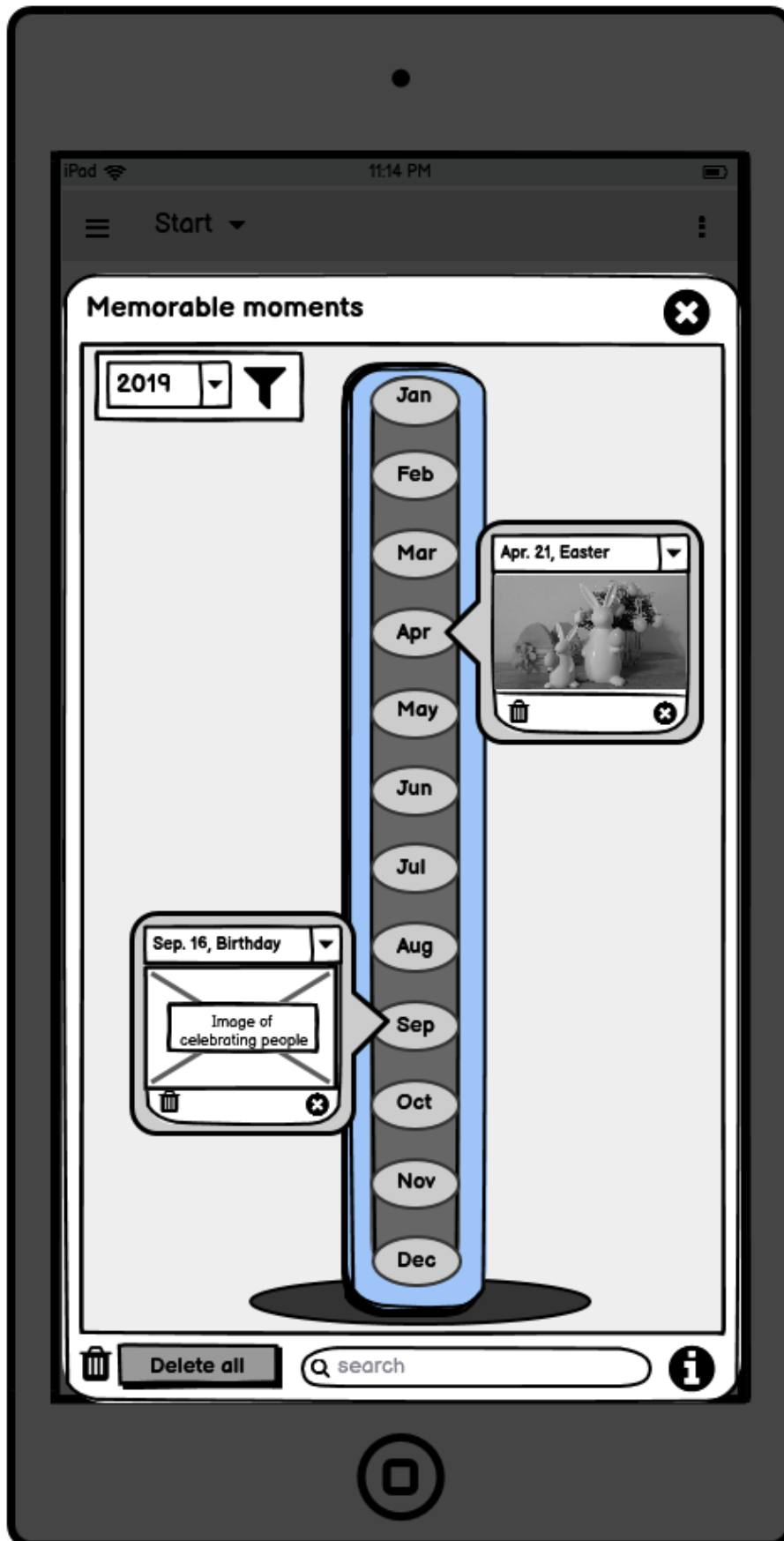
Screen: Last learned information



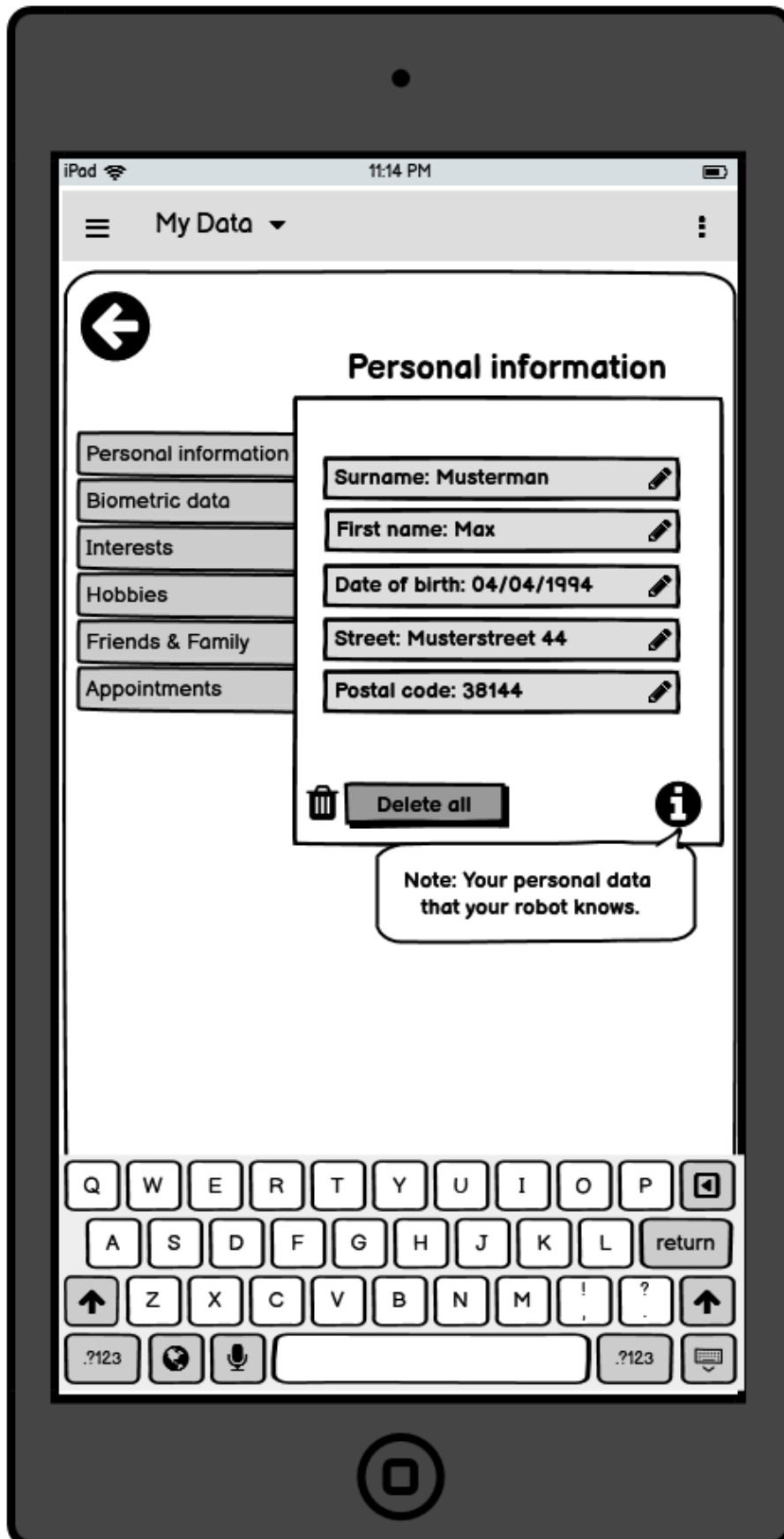
Screen: Processed personal data



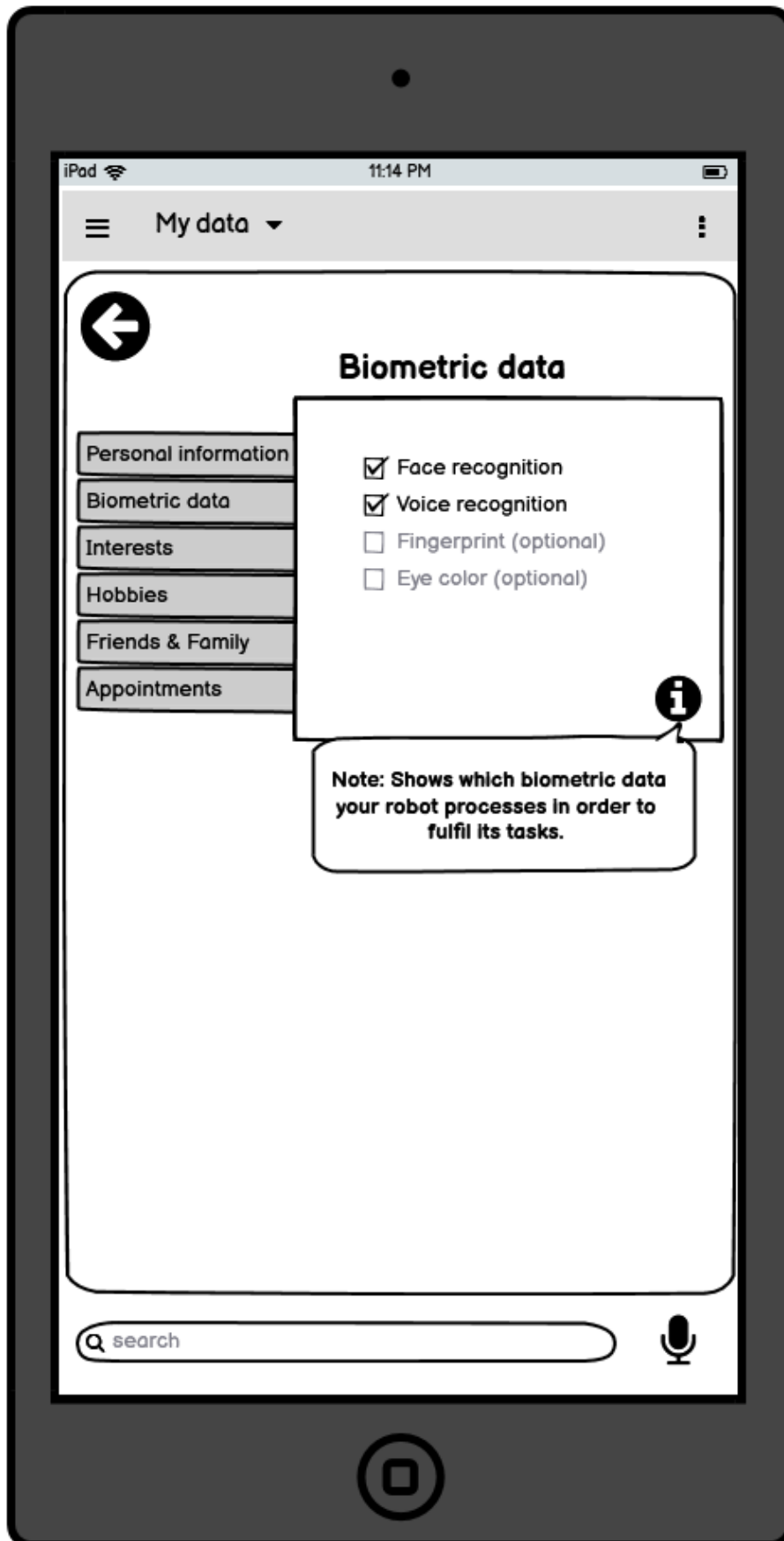
Screen: Memorable moments



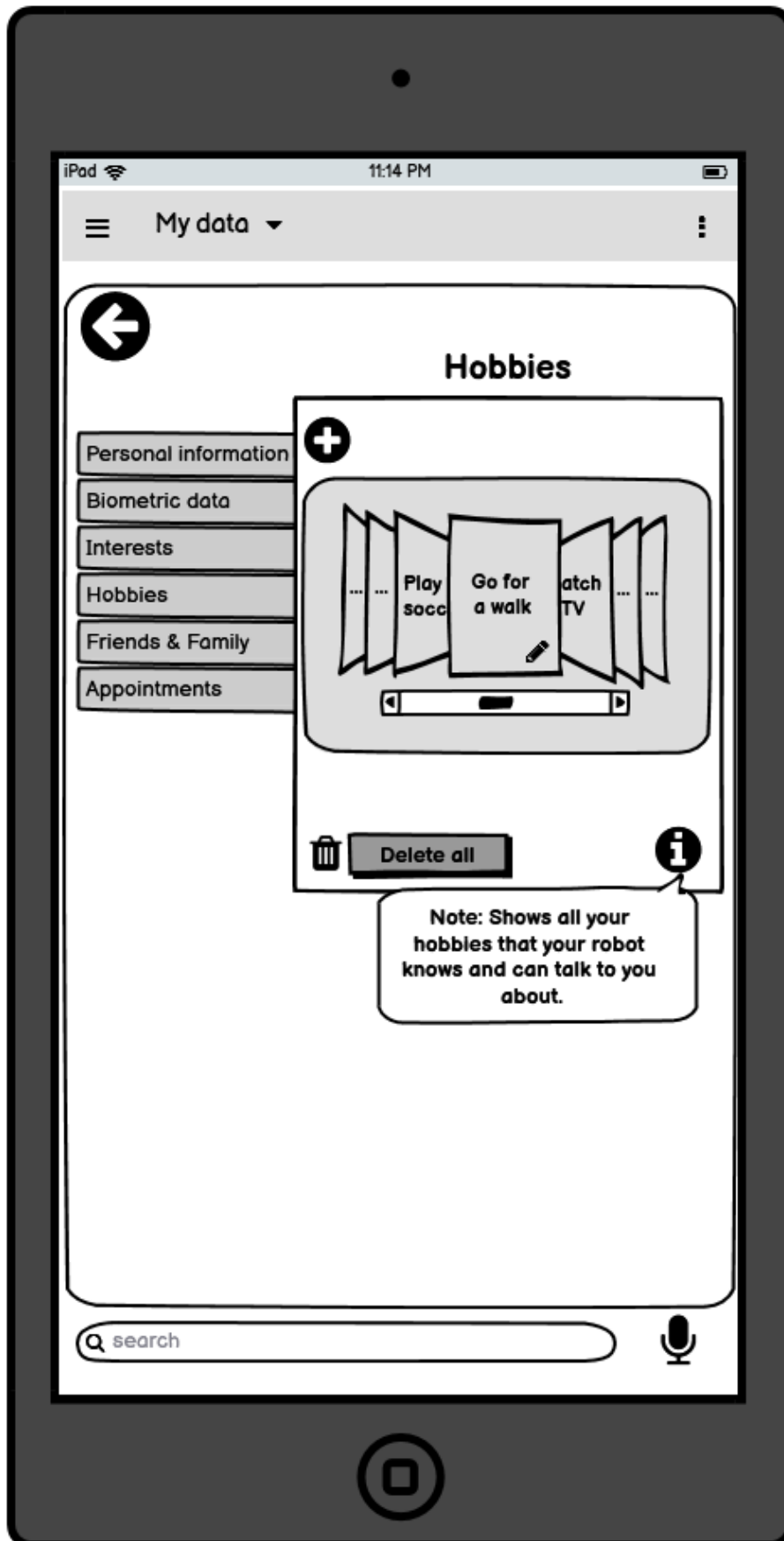
Screen: Personal information



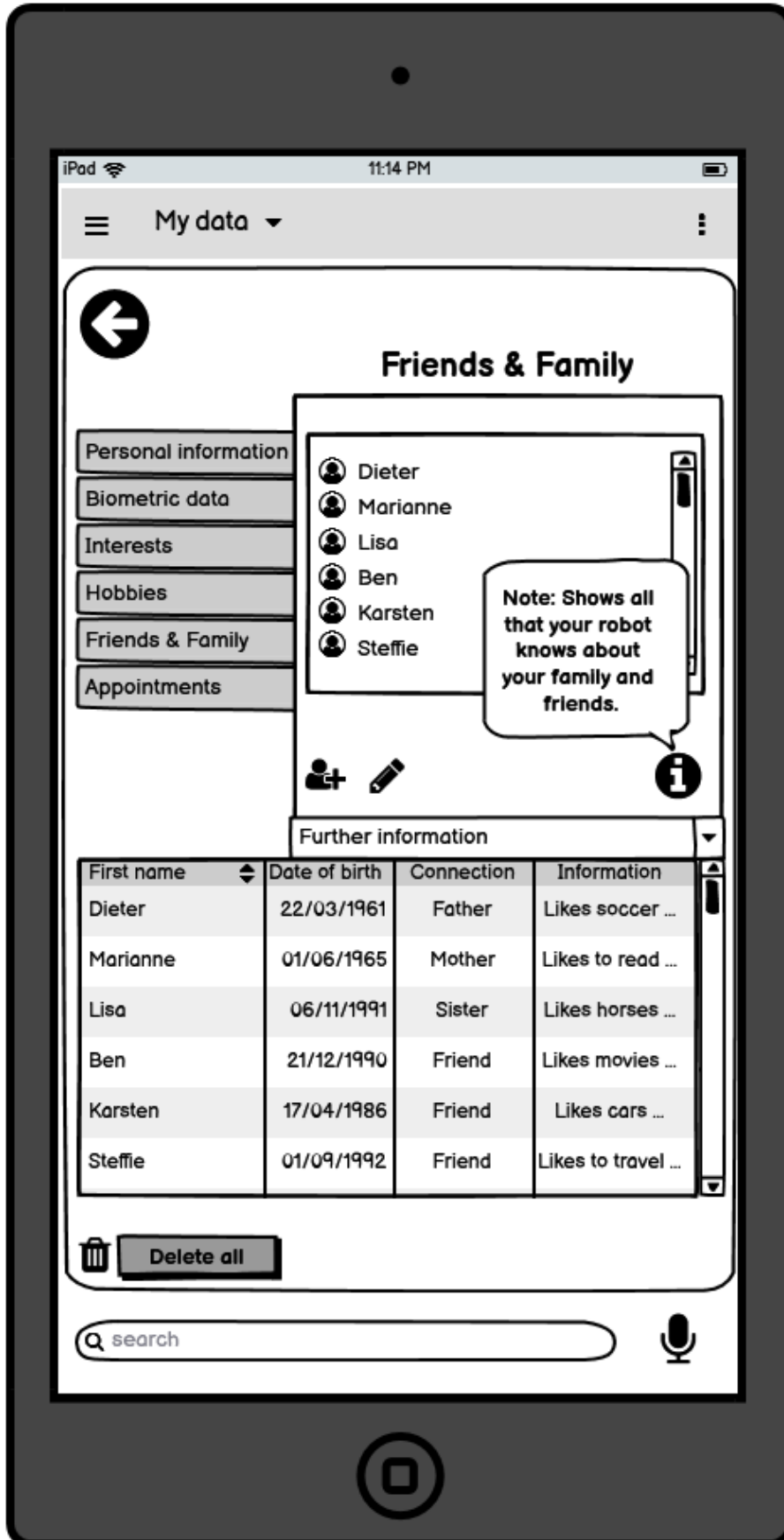
Screen: Biometric data



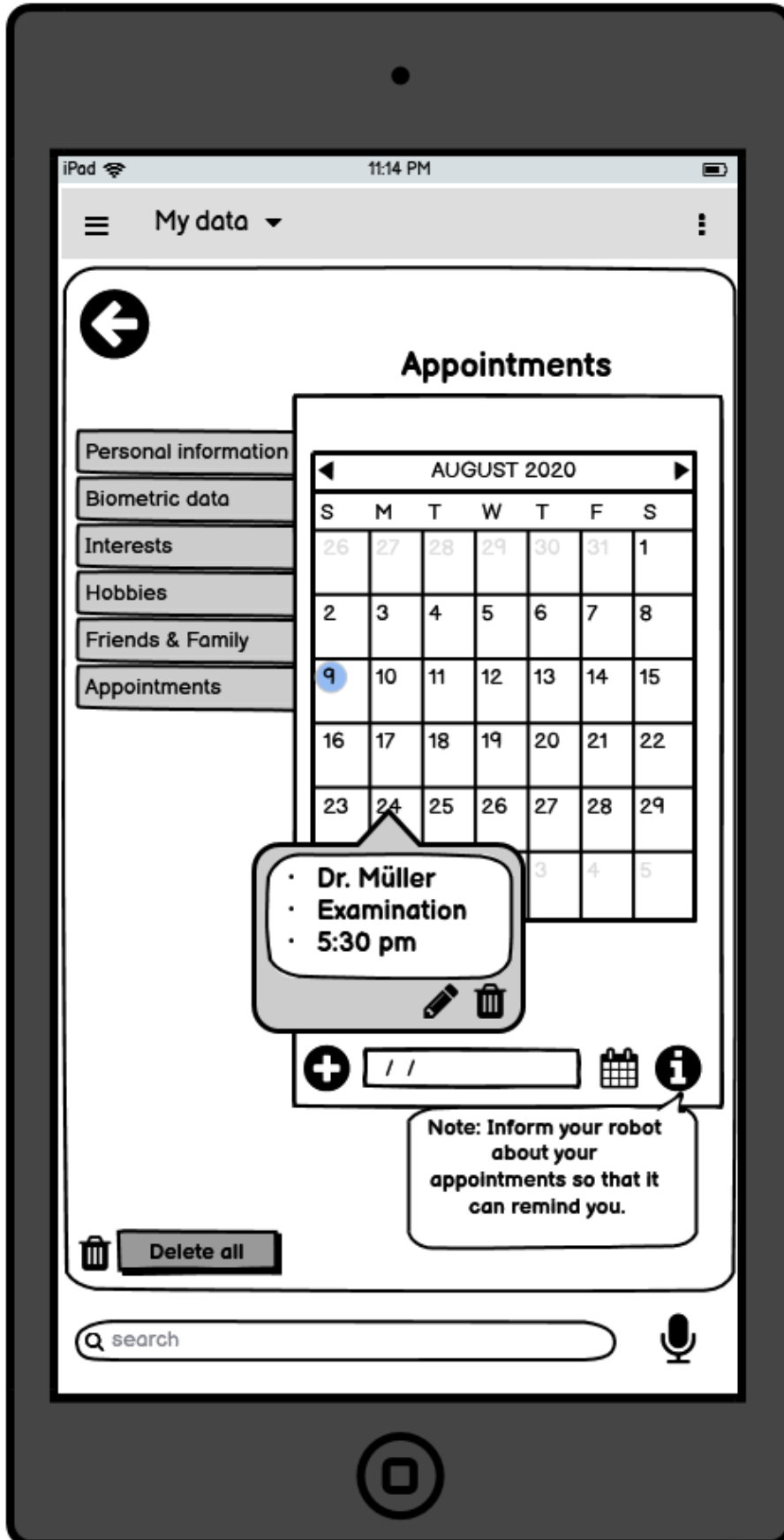
Screen: Hobbies



Screen: Friends & Family



Screen: Appointments



Screen: Settings



3. Selected interview comments

(Note: Translated from German.)

Screen: Start

- “Can I access it when I am not at home? Very practical, especially when you have pets.”
- “So, does it (the robot) move? A little bit creepy in general. Well, an overview of processed data is of course always good, if it is transparent. If I know what has been recorded and how it was linked and processed, it makes things less creepy.”
- “First of all, it is quite clear and you know what is going on fairly precisely. It seems to be reasonably transparent, I think.”
- “Yes, firstly, I find it to be very interesting. It is totally cool, if you can see all the information, which it finds out about you.”
- “It could be totally useful for sure, but could of course be also used for surveillance.”

Screen: Current position of robot

- “You can of course lock rooms, which is also very nice. You don’t want to be observed everywhere, of course! Like bedroom, toilet and so on. Just as it is here. That would bother me. Does it move by itself? Or do I have to tell it that it should move somewhere? (Interviewer says that the robot can move by itself.) Then it’s appropriate that it be locked. I would find it not nice that I am in the bedroom and then it comes in. And then it startles me or so. Especially when changing clothes! That would be unpleasant. Sometimes you would like to hide what you do during the day, even in your own house.”
- “I do think it would be useful, like a bit of privacy. Of course, it’s quite an invasion of privacy to have such an autonomous camera in the house. But it’s quite a good feature.”
- “I think this (the locking of rooms) makes perfect sense for privacy. Well, you never know where the data is going with a robot like that. On the other hand, when I have the need to be alone or I don’t want to interact with the robot, I can also turn it off.”

Screen: Last learned information

- “New friend Mark? (That’s) Intense! It’s good that there is an overview for that. The more transparency there is in machines, the less creepy they are. Obviously, it is due to the spirit of the times. It is all new, it is all creepy for the first time, as soon as it can do something on its own. But I could well imagine that in this way you could find a good introduction to such companions.”
- „Well, if I would own such a thing and I know it is storing (such) information, then I would be interested (in knowing) what it stores.”

Screen: Setting options

- “I find this page to be relatively clear. Setting options are otherwise relatively complex most of the time, but this is very telling. Especially the curiosity of your robot, I think that’s well done. I would change curiosity (level) depending on the day. I think of it as funny somehow. In everyday life, I would set it to medium. (...) I would probably make it mood-dependent too.”
- “Ah, you can adjust how often the robot asks you about certain things and how deep the questions then become! I find it good, that you can adjust that.”
- “I think it’s actually quite good that you can adjust – so to speak – how strongly the robot is interested in your life. It’s goofy, if it sticks to your heels all the time and takes note of just everything that you are doing. Somehow, you feel somewhat stalked.”
- “I find this also interesting that you can adjust curiosity. I think this goes along with how much it communicates with you. Maybe it will gather the same amount of data, just that it will communicate less or approach me less by itself and maybe it will not very often be in the same room as I am, if I set it to low.”
- (To the curiosity feature) “Maybe, with this you can control, how much it records. I find it in any case interesting that there is such a gradation. But this is relatively ambiguous at first. What does low, medium, strong mean, and which areas are affected by that?”

4 Questionnaire

(Note: Translated from German)

Questionnaire

(1) Specify your gender

Male Female Other

(2) How old are you?

(3) Employment status

School student
 University student
 Employed/Self-employed

(4) Do you regularly use voice commands to control your smartphone?

Yes No

(5) Do you have experience with conversational assistants like Echo/Alexa/Cortana etc.?

Yes No

(6) A social robot would enrich my everyday life.

disagree somewhat disagree undecided somewhat agree agree

(7) The robot could help me feel less alone.

disagree somewhat disagree undecided somewhat agree agree

(8) It does not bother me that the robot knows so many personal things about me.

disagree somewhat disagree undecided somewhat agree agree

(9) The robot would restrict my privacy.

disagree somewhat disagree undecided somewhat agree agree

(10) I think it's good if the robot captures and saves information about me on its own.

disagree somewhat disagree undecided somewhat agree agree

(11) Sensitive data (such as account numbers, passwords, religious beliefs, etc.) should be saved by the robot.

disagree somewhat disagree undecided somewhat agree agree

(12) The shown app helps me to maintain my privacy.

disagree somewhat disagree undecided somewhat agree agree

(13) My data are clearly displayed by the app.

disagree somewhat disagree undecided somewhat agree agree

(14) Data processing and storage happens transparently.

disagree somewhat disagree undecided somewhat agree agree

(15) I have full control over my data.

disagree somewhat disagree undecided somewhat agree agree

(16) The menu navigation of the app is easy to understand.

disagree somewhat disagree undecided somewhat agree agree

(17) All app functions are understandable.

disagree somewhat disagree undecided somewhat agree agree

(18) The app offers too few delete functions to remove my data.

disagree somewhat disagree undecided somewhat agree agree

(19) The app makes me feel that I have control over the robot and its functions.

disagree somewhat disagree undecided somewhat agree agree

20) Are you missing certain functions or buttons in the app shown? If so, which ones?

(21) Further remarks on the App:

(22) Further comments on the survey:

5 Computed questionnaire results

(Note: Only items 6 to 19 were taken into account.)

Item	Degree of approval		
	mean	med.	stdev.
6	-0.1	0	1.04
7	0.2	0.5	1.17
8	-0.2	0	0.98
9	0.2	0.5	1.17
10	0.4	0.5	1.11
11	-1.5	-2	0.67
12	1	1	0.77
13	1.7	2	0.46
14	0.6	1	1.2
15	1.1	1	0.9
16	1.7	2	0.64
17	1.5	2	0.92
18	-1.1	-2	1.22
19	1.4	1	0.49

Selected items	Pearson's correlation coefficient
12 and 19	$r = 0.53$
13 and 15	$r = 0.27$
15 and 16	$r = 0.38$