iCat for you

A comparison between different personal e-health assistants

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1 Abstract

The world population is getting older and more and more people suffer from a chronic disease, such as diabetes. The need for medical (self-)care therefore increases, and a personal assistant could help. A personal assistant can have many different appearances. E.g. it can be a computer or a robot. When it is a computer, the assistance can be given in text, in speech or both, and by a standard chat application or a virtual agent. This thesis gives guidelines for supporting self-care and shows how it could be incorporated in a (embodied) personal assistant.

First guidelines were derived from motivational interviewing, persuasive technology, and from existing guidelines for personal assistants. Two guidelines were found, be empathetic and be trustworthy. The first guideline is derived from Motivational Interviewing and can be reached by having ten skills. We only implemented three skills at most in the personal assistants due to time and technical constraints. The skills were implemented in a text interface, a virtual agent, and an embodied agent taking into account the technical constraints of the different assistants. The hypotheses were that the guidelines could be better incorporated in an agent than in a text interface, and that an embodied and social agent would incorporate the guidelines better than respectively a virtual and non social agent. Two experiments (N=6 and N=24) were done in a Wizard of Oz setting. In both experiments the participants worked with a text interface based assistant, a socially intelligent agent, and a non-socially intelligent agent. There were two groups in the experiments, the participants that worked with the virtual agent and the participants that worked with the embodied agent. The hypotheses were tested with questionnaires and by scoring video data on the social behavior of the participants towards the personal assistants. The first experiment proved that it is possible to have the same conversation with a robot as with a text interface. The second experiment showed that a text interface based personal assistant is just as trustworthy as an agent, but less empathetic. The socially intelligent virtual agent proved to incorporate the guidelines best and the non-socially intelligent embodied agent proved to incorporate the guidelines worst.

These first experiments were performed with non diabetics, in the future we would like to perform an experiment with elderly that have diabetes.

2 Introduction

In the year 2000, one in ten individuals in the world was 60 years or older and one in fourteen was at least 65. It is expected that these numbers will increase to one in every five persons being 60 or older and nearly one in six people 65 or older in 2050 (UN, 2002). As a result it is expected that the elderly and especially the chronically ill will have to be more self-sufficient, i.e., they should be involved in their self-care at home.

The World Health Organization (WHO) estimated that within the chronically ill, treatment adherence is only about 50% (WHO, 2003). Therefore, improving this adherence could mean a large improvement in the health of the chronically ill, such as diabetics.

The SuperAssist project focuses on improving the treatment adherence of diabetics with the help of a personal assistant. In this thesis we take the HealthBuddy®, a text interface based personal assistant which is already used for treatment adherence of diabetics, as a basis for a personal assistant. The HealthBuddy uses a psychological method for behavioral change, Motivational Interviewing, incorporated in computer technology. It can be viewed as an example of persuasive technology (Fogg, 2002).

2.1 SuperAssist project

TNO, Delft University of Technology, and Leiden University Medical Center are developing models for the supervision of distributed personal assistants for tele- and self-care within the SuperAssist project (De Haan, Blanson Henkemans & Ahluwalia, 2005). This project aims at setting up an integrated healthcare service, assisted by electronic devices and personal software agents, which are experienced as trustworthy and socially acceptable by the user. In the first phase it will focus on healthcare for diabetes type 2 patients. It also aims to reduce the costs of health-care by improving the local, self-care capability of people by efficient employment of remote, distributed expertise. A personal assistant could support them in their daily routine of measuring their blood glucose, taking their medication, and eating appropriately. Figure 1 gives a schematic overview of the SuperAssist project. The smileys denote the different personal assistants in the system. This thesis will concentrate on the smiley with the red square around it.

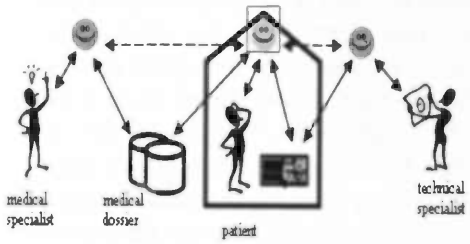

Figure 1 SuperAssist project

Patients with type 2 diabetes are a large group among the elderly. People need glucose as an energy source. Normally the body arranges a stable blood glucose level by the hormones insulin and glucagon. Insulin lowers the blood glucose level and glucagon heightens it. However, in diabetes blood glucose level is not stable. In Type 1 diabetes, insulin producing cells in the pancreas are destroyed. Therefore, insulin is functionally absent or significantly diminished. Type 1 diabetes is usually acquired at a young age. The only treatment for this type is to inject the patient regularly with insulin.

Type 2 diabetes on the other hand typically occurs in individuals who are older than 40. The pancreas produces not enough insulin and the body has become more resistant to insulin. Genetic factors, obesity and lack of exercise play a role in acquiring diabetes type 2. The treatment of type 2 diabetes is aimed at changing the lifestyle of patients: changing their diet, quitting smoking, taking medication, and exercising regularly. Diabetics can acquire a number

of conditions, ranging from heart disease, vessel disease and kidney damage to blindness and cognitive problems (Diabetes Fonds, 2005).

2.2 Persuasive technology

Persuasive technology explores the overlapping space between persuasion in general and computing technology (Fogg, 2002). This technology could help with supporting diabetics, because it is aimed at persuasion (e.g. behavior change of a person), which is often needed in diabetics. Not only is it a tool for treatment, but also for prevention (Intille, 2004). Persuasive technology is based on the theory that people have to be motivated to change their behavior. Two methods for persuasion are generally used: just-in-time messages, where people receive a simple message from an electronic device at an appropriate time at an appropriate place, using a non-irritating strategy (Intille, 2004) (e.g. You are close to the medicine cabinet, maybe it is a good time to take your medicine) and messages that highlight the benefits of a particular behavior (Intille, 2002) (e.g. If you take your medicine you diminish the change on a heart attack).

Figure 2 the HealthBuddy®

Two studies showed a positive effect on the behavior of participants when they were using an application with persuasive technology (Nawyn, 2005; Kaushik, 2005). Both studies took place in an apartment of MIT where two participants stayed respectively two weeks and a week. The studies were conducted with only one participant and the experiments were too short to be able to establish any long-term effects. The two participants signed in on a list with people who wanted to do an experiment for a longer period in the apartment and were therefore not representative for a large group. Kaushik (2005) showed that the participant was complying with the persuasive device more often than to the non-persuasive device and Nawyn (2005) showed that the participant was even complying with the persuasive device when the advice involved preventive actions.

Both studies showed a positive effect in the behavior of the participants when they were using an application with persuasive technology with doing exercises and watching less television, and doing exercises and taking medicines.

In the United States of America and recently in the Netherlands, there were experiments with a text interface based device to change the lifestyle of chronically ill. This device was the Health Buddy® (figure 2) from the Health Hero Network®. It makes use of Motivational Interviewing in its dialogs, which is a therapeutic method to change behavior. Because it is integrated in an electronic device, it is a persuasive technology. It has already accomplished positive results in changing lifestyle and improving quality of life (Bigalow, 2000; Van Dijken, Niesink & Schrijvers, 2005). However, more empirical research is needed to see if there are even better methods, maybe methods wherein Motivational Interviewing can be incorporated better.

The Health Buddy is a personal assistant that is text based, but maybe a personal assistant that is a virtual agent (e.g. the Healthpal (Blanson Henkemans, Neerincx, Lindenberg, Van der Mast (2006)) or an embodied agent (e.g. the iCat) could result in even better results for improving the treatment adherence of diabetics.

2.3 Research questions

This thesis addresses several questions. Can we find guidelines for personal assistants that try to change behavior? We already saw that implementation of skills from Motivational Interviewing in a text interface improved the treatment adherence of patients significantly. Can we implement these skills and maybe more, besides in a text interface also in a virtual agent or an embodied agent? Is it possible to have the same conversation with a text interface and an agent? Will the implementation of the skills have an effect on the incorporation of the guidelines? Are there differences in implementation of the skills and incorporation of the guidelines between the text interface and the agents, between the virtual and embodied agents, and between the social, an agent that show socially intelligent behavior, and non-social agents?

3 Guidelines for (robot) health assistants

A personal assistant that uses persuasive technology has to follow several guidelines. We used Motivational Interviewing as a starting point to find guidelines for behavioral change, because this technique is already tested in a persuasive device, the Health Buddy®. Motivational Interviewing is derived from several psychological theories on which we will give a short introduction. There has already been some research towards personal assistants and in that research guidelines from Motivational Interviewing are used.

3.1 Psychological theories about behavioral change

Motivational Interviewing is a technique that is linked to three psychological theories about behavioral change; Rogers' (Rogers, 1951) client-centered approach, the Transtheoretical Model of change (TTM) (Prochaska & DiClemente, 1982), and the cognitive consistency theory (Festinger, 1957). Below we will give a short introduction to all three theories and what them links to Motivational Interviewing. We would like to incorporate all the found guidelines into the personal assistant but this is not possible, simply because a text interface, virtual agent, and embodied agent are not human.

3.1.1 Theory of critical conditions to change

The theory of Rogers (1951) was based on years of experience with his clients. Rogers says that organisms know what good for them is. Among the things we need are food and positive regard. Positive regard stands for love, affection, attention etc. and with positive regard we get a high positive self-regard. Without positive self-regard we fail to become what we can be.

Rogerian therapy is based on the qualities of the therapist. When a therapist has the ability to be honest with the client, the ability to feel what the client feels and respects the client with unconditional positive regard, a client will improve no matter what techniques are used. All these qualities are aimed at giving the client a higher self-esteem and when clients think they are able to change their behavior the can change it.

3.1.2 Cognitive consistency theory

This theory was developed by Leon Festinger (1957). It was based on the assumption that people are motivated to reduce dissonance between two cognitive "elements". An example is when a person knows that smoking is harmful but does not quit. This will cause dissonance and to resolve this dissonance, information has to be found to justify that smoking is not harmful. A limitation of this theory is that is doesn't explain why people tolerate dissonance between knowledge and behavior. Many people smoke although they know there is more evidence for the negative effects of smoking than for the positive effects.

Behavior can be changed with this theory by convincing the patient that his/her current behavior has more negative sides than the behavior that has to be reached.

3.1.3 Transtheoretical model of change (TTM)

The Transtheoretical model of change (Velicer, Prochaska, Fava, Norman & Redding, 1998) was based on a comparison between 18 different theories from psychotherapy and on behavioral change. The theories came from the Freudian school of thought as well as from the Skinnerian tradition and from the Rogerians. Thus it is a transtheoretical model. The

comparison led to only 10 processes that can produce change in the behavior of a client (Prochaska, DiClemente & Norcross, 1992). The smoker example, which is given in italics, is taken from (Velicer et al. 1998).

1. Consciousness raising: Provide information to the client regarding the behavior and the client. *I recall information people have given me on how to stop smoking.*
2. Self-re-evaluation: Assessing how the client thinks about him or herself with respect to the problem. *My dependency on cigarettes makes me feel disappointed in myself.*
3. Self-liberation: The client chooses and commits to action or beliefs in his or her ability to change. *I make commitments not to smoke.*
4. Counter conditioning: The client substitutes the problem behavior. *I find that doing other things with my hands is a good substitute for smoking.*
5. Stimulus control: The client avoids or removes stimuli that elicit the problem behavior. *I remove things from my home that remind me of smoking.*
6. Reinforcement management: The client is rewarded by him or herself or someone else for making changes. *I reward myself when I don't smoke.*
7. Helping relationships: The client is open and trusting about problems with someone who cares. *I have someone who listens when I need to talk about smoking.*
8. Dramatic relief: The client experiences and expresses feelings about the problem behavior and the solutions. *I react emotionally to warnings about smoking cigarettes.*
9. Environmental reevaluation: Assessing how the client's behavior effects the physical environment. *I consider the view that smoking can be harmful for the environment.*
10. Social liberation: The client finds increasing alternatives for the behavior in society. *I find society changing in ways that make it easier for a nonsmoker.*

Besides the 10 processes of change, there were also 5 stages of change identified. The smokers' example comes from Brug, Conner, Harré, Kremers, McKellar & Whitelaw (2005).

1. Precontemplation: People are not intending to take action in the foreseeable feature. *The smoker is unaware that his/her behavior constitutes a problem and has no intention to quit.*
2. Contemplation: People are intending to take action in the next six months. *The smoker starts to think about changing his/her behavior, but is not committed to try to quit.*
3. Preparation: People are intending to take action in the immediate future. *The smoker has the intention to quit and starts to make plans about how to quit.*
4. Action: People have made changes in their lifestyle within the past six months. *The smoker makes active attempts to quit.*
5. Maintenance: People are working to prevent relapse. *After 6 months of abstinence the smoker is in the maintenance stage and attempts to prevent relapse.*

People often relapse to an earlier stage, but this is no problem as long as they slowly progress to another stage. Being in a certain stage, for example stage 3, does not mean that people are actually going to change their behavior it just means that they are more likely to change their behavior than before (Brug et al., 2005).

A likely behavior change can be accomplished by using the processes of change when the person is in the right stage. Stimulus control for example does not have any use when the person is in the pre-contemplation stage, but is of use when the person is in the action and maintenance stage.

3.1.4 Motivational Interviewing

The key principle of Motivational Interviewing is that patient's self-knowledge about the effects of his/her behavior combined with self efficacy results in a positive behavior change (Miller & Rollnick, 1991). The skills of the therapist are based on the Rogers' theory (self-efficacy) and the abilities to gently persuade a client and to let the client see what the discrepancies between the current behavior and the goal behavior of the client are (cognitive consistency). Ten skills are identified:

1. Ability to express empathy through reflective listening.
2. Ability to communicate respect for and acceptance of clients and their feelings.
3. Able to establish a non-judgmental, collaborative relationship with the client.
4. Able to be a knowledgeable support person.
5. Be complimentary rather than punitive.
6. Listen rather than tell.
7. Gently persuade, with understanding that change is up to the client.
8. Develop discrepancy between client's goals or values and current behavior, helping clients to recognize the discrepancies between where they are and where they hope to be.
9. Adjust to, rather than oppose, client resistance.
10. Support self-efficacy and optimism: that is, focus on client's strengths to support the hope and optimism needed to change.

Our research focuses on the question if a socially intelligent robot is able to change the behavior/lifestyle of a diabetic. All the skills can be summarized under the guideline that the personal assistant that tries to change the behavior has the ability to be empathic. A text interface can incorporate fewer skills than a socially intelligent agent, and is therefore probably less empathetic. A text interface for example can not express empathy through reflective listening, but a socially intelligent agent can.

In this thesis we did not incorporate all skills into the personal assistants, but only the ones that could easily be implemented in the personal assistants. This meant that we tried to implement skills 1, 5, and 6 in the personal assistants.

3.2 Personal assistants

The guideline that follows from Motivational Interviewing is already used for personal assistants. Research shows that a personal assistant helps with treatment adherence and the sense of safety and therefore the quality of life of the patient increases (Friedberg, Ramaekers, and Wüst, 2005). We hypothesize that a virtual or embodied agent could be of better help for diabetics to remember the advice from their physician, and reassure them than a text interface based device. To improve treatment adherence patients have to cooperate with the personal assistant (De Haan et al., 2005). Advice following can be improved when using an embodied agent. The social facilitation effects, the improvement of the task performance because of the presence of an agent (Triplett, 1898), of an embodied agent are stronger than with a virtual agent (Bartneck, 2003). It is therefore possible that people are more likely to follow the advice given by an embodied personal assistant than from a virtual, non-embodied assistant.

Two guidelines to reach this goal are used in research to personal assistants.

1) People must like to use the assistant. If not, they won't use it. This guideline is actually the same as that the assistant must be emphatic, which follows from the skills from Motivational Interviewing. Advice must therefore be given in a positive manner. When a diabetic has for example eaten too much sugar he or she already knows that. An assistant pointing this out will not help. What could help is pointing out why it is healthier for the

diabetic to eat less sugar. Also, the patient will like the assistant better if it gives emotional support, that is, show sympathy and compassion. It is shown to lead to less frustration and longer interaction times (Klein, Moon & Picard, 2002). By looking at the user and showing empathy a robot with the ability to express emotions can be liked better than a text interface. This is also supported by the Media Equation (Reeves & Nass, 1996). This says that people treat all computers as social actors, but the more a technology is consistent with social and physical rules, the more people will like to use the technology.

2) The user must trust the assistant. This guideline can not be linked to the guideline from Motivational Interviewing, because there is a big difference between trust in a human and trust in an electronic device. To achieve trust, the interaction between user and the system must be acceptable for the human user and perhaps be adapted to the state of the user (Neerincx & Streefkerk, 2003). Trust can be reached by good advices by the assistant and a good interface. The Health Buddy® for example has only four buttons and its use is self-explanatory. Wærn and Ramberg (1996) showed that people tend to trust computers less than human beings.

   Swedish and Indian people had to answer questions about faults in cars by choosing among alternatives. After having answered the questions they got the answer and explanation of an expert. They were told that some answers and explanations came from a human car mechanic and others from a computer. They had to say which answers and questions they thought were from a computer and which from a human. Then they were asked to rate the person or system from which the answer and explanation originated. Trust, knowledge, explanatory value and comprehensibility were rated. The Swedish participants gave higher ratings for knowledge and explanation value when they attributed the advice to human and gave higher ratings of trust and understanding when the advice was attributed to computers. The Indian participants gave human answers and explanations a higher rating overall. Wærn and Ramberg conclude nothing from the differences between the Swedes and the Indians because the difference can be explained by several reasons. Namely cultural differences, the computer experience, the Swedish people all had some experience with computers while the Indian people had not, or the experimental setup, the Swedish people used the computer for giving the answers while the Indian people used paper and pencil to give the answers.

   In another experiment participants got solution and explanation through a computer or the same solution and explanation through a telephone by a human. The ratings of trust were significantly different. In a rating scale ranging from 1 to 10, trust in a human being was given an average rating of 9.38 in comparison of 7.55 for a computer.

   Two comments on this experiment can be given. The first is that this effect can be due to the fact that the way of presenting the solution and explanation was different in both situations. It is possible that other results would be found when the solution and explanation of the expert would be shown on the computer also. By talking to someone through the phone one increases the trust because talking through the phone approaches natural interaction more than reading information from the screen. Another comment on the research is that participants had experience with the phone but did not have experience with the computer.

   A robotic personal assistant may be trusted more than a text-interface-based personal assistant, because its interface is more natural. On the other hand, a text interface may be trusted more because many people are used to getting information from a computer screen rather than receiving it in spoken text from a robot with the ability to express emotions.

The use of a socially intelligent robot should result in a higher trust independent according to the results of Wærn and Ramberg (1996) independent of the reason why they found their differences. When the difference was there because participants thought the solution and

explanation came from a computer than a socially intelligent robot will perform better than the computer because of its abilities to recognize and synthesize speech. If the reason was the natural interaction than the robot will perform better than the computer because it can, besides the recognition and synthesis of speech, express emotions and is embodied therefore the socially intelligent robot approaches face-to-face communication even better than a phone conversation. A virtual agent lacks embodiment, if the improvement of face-to-face interaction is (one of) the reason(s) a robot performs better than a robot will also perform better than a virtual agent. When the reason was the computer experience of the participants than the socially intelligent robot will perform better because the interface is very natural in contrast with the computer. The trust towards the socially intelligent robot will thus probably be higher than that of a computer or other text-interface device.

Using a socially intelligent agent could improve the trust in the personal assistant, and the likeability/empathy of the assistant and therefore the number of advices that are followed. It is very difficult to measure the cooperation with a personal assistant in a short time. But we could measure how much a personal assistant is trusted and how empathetic it is found.

3.3 Robots

Robots could be used as personal assistants, but what is a robot and what is a social robot?
A survey by the United Nations has reported that there will be 6.6 million robots in homes by 2007. Most of them will be cleaning robots, but it is expected that there will be 2.4 million entertainment and "leisure" robots (BBC News, 22nd of October 2004).

ro·bot (rō′bŏt, -bōt′) *n.*

1. A mechanical device that sometimes resembles a human and is capable of performing a variety of often complex human tasks on command or by being programmed in advance.
2. A machine or device that operates automatically or by remote control.
3. A person who works mechanically without original thought, especially one who responds automatically to the commands of others.

[Czech, from `robota`, *drudgery*. See `orbh-` in Indo-European Roots.]

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In the research of the United Nations they have probably taken the first two definitions, because most cleaning robots will fall under the second.
We will follow only the first definition because communication with a robot only falls under this definition. Although the requirements for communication depend on the use of the robot, the desires of future users do not. Most people want a robot with which they can communicate in a human-like manner, but human-like behavior and appearance are less important (Dautenhahn, Woods, Kaouri, Walters, Koay & Werry, 2005). This conclusion was drawn out of results of a questionnaire.

As said earlier it is very important for a personal-assistant to be trusted. Otherwise none of the advices will be followed by the patient. To get trust the interaction between user and system must be acceptable (Neerincx & Streefkerk, 2003). Speech is for many people a more acceptable way of interaction than communication through the use of a keyboard. A robot with speech recognition and synthesis is therefore a step in the right direction. But acceptable interaction is more then understanding each other. A robot must interact taking into account the social rules. Facial and body language are very important when interacting with each other. By

using a combination of facial expressions and speech a robot can give users a good feeling about themselves. Without a good feeling a system will not be used (Klein, Moon & Picard, 2002). A robot that uses social rules to interact is called a social robot.

3.4 Social robots

We found several guidelines for Motivational Interviewing and personal assistants, and we spoke about incorporating those guidelines in a social robot. Before incorporating the guidelines in a social robot we first have to know what the guidelines for a social robot are.
Bartneck and Forlizzi (2004) propose the following definition of a social robot:

> *A **social robot** is an autonomous robot that interacts and communicates with humans by following the social rules attached to its role. This definition implies that a social robot has a physical embodiment. Screen characters would be excluded..... However, if a robot has some motoric and sensoric abilities then such a system could be considered a robot.*

Breazeal (2003) defines four classes of social robots. These classes are distinguished by their ability to support the social model in complex environments and their ability to support complex scenarios.

- *Socially evocative.* People are encouraged to anthropomorphize the robots from this class. A robot animal is an example of this.
- *Socially communicative.* Robots from this class use human-like social cues and communication modalities to facilitate the interaction with people. These robots have the ability to speak for example.
- *Socially responsive.* This class of robots is socially passive but can learn from interactions with people.
- *Sociable.* Sociable robots pro-actively engage people in a social manner to benefit the person and itself.

For the personal assistant the second class is the most important, because it is very important that the interaction with people is fluently and the robot does not have anything to gain from it. Although you can see a personal-assistant in a multi-agent system also as sociable, the personal-assistant wants information from the patient to have more information where it can reason about. With more information at its disposal it can give a better advice and can give better information to the other agents in the network so in some way it has profit from it.

Fong, Nourbakhsh & Dautenhahn (2003) focus on this type of social robots and those robots exhibit the following social characteristics specifically.

- Express and/or perceive emotions
- Communicate with high-level dialogue
- Learn/recognize models of other agents
- Use natural cues (gaze, gestures, etc.)
- Exhibit distinctive personality and character
- May learn/develop social competencies

A robot with the ability to express believable emotions probably makes the interaction for the user more enjoyable (Bartneck, 2003). Therefore it satisfies the empathy guideline, namely that the user will want to use the personal assistant (Klein et al., 2002). Another advantage of an embodied agent is that the social facilitation effects (Triplett, 1898) are stronger than with a virtual agent (Bartneck, 2003), so people are more likely to follow the advices given by an embodied personal assistant.
To have a pleasant interaction, the communication and emotion skills of the robot are very important (Fong et al., 2003; Duffy, 2003; Bruce, Nourbakhsh & Simmons, 2002). It is important that the robot has good synthesized speech, because a voice that is hard to understand

is irritating for the user. For elderly people (and most type 2 diabetics are elderly), it is even more important that the robot has a clear and articulated voice. Lip-synchronization can improve the perception of the speech, because people are used to see moving lips when somebody is talking. Asynchronous lip-movements on the other hand are very irritating and it would probably be better to use no lip-movements than asynchronous lip-movements. If both human and robot use speech to interact a dialog emerges. A dialog must be fluent, so good turn-taking is necessary. But a dialog exists of more then speech alone, body- and facial-expressions are important too and the dialog also depends on the personality of the robot. Besides that the robot has to show body- and facial-expressions it would be nice if the robot recognized some body- and facial-expressions, because the emotional state of a user could be reflected in its posture and gestures. In Nehaniv, Dautenhahn, Kubacki, Haegel & Parlitz (2005) is shown how difficult it is to recognize different gestures. Many gestures are ambiguous and it's therefore necessary to disambiguate them as much as possible. There is still a lot of work to be done in this direction.

Another important feature for a good interaction is gaze- and face-tracking (Bruce et al., 2002; Sidner, Kidd, Lee & Nash, 2004). The experiments in these articles both showed a high improvement of interaction when the robot tracked the face and gaze of the participant. Bruce et al. (2002) also showed an improvement of interaction when the robot had a face to communicate at in comparison to a robot without a face. People had difficulties in directing their speech to a faceless robot. A robot with a face and tracking abilities gave a roughly additive increase in performance.

So it is important that a robot is good and fast in speech-recognition and speech-synthesization, has a face, can display emotions and makes use of tracking. An iCat has all these features.

3.4.1 The iCat

The iCat is the only available research platform that can have facial expressions. There are other socially intelligent robots which have the ability to express emotion, like Kismet and Leonardo from the Massachusetts Institute of Technology (MIT), but these are not available for other research institutes. Therefore the iCat is chosen to do this research on the trust that people have in a social intelligent robot when it gives advice about their health. And feel more empathy towards a socially intelligent robot than towards a text interface.

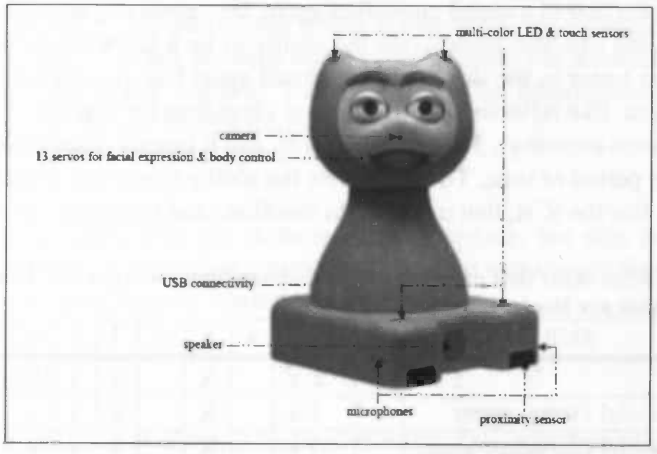

Figure 3 the iCat

In the iCat all the guidelines for a social robot according to Fong, Nourbakhsh & Dautenhahn (2003) can be incorporated. The iCat is a research platform for studying human-robot interaction with a socially intelligent robot. It looks like a yellow cat with a face and a body that can follow a person and can express emotions by moving lips, eyebrows, eyes, eyelids, head and body. Besides the facial expressions it has lights in its ears and feet to show its state and support its expressions, while sleeping for example the ears of the iCat blink to show it is still

alive. To make its movements believable the iCat makes use of the principles of animation (Van Breemen, unpublished). The movements become believable because all the principles of animation are focused on making a smooth movement instead of the common machine-like behavior – constant velocity and moving in straight lines. Besides fluent animations it is also of importance that abrupt transitions between emotions are avoided, because credibility is lost when the transition is abrupt. In the iCat a smooth transition between movements is assured by using a Transition filter (Van Breemen, 2004).

But how do you know what people think of the robot and if they are actually going to use it? And not besides the point in this thesis, is a patient more willing to use a robot than a text-interface and are advices better followed?

3.5 Summary

In the literature we found how the skills for Motivational Interviewing could be incorporated in a (robot) personal assistant that gives health advice. We have expectations about the successful incorporation of empathic abilities and trustworthiness in a text interface, a virtual agent, and an embodied agent. We think that in the embodied social agent skills from motivational interviewing can be implemented best and that both guidelines will therefore be followed best by the social embodied agent.

The conversational skills that are derived from the psychology can be incorporated in the assistants. Although there are some restrictions depending on the interface of the assistant, we will show (summarized in table 1) which skills of Motivational Interviewing can be incorporated in which interface. The text interface can have a non-judgmental, collaborative relationship with the client (skill 3), it also can be complimentary rather than punitive (skill 5), can gently persuade (skill 7), can develop discrepancy between client's goals and behavior (skill 8), can adjust to client resistance (skill 9), and can support self-efficacy and optimism (skill 10). The non-social agents can have the same skills as the text interface and no extra. A social virtual agent on the other hand can incorporate the same skills as the text interface and more. It can express empathy through reflective listening (skill 1), can communicate respect for and acceptance of clients and their feelings (skill 2), and can listen rather than tell (skill 6). The third interface is a social embodied agent, this agent can incorporate the same skills as a virtual agent, but can also incorporate the ability to be a knowledgeable person (skill 4) and is in our opinion better in the skills that the virtual agent has. Because embodiment makes the actions of the agent, like reflective listening, more clear than the actions of the virtual agent. But only skill 1 (express empathy), 5 (positive regard), and 6 (attentiveness) can be implemented and tested in a short period of time. To incorporate the ability to express empathy in a robot, we have to use a robot, like the iCat, that can express emotions and therefore can be socially intelligent.

Table 1 the skills that every personal assistant can incorporate. The bold printed skills are the skills that are implemented.

Skill	**1**	2	3	4	**5**	**6**	7	8	9	10
text			x		**X**		x	x	x	
Non-social virtual agent			x		**X**		x	x	x	
Non-social embodied agent			x		**X**		x	x	x	
Social virtual agent	**X**	x	x		**X**	**X**	x	x	x	x
Social embodied agent	**X**	x	x	x	**X**	**X**	x	x	x	x

4 Design of personal assistants

After we had found the guidelines we had to implement the skills from Motivational Interviewing in the text interface and our agents. Then we could conduct experiments to measure to what extent the personal assistants were trustworthy and had empathetic abilities. The skills that had to be implemented were; empathy, positive regard, and attentiveness. We implemented these skills into a in a text interface, two virtual agents (one for the pilot and one for the experiment), and an embodied agent.

4.1 Text interface

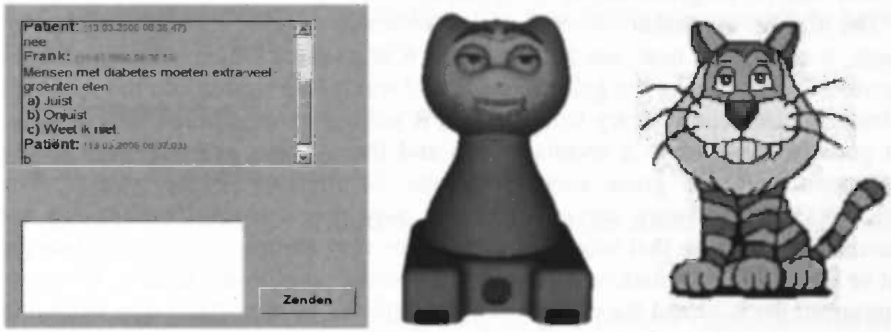

Figure 4 The text interface, the virtual iCat and Tiggie

The text interface is a chat program through which the experimenter can ask the questions which the participant can answer with a keyboard (fig. 4). It is implemented in C# and it is the client in the tcp/ip protocol. The participant sees the questions from the program in the upper window of the interface while he/she is able to type in the lower window. By pushing on the send-button the participant sends the message. The participant thinks he/she sends the message to a computer program, but he/she actually sends the message to the experimenter. The answers of the participant are also displayed in the upper window. The only skill from Motivational Interviewing that could be implemented in the text interface was positive regard.

4.2 Agents

As said before we did not only try to implement the skills in a text interface, but also in agents. Agents are in this context virtual or embodied characters that can speak with lip-synchronization and have the ability to expose socially intelligent behavior.

4.2.1 Social vs. non-social agent

In the non-socially intelligent agent only one skill could be implemented. This was the same skill as could be implemented in the text interface, positive regard. The agent did not follow the participant with its eyes and head, did not blink or nod, and did not express emotions. It even looked passed the participant to make the non-socially intelligent condition more extreme.

The socially intelligent agent on the other hand was able to have all three skills. The empathy was implemented by the ability to express emotions like happy, sad, and understanding. The happy movement is a smiling agent, while the agent shakes its head, moves it downwards and closes its eyes a bit to look sad. The understanding emotion was very clear; it was a deep nod

with an understanding "mmm" sound that came from the Loquendo text-to-speech engine library. Next to these emotions the agent is able to go to sleep and wake up again. During both movements the agent yawns. The yawn is just like the "mmm" a sound from the Loquendo sound library.

Just like the text interface and non-socially intelligent agent the socially intelligent agent is complimentary rather than punitive, but the socially intelligent agent can strengthen its compliments by a happy face.

The socially intelligent agent is looking at the participants while it has a listening expression and sometimes nods its head with or without an understanding "mmm" sound. This implements the attentive skill.

Two different agents were used in the experiment, the iCat from Philips (fig. 3) and Tiggie from DoellGroup. The iCat comes with the Open Platform for Personal Robotics™ ('OPPR') software. In the OPPR software an animation editor is included to make it easier to create your own animations, but there is also a library included with many standard animations and its transitions. The iCat can be programmed in C++, but it is also possible to use the scripting language .LUA. The iCat has a speaker, microphones, a webcam, a proximity sensor and touch sensors. With these, it can speak, hear, see and feel. Our iCat uses the Dutch male voice from Loquendo (Loquendo, 2006). During the going to sleep and waking up movement, the iCat uses the movements from the animation library from the OPPR software from Philips. The going to sleep movement goes from active to a nodding sleep and then to vast asleep. The listening movement meant open eyes and green ears to indicate its attention to the speaker. The movements from the OPPR software are adjusted in a way that body movements are not included in the animation, because that would be a cause for very abrupt movements when the iCat looked right or left and the animations all have their starting point in the middle. We made LUA-scripts to program the iCat and for communicating with the server, which was written in C#, it was necessary to create a tcp/ip connection between the LUA scripts and the C# code. This was done by using luasocket, an extra module of .LUA.

Tiggie is a virtual Microsoft agent (fig. 2) developed by DoellGroup. This agent was chosen because it had almost the same expression abilities as the iCat and it was a catlike agent like the iCat. The social and non social conditions of Tiggie were made in such a way they resembled the social and non social conditions of the iCat. The voice Tiggie used was the same as the iCat used, namely the male Dutch voice from Loquendo. The movements of Tiggie were standard movements that were already incorporated in the Tiggie software. The movements were chosen to resemble the movements of iCat as much as possible. Tiggie could be controlled by commands in C#.

4.2.2 Embodied vs. virtual agent

In both the pilot and the experiment the iCat was used as the embodied agent, but there was a difference in which virtual agent was used in both experiments. In the pilot Tiggie from DoellGroup was used and in the experiment the virtual iCat was used. The implementation of the skills was the same for the embodied and virtual agents except for the implementation of the following of the participants. In the socially intelligent embodied iCat condition the information the experimenter gets from the webcam in its noise is used to adjust the position of body, head, and eyes. By adjusting these properties fluently the iCat seems to follow the participant and therefore listen to the participant. While the socially intelligent virtual iCat was positioned on the screen is such a way that it looked at the participant, and Tiggie looked both in the socially intelligent condition and in the non-socially intelligent condition towards the participant.

5 Pilot experiment

In the pilot we explored whether we could implement skills from Motivational Interviewing in the text interface and the agents, and if we could use these skills well in a Wizard of Oz setting of the experiment.

A Wizard of Oz experiment means that participants think they are interacting with an autonomous system, but the system is partly or completely operated by the experimenter. In this experiment participants thought they were communicating with an intelligent interface which automatically responded on their answers while it was the experimenter who did the speech/language recognition and gave the questions and responses.

The aims of the pilot were: (1) to find and test guidelines for a socially intelligent robot that can act as a personal assistant; (2) to find out if it was technically possible to have the same conversation with the text interface as with the agents.

5.1 Hypotheses

For the pilot we had two hypotheses:

H1: One can have the same conversation with a text interface based personal assistant as with a virtual or embodied agent.

H2: The three chosen skills (1) express empathy, (2) give positive regard, and (3) be attentive, could be implemented in the agents as postulated in the previous section.

5.2 Participants

Six participants (students who were doing an internship at our TNO institute, unrelated to the present study) volunteered to participate in the experiment, two female and four male, aged 22-29 (M age = 24.17 SD= 2.56). The participants were randomly assigned to one of two groups: One group (N=4) worked with the iCat and the other group (N=2) worked with the onscreen agent Tiggie. This latter group was smaller due to technical problems with Tiggie.

5.3 Method

5.3.1 Design

All participants received three personal assistants to test. They all received a text interface and besides the text interface the received the virtual or embodied social and non-social agents (see appendix 5). The text interface was used as a control condition for the comparison between virtual and embodied personal assistants. The social/non social was a within-subjects factor while embodied/virtual was a between-subjects factor.

To measure the extent to which the guidelines for empathy and trustworthiness were followed we used the ratings on the questionnaires. The conditions were not counter-balanced, because we had only six participants.

Before every personal assistant participants received a scenario about a diabetic patient. The scenarios were given to every participant in the same order. The scenarios talked about a patient that had to test the assistant for a week. After finishing the "week" the participants received three questionnaires about the interface. When all three personal assistants were finished the

participants were asked to fill out a last questionnaire about there overall opinion of the three personal assistants.

5.3.2 Introduction materials

To give the participants some knowledge about diabetes they all saw an animation of about 3 minutes about diabetes, made by a student, and a short movie, 12 minutes, that was a shortened version of an educational video about diabetes. They also received some information from the experimenter about the treatment adherence of diabetics. Several questionnaires were given before they first the first scenario (Appendix 3).

5.3.3 Scenarios

Three scenarios were written about diabetics with self-care problems. The scenarios were given in the same order to every participant, but the order of the experimental conditions was varied. The first scenario focused on a 62 year old diabetic who had problems with following her/his diet, the second scenario was about a 56 year old who did not felt like doing the regularly self-checks, and the third scenario talked about a someone of 43 that regularly forgot her/his medication.

In each scenario the physician had asked the patient to try a personal assistant for a week (Appendix 2). It was explained to the patient that the assistant would ask questions on Monday, Wednesday, Friday, and Sunday.

5.3.4 Questions during the experiment

Because the questions were asked every other day for a week, it meant that participants received four blocks of questions. Between every block there was a short break and in the experiment there was a short story about what the subject did during the day in this break. A block consisted of eight questions of which four about their health and four multiple choice questions about diabetes. Three of the multiple choice questions asked for the same knowledge as in the other three blocks to see if people learned faster in a certain condition.

The questions, and the reactions on the participants' responses, were based on motivational interviewing (Appendix 5).

Examples of health questions were: "How are you feeling today?" "What is your blood glucose level?" The reaction of the personal assistant was attuned to the answer of the participant: if the participant was positive the interface said it was happy for the participant. If the participant was working with a social interface the facial expression was in line with its reaction.

Examples of multiple choice questions were: "Is a blood glucose level of 8 healthy? A) yes B) no C) I do not know", "People with diabetes have to eat a lot of sugars. A) yes B) no C) I do not know." If the answer was wrong the interface did not say that the participant was wrong, but gave the explanation of the correct answer. If the participant gave the correct answer the interface said it was correct and explained why. When the interface was socially intelligent it was happy or neutral depending on whether the answer was correct or not.

5.3.5 Measures

We also measured how many multiple choice questions were answered correct. In the

following we will first explain our subjective measures and then our objective measures.

The measures can be divided in two groups. The first tests the hypotheses, we had several subjective and objective measures. Trustworthiness and empathy were the guidelines that had to be measured. The trustworthiness was measured directly by questions about trust while the empathy was directly measured by questions about perceived empathy. Indirectly the trustworthiness was measured by a questionnaire about acceptance. A higher trustworthiness could lead to a higher acceptance and more correct answers. In the same way a personal assistant that is perceived as empathetic has a more social personality, is better accepted, and evokes more social behavior than a personal assistant that is perceived less empathetic.

The second group of measures did not test the hypotheses but did look at other things that could be interesting such as, the attitude towards robots and the personality of the participant. The questionnaires about attitude, personality, and the first pleasure/arousal pictures were asked at the beginning of the experiment and the questions had to be filled out on paper. The other questionnaires were asked during and at the end of the experiment (Appendix 4).

We will start with the second group of measures.

- Attitude towards robots: To measure the attitude towards robots we used a questionnaire based on the questionnaire used by Woods, Dautenhahn & Schulz (2004). The questionnaire consisted of five pictures of robots: the iCat, and robot no. 3, robot no. 28, robot no. 102 and robot no. 97 from Woods et al. (2004). These robots were chosen because they were evaluated in Woods et al. (2004) as pure animal, pure machine, 80% human/20% machine and 50% human/50% machine (fig. 6). We also measured what the position of the iCat was on the uncanny valley (Mori, 1970). This was done by asking the participants to say if the robots were human, machine, or animal and than we positioned the robots, according to the reactions of the participants, on a line that ranged from machine to animal to human. Research concludes that the appearance of an interface matters (Woods, Dautenhahn & Schulz, 2004; Fong et al., 2003; Bengtsson, Burgoon, Cederberg, Bonito, Lundeberg, 1999; Duffy, 2003). The first tendency was to make a humanoid robot because robot-human interaction would be best if the robot appeared to be a human. This idea proved to be false, because the expectations of the people are too high and instead of finding the robot sympathetic they find it unsympathetic or even repulsive. The point of this big disappointment is called the "uncanny valley" by Mashiro Mori. To explain the uncanny valley Mori (Mori, 1970) gives an example of when people are repulsed by something that is almost perfect. The example is a prosthetic hand, this hand can look indistinguishable from a real hand, but it does not feel like a real hand. When shaking the hand there is a difference between what you expected to feel and what

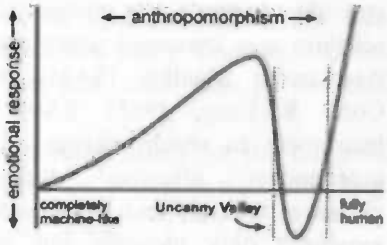

Figure 6 the Uncanny Valley

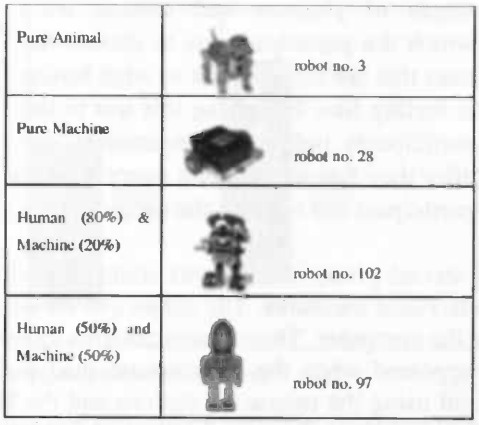

Figure 5 Pictures of the robots, besides the iCat, that were used in the questionnaire about the attitude towards robots. Figure taken from Woods et al. (2004)

you actually feel, which gives a feeling of discomfort. Figure 7 is a picture of the uncanny valley; the x-ax is the scale of anthropomorphism, the further on the ax the more human-like. On the y-ax stands the emotional response, the higher the better. In Woods et al. (2004) the emotional response is measured by asking questions about the friendliness, aggressiveness, shyness, bossiness, anger and fright. They called this the Behavioral Intention (BI). We used a Dutch translation of these questions in the questionnaire.

- Personality: The participants were asked to fill out a small personality questionnaire (15 questions). The personality questionnaire was based on the big-five questionnaire (Goldberg, 1992). The big-five says there are five important personality traits: extroversion, openness to experience, emotional stability, agreeableness and conscientiousness. The higher the overall score the more social someone rates him/herself. We used a smaller version of this questionnaire that consisted of fifteen questions which were divided in five groups of three questions. This smaller version of the big-five was validated at TNO (Van Vliet, 2001). This questionnaire could possible help to find out if the preference of a personal assistant could be linked to the personality of someone.
- Personal data: The participants were asked to fill out a form which asked their age, gender, education, profession, chat- and computer-experience.
- Pleasure/Arousal: The extent of empathy towards the subject in the scenario was measured using the Self-Assessment Manikin (SAM) (Hodes, Cook & Lang, 1985). SAM is an instrument to obtain ratings on three independent affective dimensions: pleasure, arousal, and dominance. We measured only pleasure and arousal. These ratings are obtained by showing pictures (figure 7) displaying different stages of pleasure and arousal from which the participant has to choose the ones that are most similar to what he/she is feeling like. By giving this test to the participants before the experiment and after they finished reading every scenario we tried to measure the extent of empathy the participant has towards the subject in the scenario.

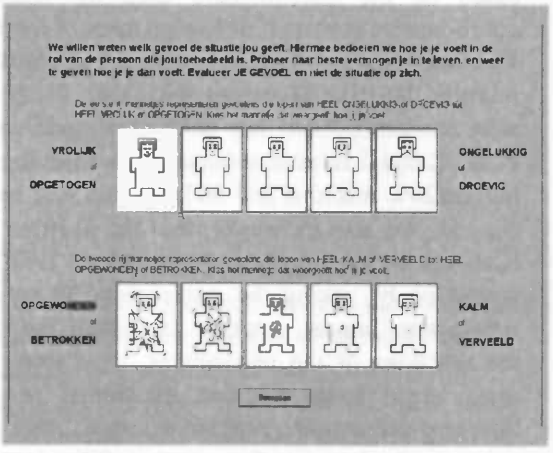

Figure 7 SAM

The second group of measures could be divided into two groups itself, subjective measures and behavioral measures. The subjective measures were all questionnaires that had to be filled out on the computer. These questionnaires appeared on the screen at the right of the participant. They appeared when the experimenter had pushed a questionnaire button and they could be filled out using the mouse for options and the keyboard for explanations. When the participant had filled out a questionnaire he/she had to push a button and the results were then saved.

Subjective measures

- Acceptation: To measure the acceptance level of the personal assistants a shortened version of the Unified Theory of Acceptance and Use of Technology (UTAUT)-questionnaire (Venkatesh, Morris, Davis & Davis. 2003) was used. We translated this

questionnaire to Dutch and made it shorter (16 questions).

- Personality of personal assistants: The same personality questionnaire that was filled out by the participants about themselves was given to the participants to fill out for the personal assistants. The higher the overall score the more social the interface is perceived.
- Trust: Four questions were asked about level of trust, credibility, intelligence and expertise.
- Empathic abilities: The empathic abilities were measured by a questionnaire that asked questions specific about empathy. Eighteen questions were asked, but these eighteen questions included the four questions about trust. There were therefore fourteen questions asked about the perceived ability to express empathy of the personal assistants.
- Overall: For the overall impression questions participants were asked to rate the interfaces: which they liked most, how much they liked every interface, which interface they found the most reliable/believable/professional. In total nine questions were asked in this questionnaire.

Behavioral measures

- Conversational behavior: We recorded the face of the participant with a webcam (Logitech Sphere) during the experiment. After the experiment the video data was scored for behavior towards the interface. The percentage of the total interaction time that participants were talking/typing with the personal assistant, how many times participants laughed and said goodbye to the personal assistant, and how much time of the total interaction time they looked at the agents.
- Correct answers: To see if there was a difference in learning effect for the different assistants we scored how many of the sixteen multiple-choice questions were answered correct.

5.3.6 Procedure

The experiment was conducted in a room that resembled a sitting room. There was a table with a lcd-screen, a laptop on it. Only when the embodied iCat was used it would be on the table also. The lcd-screen was used for the text interface and the virtual iCat while the laptop screen was used for the questionnaires. The laptop screen and lcd-screen were linked to each other so participants only needed one mouse and keyboard to use both screens. We used two screens because research suggests that people are more likely to react positively towards a computer program when the computer asks questions about its own program (Reeves & Nass, 1996), by using two screens we hoped to eliminate this bias.

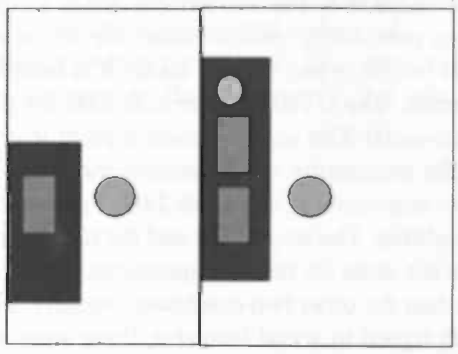

Figure 8 Experimental setup

There were three agent conditions: text interface, social agent, and non-social agent. The text interface condition was the same for both groups. The social and non-social agent condition was performed with either the iCat or Tiggie, dependent on whether a participant was in the iCat or Tiggie group.

Each participant was explained that the goal of the experiment was to see which personal assistant they would like if they had diabetes. It was emphasized that the personal assistants

were specifically designed to give questions and react to the answers to those questions, and not to do anything more. Participants were told they would work with three different personal assistants and in each condition they would receive four blocks of questions. Prior to each personal assistant they would receive a scenario about a diabetic with whom they had to empathize.

The experimental session started with questionnaires about personal data, personality, pleasure/arousal, and attitude towards robots.

After the questionnaires there was a short animation about diabetes and an introductory movie about diabetes. They were also told that the personal assistant would ask them multiple choice questions, and that it was not important that they answered this questions correct.

Then they received the first scenario about a diabetic. After reading the scenario they received the questions about pleasure/arousal again. By comparing them with the answers at the start of the experiment we measured the extent of empathy they had with the subject of the scenario. And the personal assistant started with asking questions. When they had finished the fourth block of questions they had to fill out the questionnaires about acceptation and empathic abilities of the interface, and trust in the interface.

After the three scenarios were completed, there was a questionnaire to measure the overall impression of the different interfaces.

5.4 Results and conclusions

First of all is that Tiggie proved to be a non-suitable tool for this experiment; because of software problems it was not possible to complete the experiments which used Tiggie. Therefore there are just a few results concerning Tiggie. We will not use Tiggie in a next experiment, but use a virtual iCat instead, because of our software problems with Tiggie.

5.4.1 Hypotheses results

The two participants in the Tiggie condition did not see any difference between the social and nonsocial Tiggie. They liked Tiggie better than the text interface, because of the more natural way of interaction. Participants did notice a difference between the social and nonsocial iCat.

In the personality questionnaire, the social iCat received a mean score of 7 (out of 9) while the text interface and the non-social iCat both scored around the 6, indicating that they liked the iCat better. The UTAUT score was 3.02 for the text interface and 2.83 for the social iCat, but the non-social iCat scored almost a point less. For the empathy score the same trend was seen as in the personality questionnaire: the social iCat scored 2.65, the text interface scored 2.17 and the non-social iCat scored 2.09. Trustworthiness was scored immediately after completing the condition. The social iCat and the text interface scored with respectively 4.08 and 4.25 more or less the same on the trust questions. The non-social iCat did have a score more than a point lower than the other two conditions, namely 3.00.

With regard to social behavior, there were no differences in expressions in the speech of the participants during different conditions. There were however differences in social behavior towards the interface. With the social iCat, for example, participants leaned towards the iCat and directed their conversation at the iCat, while in the non-social condition participants were hanging back in their seat. In our future experiment we will record facial and body expressions of the participants, because it may indicate how much fun it is to work with a personal assistant.

As can be seen from the results of the experiment it was possible to have the same conversation with a text interface and the iCat, but unfortunately not with Tiggie.

The three skills could be implemented in both the iCat and Tiggie. In the text interface only one of the skills, give positive regard, could be implemented. The results show that the level of implementation can have positive effects on the two guidelines, empathy and trustworthiness. The social iCat scored higher on the empathy guideline, but not on the trust guideline. Another finding was that if a personal assistant is able to incorporate more skills than it has incorporated, as is the case in the non-social condition, this is hold against it. The non-social iCat scored lower on both guidelines than the text interface based personal assistant and the social iCat.

5.4.2 Other results

When positioned on the animal-human scale, the iCat was positioned as an animal by all participants, except one who thought it looked human. All participants said iCat had a complete face in contrast with the robot animal, of which half of the participants said that it had a complete face. On average, the other robots were positioned as 100% animal, 66% human/33% machine, 33% human/66% machine, and 100% machine. Only one of the participants thought that the robots could have feelings and none of the participants classified a robot as being really aggressive or unfriendly.

In the final questionnaire all four participants in the iCat condition indicated that they would like a personal assistant if they had diabetes. Three of them would like to use the social iCat at home and one the text interface.

When we compare our results for attitude toward robots with those from Woods et al. [28], we find that in Woods et al. the children attributed feelings to a robot more easily and that in contrast to our participants, they found some robots aggressive and unfriendly. These differences might be caused by the difference in age. There were however no differences in how participants positioned the robots on the animal-machine-human scale: our participants placed the robots at about the same position with regard to the animal, machine, human appearance as the children.

In summary, our experiment showed that the iCat can have the same conversation as the text interface and those skills from Motivational Interviewing could be implemented and tested.

Obviously, the pilot study was limited in that it involved only 6 participants who were not diabetics. Following we present a larger study to substantiate the findings of the pilot experiment.

6 Experiment

An experiment was conducted to explore the effects, which were found in the pilot experiment, of the incorporation of the skills of Motivational Interviewing better.

6.1 Hypotheses

In the pilot experiment we found that it was possible to have the same conversation with the text interface based personal assistant and the iCat. It was also found that some skills could be implemented in the different personal assistants and that the incorporation of these skills had an effect on the guidelines on empathy and trustworthiness. In this experiment we have several hypotheses about how the implementation of the skills has an effect on the guidelines.

H1: Agents evoke more empathy, but are found equally trustworthy as the text interface.

H2: Embodied agents evoke more empathy and are found more trustworthy than virtual agents.

H3: Socially intelligent agents evoke more empathy and are found more trustworthy than non-socially intelligent agents.

6.2 Participants

Twenty-four participants took part in the experiment, twelve female and twelve male, aged 45-65 (M age = 55.04 SD= 5.74). They were paid 55 euro for their participation in the experiment that took around 2 hours. The experiment was conducted in the same room as the pilot experiment. Participants were divided in two groups.

6.3 Design

The design of the experiment was the same as that of the pilot, besides the number of participants.

One group (N=12) worked with the embodied iCat and the other group (N=12) worked with the virtual iCat (see appendix 6). The conditions were counter-balanced; every order of conditions was done by a female and a male participant.

Figure 9 Photo of experimental setup

6.4 Procedure

The second experiment differed in some ways with the pilot experiment. The biggest difference was that there was instead of Tiggie a virtual iCat.

Next to this there were short stories between every block of questions about what the subject of the scenario did during the day. In the second experiment the participants received some general questions to get used to the personal assistant when they started using it. If the iCat was used participants could ask the iCat to repeat the last sentence when they had difficulty understanding it. And their face was recorded with a webcam (Logitech Sphere) that stood on the table next to the laptop.

6.5 Results

In the following we will show the results of the experiment. We will start with the questionnaires and behavioral measures that give results for the hypotheses, and we end with some general results. Mostly only the significant differences are shown, these differences give evidence for the hypotheses. The three main effects for the hypotheses are the differences between agents and text, virtual and embodied agents, and social and non social agents.

6.5.1 Results of hypotheses tests

Trust:

Two of the four questions about trust gave a significant difference (table 2). Both differences show that the embodied agent is trusted more than the virtual agent.

Table 2 Significant differences in trustworthiness questions. The highest value is given in italics.

Trust question (scale)	Mean				Test/Result	Significance
	Embodied	Virtual	Embodied Non-Social	Virtual Non-Social		
Expertise (1= no expertise, 5= high expertise)			*4.42*	3.58	Mann-Whitney U U = 34.5 Z= 2.165	$p < 0.05$
Intelligence (1= not agree, 5= agree)	*3.67*	2.88			Mann-Whitney U U = 190 Z= 2.02	$p < 0.05$

Acceptation:

Only one out of sixteen questions gave a significant difference (table 3). The social iCat was found more pleasant than the non-social iCat.

Table 3 Significant differences in the UTAUT-Questionnaire (1 question out of 16). The highest value is given in italics.

Utaut question (scale)	Mean		Test/Result	Significance
	Social	Non-Social		
Pleasantness (1= unpleasant, 5=pleasant)	*3.92*	3.21	Mann-Whitney U U = 183.5 Z= 2.15	$p < 0.05$

Correct answers:

No significant differences were found between the number of correct answers of the different personal assistants.

Personality of personal assistants:

The personality questionnaire gave significant differences when all the questions of the personality questionnaire were taken together. The scale of the questions of the personality questionnaire ranged from 1-9. The means of the questionnaire were tested with "difference test means". The virtual iCat (mean=6.78) was significantly (p one sided < 0.05) more social than the text interface (mean=6.04). The social iCat (mean=6.84) was significantly (p one sided < 0.05) more social than the text interface (mean=6.04) and the non-social iCat (mean=6.19).

In table 4 the separate questions of the questionnaire that gave significant differences (8 out of 15 questions) are shown. One can see that the virtual and social iCat scored consequently higher than the non-social agents and the text interface.

Table 4 Personality questionnaire of personal assistants (8 questions out of 15 showed significant differences). The highest result is shown in italics.

Small5 question (scale)	Mean								Test/Result	Significance
	Agent	text	embodied	virtual			embodied	embodied		
					social	Non-social	social	Non-social		
Silence (1= silent, 5= talkative)		5.38		*6.71*					Mann-Whitney U U = 190 Z= 2.021	p < 0.05
		5.38			*6.75*				Mann-Whitney U U = 186 Z= 2.103	p < 0.05
Kindness (1= not kind, 5= very kind) Not kind/ Kind			6.46	*7.83*					Mann-Whitney U U = 48.5 Z= -2.876	p < 0.005
		6.71		*7.83*					Mann-Whitney U U = 158 Z= 2.681	p < 0.01
Friendliness (1=unfriendly, 5= very friendly)			7.08	*7.88*					Mann-Whitney U U = 83 Z= -2.165	p < 0.05
Satisfaction (1= not satisfied, 5= very satisfied)			6.38	*7.54*					Mann-Whitney U U = 68.5 Z= -2.464	p < 0.05
Originality (1= not original, 5= very original)		4.96		*6.38*					Mann-Whitney U U = 176.5 Z= 2.299	p < 0.05
									Kruskall-Wallis Anova H=7.05	p < 0.05
		4.96			*6.50*				Mann-Whitney U U = 164.5 Z= 2.547	p < 0.05
Artisticy (1= Not artistic, 5= very artistic	*4.83*	3.71							Mann-Whitney U U = 406.5 Z= 2.025	p < 0.05
		3.71		*5.17*					Mann-Whitney U U = 173.5 Z= 2.361	p < 0.05
		3.71			*5.33*				Mann-Whitney U U = 169 Z= 2.454	p < 0.05
Creativity (1=Not creative, 5= very creative					*6.13*	4.21			Mann-Whitney U U = 150.5 Z= 2.835	p < 0.005
		4.33			*6.13*				Mann-Whitney U U = 149.5 Z= 2.856	p < 0.005
							6.17	3.67	Mann-Whitney U U = 28.5 Z= 2.511	p < 0.05
Warmthness (1= cold, 5= warm)		5.00			*6.38*				Mann-Whitney U U = 178.5 Z= 2.258	p < 0.05

Empathy :

Only two out of fourteen questions showed significant differences in the empathy questionnaire (table 5). The differences were all caused by the social iCat. The difference in friendliness between the social and non-social iCat was solely caused by the difference between the social embodied iCat and the non-social embodied iCat.

Table 5 Empathy questionnaire of personal assistants (2 of 14 questions showed significant differences). The highest result is shown in italics.

Empathie question (scale)	Mean						Test/Result	Significance
	Agents	text			embodied	embodied		
			social	Non-social	social	Non-social		
Looking at participant (1= not agree, 5= agree)	*3.25*	1.54					Mann-Whitney U U = 276.0 Z= 3.584	$p < 0.0005$
			4.5	2.0			Mann-Whitney U U = 59.5 Z= 4.711	$p < 0.00001$
		1.54	*4.5*				Mann-Whitney U U = 26 Z= 5.402	$p < 0.00001$
Friendly (1= not agree, 5= agree)			*4.7*	3.88			Mann-Whitney U U = 167.5 Z= 2.485	$p < 0.02$
					4.58	3.67	Mann-Whitney U U = 38 Z= 1.963	$p < 0.05$

Conversational behavior:

Several things were scored in the videos of the participants. We recorded the time they looked at the iCat (this was not measured for the text interface), the time they spoke to the personal assistant (for the text interface this was the time they typed), how many times they laughed and said goodbye, and how many multiple choice questions they correctly answered (see appendix 4) (table 6).

We excluded six participants (4 female, 2 male, 3 virtual, 3 embodied) from the analyses because their videos were not complete or they had not answered all the questions, because of technical problems. All four measured behaviors showed significant differences between the different personal assistants. The participants typed on average more in the text interface than they talked to the agents. Participants laughed most at the socially intelligent iCat. The time of looking at the personal assistant was only measured for the agents and the results show that participants look most at the socially intelligent embodied agent.

Table 6 Conversational behavior. The highest values for every test are in italics.

Behavior	Mean								Test/Result	Significance
	Agents	text	embodied	virtual			embodied	embodied		
					social	Non-social	social	Non-social		
talking	6.99%	*15.81%*							T-test $t(52) = -6.914$	$p < 0.0000$
laughing		1.22	*3.56*						T-test $t(34) = 2.312$	$p < 0.05$
					4.17	1.44			T-test $t(34) = 2.288$	$p < 0.05$
		1.22			*4.17*				T-test $t(34) = 2.403$	$p < 0.05$
goodbye	*0.83*	0.0							T-test $t(52) = 3.175$	$p < 0.005$
looking					*59.89%*	37.76%			T-test $t(34) = 2.62$	$p < 0.05$
							59.54%	31.93%	T-test $t(16) = 2.25$	$p < 0.05$

Overall:

The overall questionnaire consisted of questions that were important for both empathy and trust (e.g. which interface did you find most trustworthy?). Only one question resulted in a significant difference, namely the question about how good they found the personal assistants (table 7). The non-social agent and in particular the non-social embodied agent scored significantly lower on this question than the text interface and the social agent.

Three of the participants said they would not use one of the personal assistants at home. This means that 87.5% would use a personal assistant that could support them with their daily routine at home. Of this 87.5%, 47.5% preferred the text interface while 43% preferred the social personal assistant and 9.5% preferred the non-social personal assistant.

Table 7 Overall questionnaire. The highest values are in italics.

Question (scale)	Mean					Test/Result	Significance
	Text			Embodied	Embodied		
		Social	Non Social	Social	Non-Social		
Good (1= very bad, 5= very good)	*3.83*		3.33			Friedman Anova $Chi^2(N=24)=5.0$	$p < 0.05$
		4.0	3.33			Friedman Anova $Chi^2(N=24)=7.12$	$p < 0.01$
				4.17	3.25	Friedman Anova $Chi^2(N=12)=6.4$	$p < 0.02$

We also asked which personal assistant the participants found most pleasant. 50% of the participants chose a social personal assistant. The text-interface chose 37.5% percent and the remaining 12.5% chose a non-social personal assistant. 33.5% of the participants that did the experiment with the embodied iCat chose the iCat while 28% of the participants who worked with the virtual iCat chose the iCat.

Next to the trust questions that were posed after using the personal assistant there were also three questions, at the end of the experiment, about trust, expertise and credibility. 37.5% of the participants chose for the social personal assistant with all three questions, but there were differences in how many people chose the text interface and the non-social personal assistant. 54% found the text interface most trustworthy, but only 42% found that it had most expertise and 50% trusted it most. There were only differences between the virtual and embodied agent for the question about believability where 25% of the participants with the embodied iCat chose for the iCat while 20% of the participants who worked with the virtual iCat chose for the iCat. However none of these results were significant.

Correlations:

We correlated the different questionnaires for acceptance, personality, empathy and trust. All questionnaires are positively correlated (table 8).

Table 8 Correlation matrix of the questionnaires.

Questionnaire	Acceptance	Personality	Empathy	Trust
Acceptance	1	0.38 ($p < 0.001$)	0.53 ($p < 0.000$)	0.54 ($p < 0.000$)
Personality	0.38 ($p < 0.001$)	1	0.65 ($p < 0.000$)	0.44 ($p < 0.000$)
Empathy	0.53 ($p < 0.000$)	0.65 ($p < 0.000$)	1	0.65 ($p < 0.000$)
Trust	0.54 ($p < 0.000$)	0.44 ($p < 0.000$)	0.65 ($p < 0.000$)	1

6.5.2 Other results

Attitude towards robots:

The adapted questionnaire of Woods et al. (2004) was used to measure the attitude towards robots. In table 9 only the questions with significant differences are shown. Figure 10 shows the humanlike robots plotted in a graph.

Table 9 Questionnaire about robot pictures. The value that is most positive for that question is in italics.

Question	Mean					Test/Result	Significance
	Robot no. 3	Robot no. 97	Robot no. 102	iCat	Robot no. 28		
Can understand (1=yes, 2= no)	1.54	*1.46*	1.67	1.62	1.92	Kruskall-Wallis Anova H = 12.44	$p < 0.05$
Has feelings (1=yes, 2= no)	2.00	1.92	1.96	*1.71*	1.96	Kruskall-Wallis Anova H = 11.90	$p < 0.05$
Friendliness (1=very friendly, 5= very unfriendly)	2.54	2.63	3.17	*2.21*	3.25	Kruskall-Wallis Anova H = 17.17	$p < 0.005$
Shyness (1=not shy, 5= very shy)	2.13	2.38	2.17	*3.21*	2.46	Kruskall-Wallis Anova H = 17.30	$p < 0.005$
Angriness (1=not angry, 5= very angry)	2.50	2.67	2.96	*2.17*	2.75	Kruskall-Wallis Anova H = 9.57	$p < 0.05$

The uncanny valley (Mori, 1970) has an x-axis for the percentage humanlike, but not all the robots were classified as humanlike. Therefore we made a graph (figure 10) of the three robots that were sometimes classified as humanlike. The behavioral intention, which is the mean of the score on the questions about unfriendliness, aggressiveness, shyness, bossiness, anger and fright, is plotted on the y-axis (Woods et al. 2004).

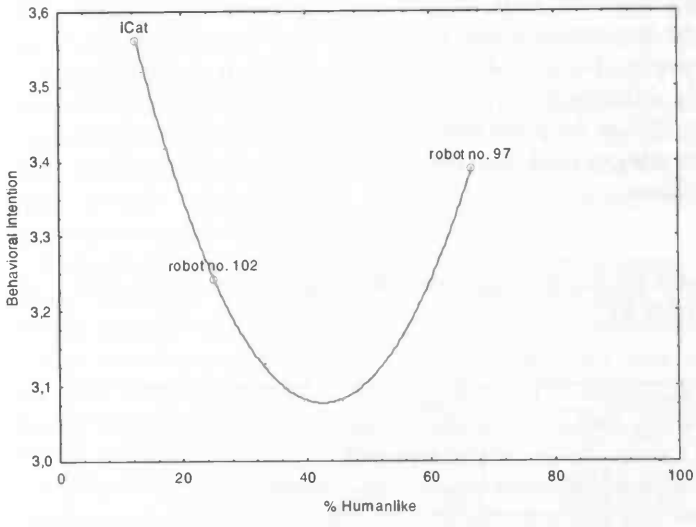

Figure 10 Humanlike graph plotted on the same axes as the uncanny valley graph in Woods et al. (2004)

Pleasure/Arousal:

The pleasure/arousal pictures (SAM) were shown to the participants to see if there was a difference between their pleasure/arousal at the beginning of the experiment and after they had

read a scenario. No significant differences were found between the pleasure/arousal of the participants at the start of the experiment and after they had read the scenarios.

Personal data:

There were three significant differences found between gender and personality. Female participants rated themselves warmer, more creative, and more talkative on a 9 point scale (table 10).

Table 10 Significant differences between gender

Personality question	Mean		Test/Result	Significance
	Female	Male		
Cold/warm	7.75	6.42	Mann-Whitney U U = 32.0 Z= 2.309	$p < 0.05$
Not creative/Creative	6.67	4.83	Mann-Whitney U U = 33.5 Z= 2.223	$p < 0.05$
Silent/Talkative	7.08	5.0	Mann-Whitney U U = 22.5 Z= 2.858	$p < 0.005$

Next to this we found a correlation between the personality of the participant and the personal assistant of their choice. The Spearman rank order correlation with pair wise deletion the was -0.447. The more concise someone rated him/herself (mean=7.48 on scale 1-9 (the higher the more concise)) in the personality questionnaire the less he/she liked the socially intelligent iCat (mean=3.92 on scale 1-5 (the higher the better)).

6.6 Conclusion

6.6.1 Evaluation of an empathic and trustworthy assistant

The experiment substantiates the findings of the pilot experiment with regard to the possibility to have the same conversation with a text interface and an agent. The pilot also supports the possibility to implement three skills from motivational interviewing, show empathy, be complimentary, and be attentive, into the personal assistants. Furthermore it showed that the implementation of those skills has a positive influence on the incorporation of the guidelines.

Before the experiment we had three hypotheses. The three hypotheses were:

H1: Agents evoke more empathy than a text interface, but are found equally trustworthy as the text interface.

H2: Embodied agents evoke more empathy and are found more trustworthy than virtual agents.

H3: Socially intelligent evoke more empathy and are found more trustworthy than non-socially intelligent agents.

To test these hypotheses, we used several questionnaires to measure to what extent we were able to implement the skills into the personal assistants and to measure how empathetic and trustworthy the personal assistants were. Furthermore we used video data and scored the amount and quality of social behavior of the participant towards the personal assistant. First we will discuss the results for empathy and then we will discuss the results for trustworthiness.

Empathy

Participants filled out an empathy questionnaire which specifically tested how much empathy the personal assistant evoked. We think that when an assistant is found more empathetic it scores also higher on acceptance, personality and social behavior towards the personal assistant. This idea is supported with the correlation matrix of the different questionnaires (table 8): The means of all the items from the different questionnaires are positively correlated.

The hypothesis that agents evoke more empathy than a text interface was supported by one question of the empathy questionnaire that supported and one question of the personality questionnaire. The video data did support this hypothesis also, only the percentage of the total time that people talked with the personal assistant was higher for the text interface. This could have several causes; people are more precise while typing, they correct errors, and the participants typed slower than they talked.

Embodied agents evoke more empathy than virtual agents was a hypothesis that was rejected. Three questions of the personality questionnaire gave a significant difference between the virtual and embodied agent on which the virtual agent scored higher.

The differences between the socially intelligent and non-socially intelligent agents for empathy were as expected in the hypothesis. The socially intelligent agent scored significantly higher than the non-socially intelligent agent on two questions of the empathy questionnaire. When all the questions of the personality questionnaire were taken together there was a significant difference between the socially intelligent and the non-socially intelligent agent. The same was seen in three of the four social behaviors that were scored; the percentage of time they looked at the personal assistant, the number of times they laughed at and said goodbye to the personal assistant. There was also one item in the acceptance questionnaire which had a significant difference between the socially intelligent agent and the non-socially intelligent agent. This item asked how pleasant the participant found the interaction with the personal assistant. The interaction with the socially intelligent agent was rated significantly more

pleasant than the conversation with the non-socially intelligent agent. One item in the overall questionnaire showed a significant difference, this was the item about how good they found each personal assistant that they had used. This difference supported the hypothesis that the socially intelligent agent evoked more empathy than the non-socially intelligent agent. The socially intelligent agent scored significantly better than the non-socially intelligent agent.

Trustworthiness

The trustworthiness was measured directly with four items about trust and indirectly with the acceptance questionnaire.

There was no significant difference on trustworthiness between agents and text which supports our hypothesis that they are equally trustworthy. Two items of the trust questionnaire significantly differed, expertise and intelligence, but both did not show a significant difference between agents and text.

The embodied agent was more trustworthy than the virtual agent, as expected. It was found more intelligent and having more expertise. In the acceptance questionnaire there was one item with a significant difference, but it was not an item related to trust.

The trustworthiness of the social agent was expected to be higher than that of the non-social agent, but this was not supported by the experiment. No significant differences were found between the trustworthiness of the social and non-social agent.

We can conclude that the first hypothesis is supported on both parts: Agents evoke more empathy and they are equally trustworthy as text interface based personal assistants. The second hypothesis on the other hand is only partially supported. The virtual agent evoked more empathy than the embodied agent. The third hypothesis is partially accepted also, the socially intelligent iCat did evoke more empathy, but it was not more trustworthy than the non-socially intelligent iCat (table 11).

Table 11 The hypotheses and which parts are accepted or rejected

	H1 empathy	H1 trustworthiness	H2 empathy	H2 trustworthiness	H3 empathy	H3 trustworthiness
accepted	x	x		x	x	
rejected			x			x

6.6.2 Robot questionnaire

Next to the questionnaires to test the hypotheses we also let the participants fill out a questionnaire concerning five robots, among which was the iCat. There were items about the appearance of the robots and items about the feelings of the robots. This questionnaire measured behavioral intention and humanlikeness of the robots. A graph (figure 12) was made with the robots that were rated humanlike and their behavioral intention. The behavioral intention was the mean of the friendliness, aggressiveness, shyness, bossiness and anger scale. This graph showed that the results of this experiment do not match with the Uncanny Valley (Mori, 1970).

The results of the questionnaire about the robots showed that the iCat scored significantly higher than the other robots on being friendly, not angry, and not shy and having feelings. The iCat was ranked second best of the five robots for understanding, but with a big difference with the number one. The number one was robot no. 97 and this was also the robot that was most humanlike according to the participants. This supports the idea that the iCat is a good interface for human computer interaction.

6.6.3 Other findings

Next to the hypotheses and the robot questionnaire we found some other interesting results.

For a personal assistant no significant differences were found between gender and preferences, there were however three significant results between the genders in the personality questionnaire. The female participants rated themselves higher on warmth, creativity, and talkativity than the male participants, but this had no significant influence on their preferences. One correlation was found between the personality of the participants and how much they liked the social iCat (figure 16). How more concise the participant rated himself/herself the less he/she likes the social iCat. This agrees with my finding that concise participants said afterwards that they liked to see the question and their answer on the screen, because it was then easier to answer the question more precise.

There was found a significant difference in the overall questionnaire for pleasantness between text interface, social iCat, and non-social iCat. As can be seen in figure 15 this significance seems to be solely caused by the difference between the embodied iCats. This supports the finding in the pilot experiment where participants said to be annoyed by the non-social iCat, because it was ignoring them. We also found that an agent that does not look at you during a conversation is more irritating when it is embodied than when it is virtual.

In the overall questionnaire we asked if the participants would use a personal assistant when they would need one; 87.5% said they would, of these 87.5% about half of them would like to use the text interface while the other half wanted to use the iCat.

6.7 Discussion

The present experiment tried to establish whether a socially intelligent personal assistant is preferred over a text interface based personal assistant. To test this question we implemented a text interface based personal assistant, a socially intelligent virtual agent, a non-socially intelligent virtual agent, a socially intelligent embodied agent, and a non-socially intelligent embodied agent. The personal assistants all incorporated as many skills from Motivational Interviewing as possible. Three skills were implemented; (1) express empathy, (2) be complimentary, and (3) be attentive. In the socially intelligent agents all three skills were implemented, while in the other agents and in the text interface only the second skill was implemented (table 1).

From Motivational Interviewing a guideline for a good personal assistant that helps to change behavior was derived, a personal assistant must evoke empathy. From literature about personal assistants there was derived another guideline, a personal assistant must be trustworthy. These two guidelines were tested with three hypotheses.

Our hypothesis that the socially intelligent embodied agent would incorporate the skills best showed to be wrong. The socially intelligent virtual agent scored higher on empathy than the socially intelligent embodied agent and incorporated the skills better. An explanation could be that we did not use any of the sensors of the iCat and that people expected to be able to do that. This explanation is given in Lee, Jung, Kim and Kim (unpublished), but we think that in our experiment this is not the case. They used a humanlike doll that participants expected to give them a handshake, we used the iCat and none of the participants touched the iCat during the experiment or said anything about touching it after the experiment. We think the difference in empathy between the virtual and embodied iCat is probably caused by the sounds of the movements of the iCat. Several participants made comments about it and it could have influenced their appreciation of the iCat. The movements were not always fluent and this could have influenced the appreciation of the iCat also.

Unfortunately we did not find as many significant differences for trustworthiness as we hypothesized, but the correlation matrix of the questionnaires (table 8) indicates that if the

empathy guideline is followed better than the trustworthiness guideline is followed better also and vice versa.

6.7.1 Uncanny valley

The graph of the humanlike robots plotted for humanlikeness and behavioral intent (fig. 10) was not as we expected. The graph did not resemble the uncanny valley at all.

The robot that is rated most humanlike (68%) seems to be passed the dip of the graph already and we think this is not the case. The graph of Woods et al. (2004) shows that the dip of the uncanny valley is at the point of 80% humanlike and not at 68% humanlike. There are several possible causes. The first is that there was not enough data and therefore the results are not valid. Secondly the questionnaire might not give enough information to find the uncanny valley. Another reason could be that adults do behave very differently than children and have their uncanny valley sooner. Finally it is possible that the uncanny valley does not exist. We think that the questionnaire in combination with the differences between children and adults are the major causes for my results. Adults do not assign feelings to robots as easily as children do and therefore many of the questions about feelings were filled in as neutral.

6.7.2 Comments of participants

Many participants made a positive comment about the iCat when they saw it for the first time; they said it was the friendliest robot from the pictures. Several participants found that the voice we used from Loquendo was weird for the iCat. They had expected a female voice. We used a male voice, because that was the only Dutch voice that sounded right. The participants during the experiment could be divided into three groups, the first group did not look at the iCat at all, the second group looked at it but did not show any emotions, and the third group smiled at it and really directed their conversation towards the iCat.

With regard to the preferences for the personal assistant the participants could also be divided into three groups. One group did not think there was any difference between the personal assistants. Another group preferred the text interface because they were able to imagine there was a human behind the reactions and they were not able to imagine this while working with the iCat. The third group found that typing was the way to communicate with a computer and talking was not.

The experiment showed that people who disliked the iCat thought it was repeating to much and was irritating, while people who disliked the text interface said that was irritating and repeated to much.

We hoped to find a better learning curve for the socially intelligent iCat than for the text interface, but we did not find any differences in amount of correct answers between all the conditions. This could be caused by the fact that the information the questions gave was too easy: most people knew the answer the second time they were asked about this. Or because some participants tried to trick the personal assistant they were working with. They did this for instance by giving the option "d" for a question with an "a", "b" or "c" answer. De Vos (2002) found the same urge of participants to trick the personal assistant with her experiment about embodied conversational agents. She found that participants are sometimes a little bit disappointed when the agent reacted coherently, but were excited when the agent gave a standard reply. We, on the other hand, found that participants were excited both when the personal assistant reacted coherent and when it gave a standard reply. We therefore agree with her that people have the urge to find the boundaries of the capabilities of the personal assistant, but do not agree on the part that people feel relieved when they find them.

7 Discussion

It is important to know how robots could help the chronically ill best. Because more people are getting chronically ill and the chances are that there is not enough medical staff to support them.

Although not all of our expectations towards the embodied socially intelligent embodied iCat were fulfilled, it was encouraging to see that almost 90% of the participants in the second experiment would like to use a personal assistant if they were chronically ill and just over 50% of them would like to use an iCat independent of the condition they were in, virtual or embodied.

7.1 Computer illiteracy

An assumption of the iCat is that computer illiterate people would prefer the iCat more than people who have computer experience. In our experiment we only tested people with computer experience. In the second experiment we did not find any significant differences for user preference of one of the personal assistant compared with their computer experience. But the four students that used the iCat in the pilot experiment, who had probably more computer experience than the participants in the second experiment, liked the iCat more than the text interface. The students were more at ease with talking to the iCat. A reason for this could be that all the students had seen the iCat before and two of them were master students Artificial Intelligence and had been therefore confronted more often with robots than most people. A longer duration of the interaction with the iCat in a future experiment could help making the participants more comfortable with working with the iCat. That the students liked the iCat also gives some evidence that the iCat is not only useful for computer illiterate people, but also for people with a lot of computer experience.

7.2 Future work

The aim is to perform an experiment with diabetics in their home for a longer period. Before this is possible some improvements of the personal assistants have to be made and experiments have to be done. The personal assistants must have some autonomy, so that the experimenter does not have to be in the home of the diabetic the whole experiment. The mechanical sounds the iCat makes should be minimized and the movements made more fluently to make a better comparison in a future experiment between the embodied and virtual iCat. When we make use of the sensors of the iCat and let the participant walk around in the room where the iCat is this could improve the appreciation of the embodied iCat in comparison with the text interface and the virtual iCat.

In the experiments we have done we did not find any significant differences for trustworthiness between the different personal assistants. We would like to design an experiment were trustworthiness is of more importance, the iCat has better conversation skills, and we make better use of the extra functionality of the embodied iCat.

During a conversation we had with a female diabetic patient she said she would like to use the embodied iCat at home for her diabetics and other tasks it could do like reading her email, turn on the television/radio on her command, and call the doctor if she had fallen. On the other hand she would like a virtual iCat to take with her in her purse on a PDA, because some diabetics need to be reminded of their medication also when they are not at home. She said she would like the same kind of interface at home and away for the continuity.

Other directions future research could take are investigations on how much influence the voice and personality of the iCat (maybe in comparison with the personality and computer experience of the participant) has on the perception of the iCat.

As one can see many directions are possible and many have to be explored to see how an iCat or more generally a robot could be of assistance for people or more specific for diabetics.

8 Conclusion

The aims of this study were threefold: (1) to find out if a socially intelligent embodied agent can ask the same questions and give the same answers as a text interface; (2) to find out which guidelines have been developed in previous research about behavioral change and personal assistants; (3) and to find out if a better incorporation of those guidelines results in a higher appreciation of the personal assistants.

The first aim was achieved in the pilot experiment where we showed that it is possible to ask the same questions and give the same answers with a text interface, a virtual agent, and an embodied agent.

The second aim consists of two parts, finding guidelines for behavioral change, and finding guidelines for personal assistants. We found a psychological method for behavioral change, motivational interviewing, which is already used in a text interface based personal assistant for diabetics. Motivational interviewing is based mainly on skills that a therapist should have. These skills can be summarized in the guideline; be empathetic. Ten skills are identified within motivational interviewing due to time and technical constraints we implemented at most three of the skills in our personal assistants. The skills we implemented were: show empathy, be complimentary, and be attentive.

In previous research about electronic personal assistants we found that trust plays an important role in using and listening to a personal assistant. A second guideline, trustworthiness, was derived from this research about personal assistants.

We implemented all three skills in the socially intelligent agents. In the text interface and the non-socially intelligent agents only one skill could be implemented, be complimentary. Therefore we hypothesized that the socially intelligent agents would be appreciated and trusted better than the text interface and non-socially intelligent agents. Next to this we hypothesized that the embodied agents would be appreciated even more than the virtual agents, because of a better incorporation of the skills.

In the pilot experiment we saw a tendency that the socially intelligent agent was appreciated more than the non-socially intelligent agent. In the experiment we used questionnaires to see if the implementation of the skills were noticed, increased the empathy, and increased the trustworthiness. We also used video data which we scored for social behavior of the participant towards the personal assistant to see if the participants found the personal assistant empathetic. We scored the video data for several behaviors; we scored number of laughs of the participants, number of saying goodbye of the participant, percentage of total conversation time that the participant looked at the personal assistant, percentage of total conversation time that the participant talked to the personal assistant.

The results of the experiment did not show any persuading evidence for our hypotheses about trustworthiness. Probably an experiment has to be performed that is better designed to test trustworthiness. The experiment did however show evidence for our hypothesis that the socially intelligent agents are more empathetic than the text interface and the non-socially intelligent agents. On the other hand the experiment rejected our hypothesis that an embodied agent would be more empathetic and trustworthy than a virtual agent. The virtual agent was appreciated more than the embodied agent. It seemed that when an interface is able to have certain skills it is hold against it when it does not have those skills. An embodied iCat for example can look at the participant, but in the non-social condition it did not do that. The non-socially intelligent iCat was therefore found less empathetic than the text interface, which is not able to look at the

participant.

We hypothesized that the skills could be implemented better in the embodied iCat than in the virtual iCat. The results however show that the virtual iCat scored better on the empathy guideline. Therefore the embodied iCat does comply less with the guidelines for a personal assistant than the virtual iCat. Nevertheless we still think that the skills we found are best incorporated in the embodied iCat, but that the implementation and the experimental set-up hold it back.

Both experiments involved participants who were not diabetics. It will therefore be necessary to repeat the experiment with the target patient group, preferably in a long-term study within a natural context, i.e., at home. We hope that socially-intelligent agents may support diabetic patients to cope with their illness better.

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9 References

Bartneck C., and Forlizzi, J. (2004). A design centered framework for social human-robot interaction, *Proceedings Ro-Man 2004,* 591-594.

Bartneck, C. (2003). Interacting with an embodied emotional character, *Proceedings of the DPPwe 2003 conference*, 55-60.

BBC News. (2004). *Robots set to get homely by 2007.* Available: http://news.bbc.co.uk/2/hi/technology/3764142.stm

Bengtsson, B., Burgoon, J. K., Cederberg, C., Bonito, J., and Lundeberg, M. (1999). The impact of anthropomorphic interfaces on influence, understanding, and credibility, *Proceedings of 32nd Hawaii international conference on System Sciences,* 1051-1065.

Bigalow, J.H. et al. (2002). *Patient compliance with and attitudes towards Health Buddy.* Santa Monica, CA: Rand.

Blanson Henkemans, O.A., Neerincx, M.A., Lindenberg, J., Mast, C.A.P.G van der (2006). SuperAssist: Supervision of Patient Self-Care and Medical Adherence. Accepted for the IEA 2006 Conference 10-14 July, Maastricht, The Netherlands.

Breazeal, C. and Fong, T. (2003). Towards sociable robots. *Robotics and autonomous systems, 42,* 167-175.

Bruce, A., Nourbakhsh, I., and Simmons, R. (2002). The role of expressiveness and attention in human-robot interaction, *Proceedings of the IEEE international conference on robotics and automation 2002 (ICRA'02),* 4138-4142.

Brug, J., Conner, M., Harré, N., Kremers, S., McKellar, S., and Whitelaw, S. (2005). The transtheoretical model and stages of change: a critque. Observations of five commentators on the paper by Adams, J. and White, M. (2004) Why don't stage-based activity promotion interventions work?, *Health education research, 20,* 244-258.

Dautenhahn, K., S Woods, S., Kaouri, C., Walters, M., K L Koay, K. L., and Werry, I. (2005). What is a Robot Companion - Friend, Assistant or Butler? *Proceedings IROS 2005, IEEE IRS/RSJ International Conference on Intelligent Robots and Systems, August 2-6, 2005, Edmonton, Alberta Canada,* 1488-1493.

De Haan, G., Blanson Henkemans, O., and Aluwalia, A. (2005). Personal assistants for healthcare treatment at home, *Proceedings of EACE'05*, 217-223.

De Vos, P. (2002). Look at that Doggy in my Windows, on effects of anthropomorphism in human-agent interaction. *M.S. thesis.* Utrecht University, Utrecht.

Diabetes fonds (2003). *Wat is diabetes?* Houten: Brink Omega.

Duffy, B. R. (2003). Anthropomorphism and the social robot, *Robotics and autonomous systems, 42,* 177-190.

Festinger, L. (1957). *A theory of cognitive dissonance*, Stanford, CA: Stanford University Press.

Fong, T., Nourbakhsh, I., and Dautenhahn, K. (2003). A survey of socially interactive robots, *Robotics and autonomous systems, 42,* 143-166.

Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure, *Psychological Assessment, 4,* 26-42.

Hodes R.L., Cook E.W. 3rd & Lang P.J. (1985). Individual differences in autonomic response: conditioned association or conditioned fear? *Psychophysiology, 22,* 545-560.

Intille, S. S. (2004). A new research challenge: persuasive technology to motivate Healthy Aging. *IEEE transactions on information technology in biomedicine, 8,* 235-237.

Intille, S.S. (2002). Designing a home of the future. *Pervasive computing,* 80-86.

Kaushik, P. (2005). The design and evaluation of a mobile handheld intervention for providing context-sensitive medication reminders. *M.S. thesis*, Program in Media Arts and Sciences, Massachusetts Institute of Technology, Boston, MA.

Klein, J., Moon, Y. and Picard, R. (2002). This computer responds to user frustration: theory, design and results, *Interacting with Computers, 14*, 119-140.

Lee, K.M., Jung, Y., Kim, J., and Kim, S.R. (unpublished). Are physically embodied social agents better than disembodied social agents?: The effets of physical embodiment, tactile interaction, and people's loneliness in human-robot interaction, *International journal of human computer studies.*

Loquendo (2005). Available: www.loquendo.com

Miller, W.R., and S. Rollnick, S. (1991). *Motivational Interviewing*, New York, NY: The Guilford Press.

Mori, M. (1970). The Uncanny Valley, *Energy, 7*, 33-35.

Nawyn, J.P. (2005). A persuasive television remote control for the promotion of health and well-being. *M.S. thesis*, Program in Media Arts and Sciences, Massachusetts Institute of Technology, Boston, MA. 2005.

Neerincx, M.A., and Streefkerk, J.W. (2003). Interacting in desktop and mobile context: Emotion, trust and task performance, *Proceedings of the first European Symposium on Ambient Intelligence (EUSAI)*, 119-132.

Nehaniv, C., Dautenhahn, K., Kubacki, J., Haegele, M., Parlitz, C. (2005). A methodological approach in relating the classification of gesture to identification of human intent in the context of human robot interaction, *Proceedings IEEE Ro-man 2005*, 371-377.

Prochaska, J. O., and DiClemente, C. C. (1982). Transtheoretical therapy toward a more integrative model of change, *Psychotherapy: theory, research and practice, 19*, 276-287.

Prochaska, J.O., DiClemente, C.C., and Norcross, J.C. (1992). In search of how people change. *American Psychologist, 47,* 1102-1114 .

Reeves, B & Nass, C (1996). *The media equation: How people treat computers, television and new media like real people and places.* New York: Cambridge University Press/CLSI.

Rogers, C.R. (1951). *Client-centered therapy*, Boston, MA: Houghton Mifflin.

Sidner, C. L., Kidd, C. D., Lee, C., and Nash, N. (2004). Where to look: A study of human-robot engagement, *ACM international conference on intelligent user interfaces (IUI),* 78-84.

Triplett, N, (1898). The dynamogenic in pacemaking and competition. *The American journal of psychology, 9,* 507-553.

United Nations (2002). World population ageing 1950-2050. Available: http://www.un.org/esa/population/publications/worldageing19502050

Van Breemen, A. J. N. (2004). Animation engine for believable interactive user-interface robots, *Proceedings of 2004 IEEE/RSJ international conference on intelligent robots and systems*, 2873-2878.

Van Breemen, A. J. N. (unpublished). Bringing robots to life: Applying principles of animation to robots.

Van Dijken, G.D., Niesink A., and A. J. P. Schrijvers A.J.P. (2005). *Telehealth in de Verenigde Staten.* Utrecht: Julius centrum UMC Utrecht.

Van Vliet, A.J. (2001). Effecten van teamsamenstelling op het moreel van uitgezonden militairen, *TM-01-A040,* Soesterberg: TNO technische menskunde.

Velicer, W.F., Prochaska, J. O., Fava, J. L., Norman, G. J., and Redding, C. A. (1998), Smoking cessation and stress management: Applications of the Transtheoretical model of behaviour change, *Homeostasis, 38*, 216-233.

Venkatesh, V., Morris, M. G., Davis, G. B., and Davis, F. D. (2003). User acceptance of information technology: Toward a unified view, *MIS Quarterly, 23*, 425-478.

Wærn Y., and Ramberg, R. (1996). People's perception of human and computer advice, *Computers in human behavior, 12*, 17-27.

Woods, S., Dautenhahn , K., and Schulz, J. (2004). The design space of robots: Investigating children's views, *Proceedings of IEEE Ro-man 2004*, 47-52.

World Health Organization (2003). Adherence to long-term therapies. Available:http://www.who.int/chronic_conditions/en/adherence_introduction.pdf

10 Appendices

Appendix 1: How the experimenter played Wizard of Oz

Figure 11 shows how the interface which the experimenter used, which was written in C#, looked like.

Before a conversation can start the experimenter has to fill in some things in the interface of

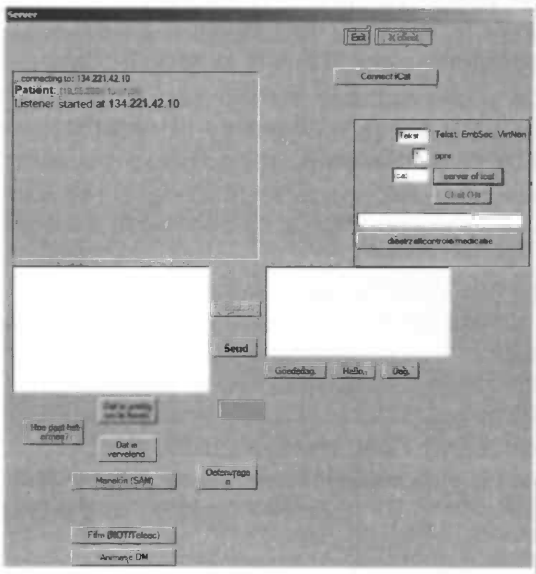


Figure 12 Server interface

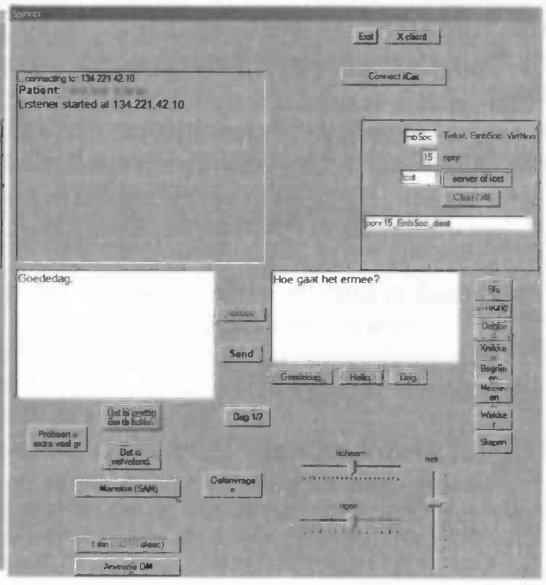


Figure 12 Server interface when iCat is used as personal assistant.

the server. The condition that the participant gets has to be filled out, does the participant get for instance the text interface or the socially intelligent embodied agent or the non -socially intelligent virtual agent. The number of the participant has to be put in the form, to facilitate the saving of the results of the participants. Is the participant working with an iCat or with the text interface? This has to be filled out, because a second client has to be connected to the server when the iCat is used. That is also the reason for the connect iCat button. Than there is the Chat On button which takes care of showing the chat window in the text interface and a last textbox where the experimenter has to fill in which scenario he/she is going to do, diet, self-check or medication. If iCat is filled out in the textbox with the 'server'-button several new buttons and three sliders appear in the form (figure 12), those buttons do not appear when the text interface is used by the participant. The buttons are for the expressions of the iCat and for putting it asleep and wakening it. With the sliders the eyes, neck and body of the iCat can be moved.

On the bottom left of the form there is a button to show the animation to the participants and a button to show the movie. Above these buttons there is a button 'Manekin (SAM)' this button invokes the questionnaires to be showed to the participant. After pushing it the text changes in the name of the questionnaire that will be shown when the button is pushed again. The button 'oefenvragen' poses the participant some questions to get familiar with the program they are using. For showing the participant the short stories in between the blocks of questions the 'Dag 1/2' button is used. The text of this button changes into 'Dag 3/4' and in 'Dag 5/6' after pushing it. In the code is programmed that according to what scenario is chosen and what day it is a different story is shown to the participant.

The six buttons beneath the windows that I have not talked about yet are the buttons that are involved in the conversation with the participant. The three buttons beneath the window at the right are three different ways to say 'Hello'. The last buttons are for posing the questions and reacting on the answers. The button on the left poses the questions while the buttons on the right give a reaction to the answer of the participant. One button is for the positive reactions, when the participant gives a right answer or a positive answer, while the other button gives reactions for when the participant gives the wrong or negative answer. After pushing one of these buttons the text is changed according to the scenario and the previous question. The text that is displayed on the six communication buttons gets send to the window on the right where it can be changed and can than be send by the button with the arrows to the window on the left. After a final check the experimenter pushes the send button and the text is send to the participant.

When the participant finishes a program the X-client button has to be pushed to save the conversation and then the server can be closed by pushing the exit button.

Appendix 2: Scenarios and during the day stories

Diet

Scenario:
Sinds een jaar weet u dat u diabetes type 2 hebt. U bent nu 62 en u bent bang voor de gevolgen van deze ziekte, zoals blindheid en problemen met uw geheugen. Vanwege deze angst probeert u zich goed te houden aan de regels die de arts aan u gegeven heeft. U controleert regelmatig uw bloedsuiker, uw voeten en uw ogen. Ook neemt u de medicatie netjes. De huisarts heeft gezegd dat u moet afvallen, maar hier hebt u veel moeite mee. Er is een dieet waar u zich aan moet houden en u moet regelmatig matig intensief bewegen, ongeveer een half uur per dag verdeeld over twee a drie momenten. Al u hele leven lang eet u gewoon wat u lekker vindt, maar de huisarts heeft nu gezegd dat u te vet eet. Aan sporten heeft u nooit wat gevonden. Eigenlijk denkt u dat als u zich goed aan uw medicatie houdt dat dat beetje extra gewicht niet uitmaakt.

Nu heeft de dokter gezegd dat u toch echt iets aan uw gewicht moet doen en heeft hij u daarom een programma mee naar huis gegeven. U moet om de dag een aantal vragen beantwoorden die het programma u stelt en deze antwoorden worden dan doorgestuurd naar de huisarts. U gaat nu elke drie maanden voor controle naar de huisarts en dit zal niet veranderen nu u een programma thuis hebt dat u gezondheid in de gaten houdt.

Eerst zult u het programma voor een week testen. Maandag, woensdag, vrijdag en zondag zult u vragen gesteld krijgen door het programma. Hierna zal om u mening over het programma gevraagd worden.

Stories:
After day 1:
Nadat je de vragen beantwoord hebt ga je ontbijten en daarna naar je werk. Op je werk ga je vandaag met de trap om wat extra beweging te krijgen. 's Middags en 's avonds eet je gezond en ga je vroeg slapen. De volgende dag verloopt net zo.

After day 2:
Nadat je de vragen beantwoord hebt ga je thuiswerken. De volgende dag voel je je niet zo lekker en ga je dus met de lift en eet je drie marsen. Je voelt je zo schuldig de volgende dag dat je heel hard gaat sporten, waarna je je erg duizelig voelt.

After day 3:
Na de vervelende ervaring van gisteren durf je vandaag helemaal niet meer te bewegen. Je bloedsuikerniveau geeft aan dat dat ook niet de juiste aanpak is. De volgende dag pak je maar weer gewoon de trap op je werk en eet je gezond.

Selfcare

Scenario:

U bent 56 en weet sinds twee jaar dat u diabetes type 2 hebt. U vindt het maar een gedoe om uw pillen regelmatig te slikken, maar u neemt ze keurig op tijd. Alleen begrijpt u niet zo goed waarom u zo vaak zelf moet kijken of uw voeten er nog goed uitzien en u alles nog goed ziet. U laat het toch elke drie maanden controleren door de huisarts? Waarom zou u dan ook nog zelf moeten controleren? U controleert elke dag uw bloedsuikerniveau, dat schommelt behoorlijk, maar u hebt geen zin om uw leven nog meer te laten inrichten door uw diabetes. Omdat u het nut er niet van in ziet controleert u uzelf niet regelmatig.
Nu heeft de huisarts onlangs gevraagd of u een nieuw programma wilt testen. U moet elke dag een aantal vragen beantwoorden met behulp van het programma en deze antwoorden worden dan doorgestuurd naar de huisarts. Het aantal bezoeken aan de hulpverlener verandert niet, u gaat deze dus niet vaker of minder vaak zien.

Eerst zult u het programma voor een week testen. Maandag, woensdag, vrijdag en zondag zult u vragen gesteld krijgen door het programma. Hierna zal om u mening over het programma gevraagd worden.

Stories:

After day 1:
Nadat je de vragen beantwoord hebt controleer je je voeten onmiddellijk. Gelukkig niets aan de hand. De rest van de dag gaat snel voorbij. De volgende dag moet je je haasten om op tijd te komen en vergeet je je voeten te controleren op wondjes.

After day 2:
In de vragen van vanochtend werd het belang van zelfcontrole weer benadrukt, maar je hebt nooit wondjes dus je hebt geen zin om je schoenen en sokken weer uit te doen om het te controleren. De volgende dag controleer je je voeten onder de douche en je blijkt een wondje te hebben. Snel stap je onder de douche vandaan en je kijkt nog eens. Het bleek een pluisje van je rode handdoek te zijn, maar je bent wel geschrokken.

After day 3:
Voordat je begon aan de vragen van vanochtend heb je je voeten gecontroleerd, want je bent behoorlijk geschrokken gisteren. Gelukkig niets aan de hand, maar ook de volgende dag controleer je je voeten netjes en je kijkt zelfs even naar je gezichtsvermogen.

Medication

Scenario:

U bent 43 en weet sinds drie jaar dat u diabetes type 2 hebt. De dokter zegt dat dit niet veel invloed op u leven hoeft te hebben, maar u vindt het nog steeds een eng idee dat u een chronische ziekte hebt. Elke dag moet u uw bloed prikken en op vaste tijden uw medicijnen slikken. Ten eerste vindt u het bloedprikken eng en ten tweede vergeet u nogal eens uw diabetes pillen in te nemen. Graag zou u, wanneer u hebt vergeten uw medicatie te slikken, nadat u de vergeten pil hebt ingenomen, contact opnemen met de huisarts. Meestal doet u dit niet, want u weet dat die het ook druk heeft, maar u voelt zich er toch ongerust over. Het kan namelijk toch niet goed zijn om uw medicatie niet in te nemen ook al is uw bloedsuiker nog goed.

Nadat u deze zorgen kenbaar hebt gemaakt aan uw huisarts heeft deze ervoor gezorgd dat u een programma mee naar huis krijgt dat u zal kunnen helpen om uw medicatie te nemen. Elke dag moet u een aantal vragen beantwoorden met behulp van dit programma en deze gegevens worden dan doorgestuurd naar uw huisarts zodat deze u in de gaten kan houden. Het aantal bezoeken aan de huisarts verandert niet, u gaat deze dus niet vaker of minder vaak zien.

Eerst zult u het programma voor een week testen. Maandag, woensdag, vrijdag en zondag zult u vragen gesteld krijgen door het programma. Hierna zal om u mening over het programma gevraagd worden.

Stories:

After day 1:

Dat stomme prikken en slikken ook altijd. Je hebt nooit afwijkende glucosewaardes en je leeft toch nog steeds zonder ooit maar enige medicatie geslikt te hebben. Het is omdat je net de vragen beantwoord hebt, maar anders zou je 's ochtends je medicatie al vergeten zijn. Je slaat de lunch over en bij het avondeten bedenk je dat je een dosis vergeten bent. Die slik je nu maar, want je dacht dat dat de juiste handelswijze was. De volgende dag herinnert de aanwezigheid van het apparaat je eraan dat je je goed aan de medicatie moet houden en vandaag lukt je dat.

After day 2:

Die reacties op je vragen laten wel echte rampscenario's zien. Dat zal toch allemaal wel meevallen. Toch wat geschrokken neem je je medicatie netjes. De volgende dag vergeet je je medicatie helaas weer en neem je tijdens de borrel een dubbele dosis, omdat je ontbijt en lunch overgeslagen hebt. Je voelt je hier niet prettig bij, maar ja het is beter dan niets slikken.

After day 3:

Je voelt je nog wat schuldig over gisteren en zeker nadat je de vragen van vanochtend hebt beantwoord neem je je voor om je medicatie nooit meer te vergeten. Je houdt je die dag aan je doelstelling en ook de volgende dag eet je heel regelmatig en neem je je medicatie op tijd.

Appendix 3: Questionnaires before the experiment

Personal data

Geslacht:

- ○ Man
- ○ Vrouw

Leeftijd:

Huidig beroep:

Hoogste opleidingsniveau:
**afgerond, bezig of niet afgerond*

- ○ VMBO
- ○ LBO
- ○ MAVO
- ○ MBO
- ○ HAVO
- ○ HBO
- ○ VWO
- ○ WO
- ○ anders

omschrijving

☐ voltooid ☐ onvoltooid

Computerervaring:

Weinig ○ **Redelijk** ○ **Veel** ○

Chatervaring:

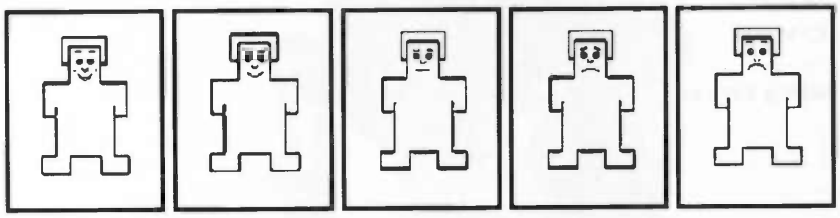
Weinig ○ **Redelijk** ○ **Veel** ○

Manekin before the experiment

Probeer met behulp van de mannetjes aan te geven hoe u zich voelt op dit moment.

De eerste rij mannetjes representeren gevoelens die lopen van HEEL ONGELUKKIG of DROEVIG tot HEEL VROLIJK of OPGETOGEN. Omcirkel het mannetje dat weergeeft hoe u zich voelt.

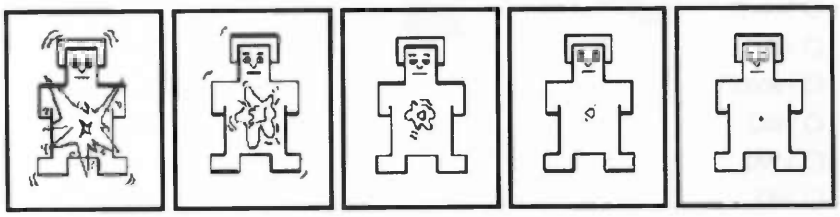
VROLIJK
of
OPGETOGEN



ONGELUKKIG
of
DROEVIG

De tweede rij mannetjes representeren gevoelens die lopen van HEEL KALM of VERVEELD tot HEEL OPGEWONDEN of BETROKKEN. Omcirkel het mannetje dat weergeeft hoe u zich voelt.

OPGEWONDEN
of
BETROKKEN



KALM
of
VERVEELD

Personality Questionnaire

Deze checklist bevat een aantal woorden waarmee u zichzelf kunt beschrijven. Beschrijf uzelf zoals u zichzelf op dit moment ziet en niet zoals u eigenlijk zou willen zijn. (Slechts één mogelijkheid per vraag aankruisen.)

	zeer sterk	sterk	matig	zwak	niet	zwak	matig	sterk	zeer sterk	
verlegen	○	○	○	○	○	○	○	○	○	brutaal
kil	○	○	○	○	○	○	○	○	○	warm
onverantwoordelijk	○	○	○	○	○	○	○	○	○	verantwoordelijk
gespannen	○	○	○	○	○	○	○	○	○	ontspannen
niet creatief	○	○	○	○	○	○	○	○	○	creatief
zwijgzaam	○	○	○	○	○	○	○	○	○	praatgraag
onaardig	○	○	○	○	○	○	○	○	○	aardig
nalatig	○	○	○	○	○	○	○	○	○	nauwgezet
onzeker	○	○	○	○	○	○	○	○	○	zeker
niet origineel	○	○	○	○	○	○	○	○	○	origineel
terughoudend	○	○	○	○	○	○	○	○	○	spontaan
onvriendelijk	○	○	○	○	○	○	○	○	○	vriendelijk
slordig	○	○	○	○	○	○	○	○	○	degelijk
ontevreden	○	○	○	○	○	○	○	○	○	tevreden
niet artistiek	○	○	○	○	○	○	○	○	○	artistiek

Robot Questionnaire

Waarop lijkt de robot?

○ Een mens ○ Een dier ○ Een machine

Vind je dat de robot een gezicht heeft?

○ Geen gezicht ○ Een volledig gezicht (neus, mond, ogen) ○ Alleen ogen ○ Alleen een neus

Welk geslacht denk je dat de robot heeft?

○ Mannelijk ○ Vrouwelijk ○ Geen van beide

Denk je dat de robot je zal begrijpen als je er tegen praat?

○ Ja ◉ Nee

Denk je dat de robot vriendelijk is?

Heel vriendelijk	○	○	○	○	○	Erg onvriendelijk

Denk je dat de robot agressief is of kan zijn?

Helemaal niet agressief	○	○	○	○	○	Erg agressief

Denk je dat de robot verlegen is?

Helemaal niet verlegen	○	○	○	○	○	Erg verlegen

Denk je dat de robot bazig is?

Helemaal niet bazig	○	○	○	○	○	Erg bazig

Denk je dat de robot gevoelens kan hebben?

Ja			○	○		Nee

Is dit een vrolijke robot?

Heel blij	○	○	○	○	○	Niet blij

Is dit een treurige robot?

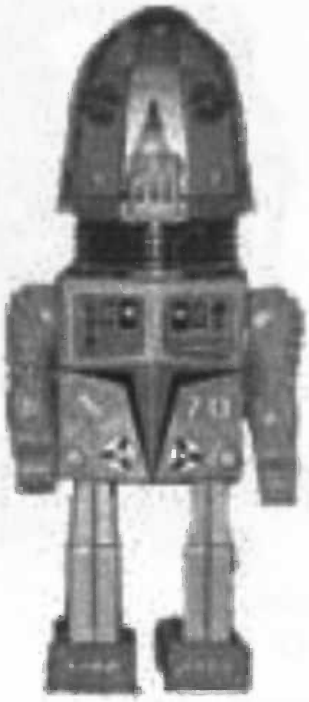
Niet verdrietig	○	○	○	○	○	Heel verdrietig

Is dit een boze robot?

Niet boos	○	○	○	○	○	Heel boos

Is dit een bange robot?

Niet bang	○	○	○	○	○	Heel bang



Waarop lijkt de robot?

○ Een mens ○ Een dier ○ Een machine

Vind je dat de robot een gezicht heeft?

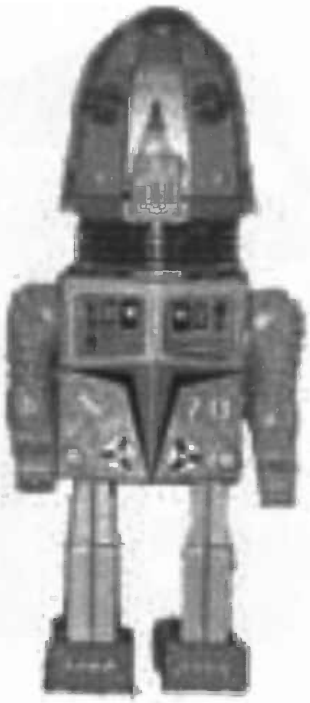
○ Geen gezicht ○ Een volledig gezicht (neus, mond, ogen) ○ Alleen ogen ○ Alleen een neus

Welk geslacht denk je dat de robot heeft?

○ Mannelijk ○ Vrouwelijk ○ Geen van beide

Denk je dat de robot je zal begrijpen als je er tegen praat?

○ Ja ○ Nee



Denk je dat de robot vriendelijk is?

Heel vriendelijk	○	○	○	○	○	Erg onvriendelijk

Denk je dat de robot agressief is of kan zijn?

Helemaal niet agressief	○	○	○	○	○	Erg agressief

Denk je dat de robot verlegen is?

Helemaal niet verlegen	○	○	○	○	○	Erg verlegen

Denk je dat de robot bazig is?

Helemaal niet bazig	○	○	○	○	○	Erg bazig

Denk je dat de robot gevoelens kan hebben?

Ja			○	○		Nee

Is dit een vrolijke robot?

Heel blij	○	○	○	○	○	Niet blij

Is dit een treurige robot?

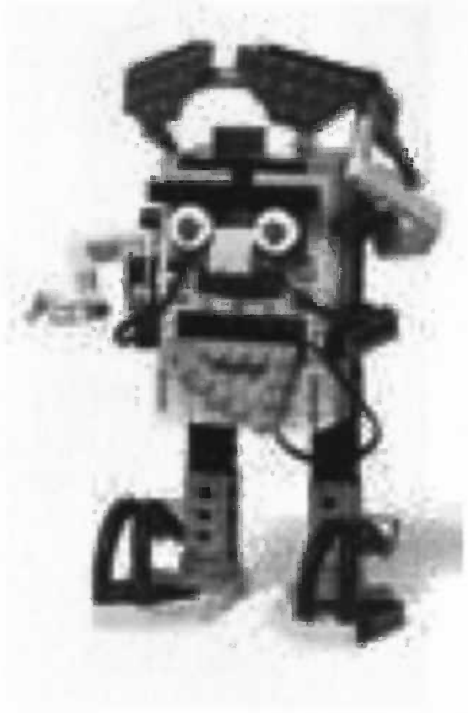
Niet verdrietig	○	○	○	○	○	Heel verdrietig

Is dit een boze robot?

Niet boos	○	○	○	○	○	Heel boos

Is dit een bange robot?

Niet bang	○	○	○	○	○	Heel bang



Waarop lijkt de robot?

○ Een mens ○ Een dier ○ Een machine

Vind je dat de robot een gezicht heeft?

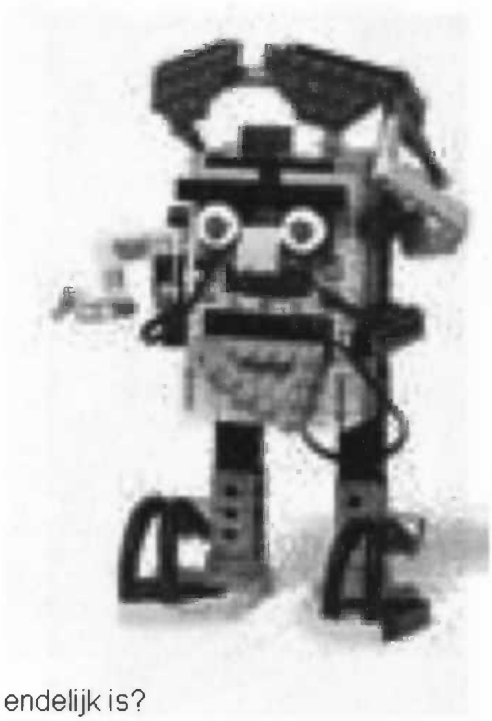
○ Geen gezicht ○ Een volledig gezicht (neus, mond, ogen) ○ Alleen ogen ○ Alleen een neus

Welk geslacht denk je dat de robot heeft?

○ Mannelijk ○ Vrouwelijk ○ Geen van beide

Denk je dat de robot je zal begrijpen als je er tegen praat?

○ Ja ○ Nee



Denk je dat de robot vriendelijk is?

Heel vriendelijk	○	○	○	○	○	Erg onvriendelijk

Denk je dat de robot agressief is of kan zijn?

Helemaal niet agressief	○	○	○	○	○	Erg agressief

Denk je dat de robot verlegen is?

Helemaal niet verlegen	○	○	○	○	○	Erg verlegen

Denk je dat de robot bazig is?

Helemaal niet bazig	○	○	○	○	○	Erg bazig

Denk je dat de robot gevoelens kan hebben?

Ja			○	○		Nee

Is dit een vrolijke robot?

Heel blij	○	○	○	○	○	Niet blij

Is dit een treurige robot?

Niet verdrietig	○	○	○	○	○	Heel verdrietig

Is dit een boze robot?

Niet boos	○	○	○	○	○	Heel boos

Is dit een bange robot?

Niet bang	○	○	○	○	○	Heel bang

Waarop lijkt de robot?

○ Een mens ○ Een dier ○ Een machine

Vind je dat de robot een gezicht heeft?

○ Geen gezicht ○ Een volledig gezicht (neus, mond, ogen) ○ Alleen ogen ○ Alleen een neus

Welk geslacht denk je dat de robot heeft?

○ Mannelijk ○ Vrouwelijk ○ Geen van beide

Denk je dat de robot je zal begrijpen als je er tegen praat?

○ Ja ○ Nee

Denk je dat de robot vriendelijk is?

Heel vriendelijk	○	○	○	○	○	Erg onvriendelijk

Denk je dat de robot agressief is of kan zijn?

Helemaal niet agressief	○	○	○	○	○	Erg agressief

Denk je dat de robot verlegen is?

Helemaal niet verlegen	○	○	○	○	○	Erg verlegen

Denk je dat de robot bazig is?

Helemaal niet bazig	○	○	○	○	○	Erg bazig

Denk je dat de robot gevoelens kan hebben?

Ja			○	○		Nee

Is dit een vrolijke robot?

Heel blij	○	○	○	○	○	Niet blij

Is dit een treurige robot?

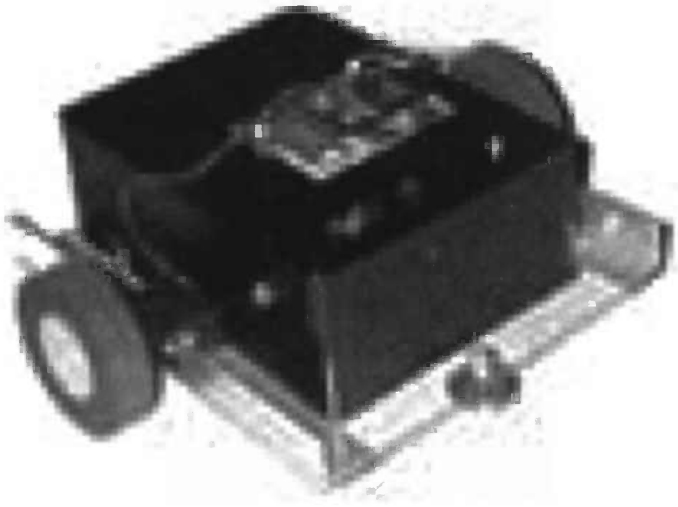
Niet verdrietig	○	○	○	○	○	Heel verdrietig

Is dit een boze robot?

Niet boos	○	○	○	○	○	Heel boos

Is dit een bange robot?

Niet bang	○	○	○	○	○	Heel bang



Waarop lijkt de robot?

○ Een mens ○ Een dier ○ Een machine

Vind je dat de robot een gezicht heeft?

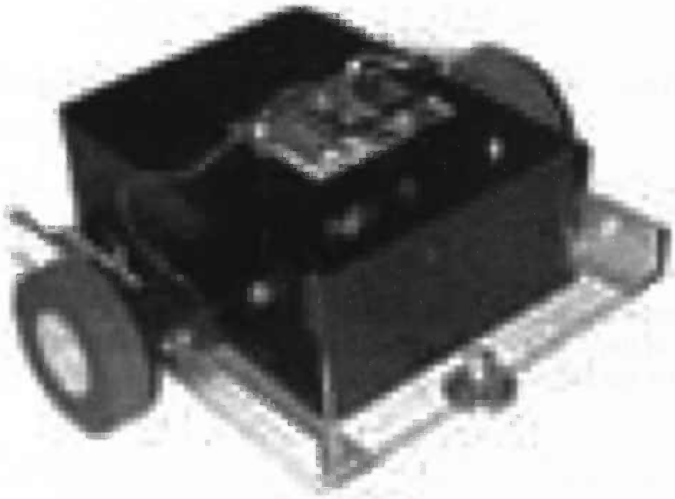
○ Geen gezicht ○ Een volledig gezicht (neus, mond, ogen) ○ Alleen ogen ○ Alleen een neus

Welk geslacht denk je dat de robot heeft?

○ Mannelijk ○ Vrouwelijk ○ Geen van beide

Denk je dat de robot je zal begrijpen als je er tegen praat?

○ Ja ○ Nee



Denk je dat de robot vriendelijk is?

Heel vriendelijk	○	○	○	○	○	Erg onvriendelijk

Denk je dat de robot agressief is of kan zijn?

Helemaal niet agressief	○	○	○	○	○	Erg agressief

Denk je dat de robot verlegen is?

Helemaal niet verlegen	○	○	○	○	○	Erg verlegen

Denk je dat de robot bazig is?

Helemaal niet bazig	○	○	○	○	○	Erg bazig

Denk je dat de robot gevoelens kan hebben?

Ja			○	○		Nee

Is dit een vrolijke robot?

Heel blij	○	○	○	○	○	Niet blij

Is dit een treurige robot?

Niet verdrietig	○	○	○	○	○	Heel verdrietig

Is dit een boze robot?

Niet boos	○	○	○	○	○	Heel boos

Is dit een bange robot?

Niet bang	○	○	○	○	○	Heel bang

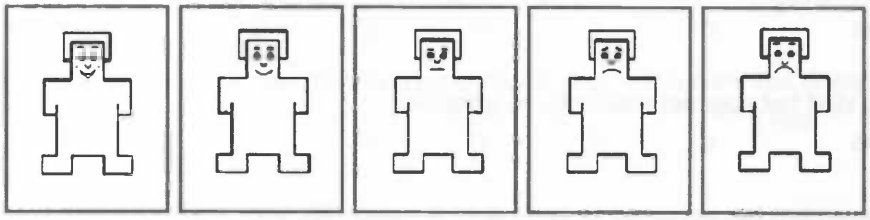
Appendix 4: Questionnaires before and after using the personal assistants and after the experiment

Manekin Questions after reading a scenario

We willen weten welk gevoel de situatie jou geeft. Hiermee bedoelen we hoe je je voelt in de rol van de persoon die jou toebedeeld is. Probeer naar beste vermogen je in te leven, en weer te geven hoe je je dan voelt. Evalueer JE GEVOEL en niet de situatie op zich.

De eerste rij mannetjes representeren gevoelens die lopen van HEEL ONGELUKKIG of DROEVIG tot HEEL VROLIJK of OPGETOGEN. Omcirkel het mannetje dat weergeeft hoe jij je voelt.

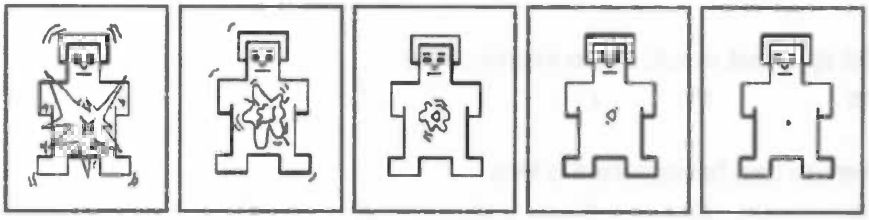
VROLIJK
of
OPGETOGEN



ONGELUKKIG
of
DROEVIG

De tweede rij mannetjes representeren gevoelens die lopen van HEEL KALM of VERVEELD tot HEEL OPGEWONDEN of BETROKKEN. Omcirkel het mannetje dat weergeeft hoe jij je voelt.

OPGEWONDEN
of
BETROKKEN



KALM
of
VERVEELD

UTAUT Questionnaire

1/16. Ik zou het apparaat nuttig vinden thuis.

Oneens ○ ○ ○ ○ ○ Eens

2/16. Het apparaat zorgt ervoor dat ik mijn taken wel uitvoer.

Oneens ○ ○ ○ ○ ○ Eens

3/16. Mijn interactie met het apparaat is helder en begrijpbaar.

Oneens ○ ○ ○ ○ ○ Eens

4/16. Het zal makkelijk voor mij zijn om goed met het apparaat om te gaan.

Oneens ○ ○ ○ ○ ○ Eens

5/16. Ik vind het appraat makkelijk in gebruik.

Oneens ○ ○ ○ ○ ○ Eens

6/16. Leren om het apparaat te gebruiken is makkelijk voor mij.

Oneens ○ ○ ○ ○ ○ Eens

7/16. Gebruik van het apparaat is een slecht idee.

Oneens ○ ○ ○ ○ ○ Eens

8/16. Het apparaat maakt taken interessanter.

Oneens ○ ○ ○ ○ ○ Eens

9/16. Werken met het apparaat is leuk.

Oneens ○ ○ ○ ○ ○ Eens

10/16. Ik vind het prettig om met het apparaat te werken.

Oneens ○ ○ ○ ○ ○ Eens

11/16. Ik voel me bezorgd om het apparaat te gebruiken.

Oneens ○ ○ ○ ○ ○ Eens

12/16. Ik aarzel om het apparaat te gebruiken uit angst om fouten te maken die ik niet kan herstellen.

Oneens ○ ○ ○ ○ ○ Eens

13/16. Het apparaat intimideert me wat.

Oneens ○ ○ ○ ○ ○ Eens

14/16. Als het beschikbaar was, dan zou ik het apparaat thuis gebruiken.

Oneens ○ ○ ○ ○ ○ Eens

15/16. Als het een redelijke prijs had, dan zou ik het apparaat kopen.

Oneens ○ ○ ○ ○ ○ Eens

16/16. Als ik de taken opnieuw zou moeten doen, dan zou ik het zonder het apparaat doen.

Oneens ○ ○ ○ ○ ○ Eens

Personality Questionnaire

Deze checklist bevat een aantal woorden waarmee je het apparaat kunt beschrijven. Beschrijf het apparaat zoals je deze op dit moment ziet en niet zoals je denkt dat het zou moeten zijn. (slechts een mogelijkheid per vraag aanvinken)

	zeer sterk	sterk	matig	zwak	niet	zwak	matig	sterk	zeer sterk	
verlegen	○	○	○	○	○	○	○	○	○	brutaal
kil	○	○	○	○	○	○	○	○	○	warm
onverantwoordelijk	○	○	○	○	○	○	○	○	○	verantwoordelijk
gespannen	○	○	○	○	○	○	○	○	○	ontspannen
niet creatief	○	○	○	○	○	○	○	○	○	creatief
zwijgzaam	○	○	○	○	○	○	○	○	○	praatgraag
onaardig	○	○	○	○	○	○	○	○	○	aardig
nalatig	○	○	○	○	○	○	○	○	○	nauwgezet
onzeker	○	○	○	○	○	○	○	○	○	zeker
niet origineel	○	○	○	○	○	○	○	○	○	origineel
terughoudend	○	○	○	○	○	○	○	○	○	spontaan
onvriendelijk	○	○	○	○	○	○	○	○	○	vriendelijk
slordig	○	○	○	○	○	○	○	○	○	degelijk
ontevreden	○	○	○	○	○	○	○	○	○	tevreden
niet artistiek	○	○	○	○	○	○	○	○	○	artistiek

Empathy Questionnaire iCat

1/18. De iCat voelt de emoties van anderen.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

2/18. De iCat neemt de tijd voor anderen.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

3/18. De iCat is moeilijk te begrijpen.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

4/18. De iCat vertelt de waarheid.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

5/18. De iCat stelt anderen gerust.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

6/18. De iCat begrijpt dingen niet.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

7/18. De iCat voltooit taken succesvol.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

8/18. De iCat zegt ongepaste dingen.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

9/18. De iCat heeft ongepaste emoties.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

10/18. De emoties van de iCat zijn echt.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

11/18. De iCat kijkt anderen aan.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

12/18. De iCat is vriendelijk.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

13/18. De iCat is intelligent.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

14/18. De iCat is beleefd.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

15/18. De iCat is onbeschoft.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

16/18. De iCat wekt vertrouwen.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

17/18. De iCat is deskundig.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

18/18. De iCat is geloofwaardig.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

Empathy Questionnaire Text

1/18. De tekstinterface voelt de emoties van anderen.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

2/18. De tekstinterface neemt de tijd voor anderen.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

3/18. De tekstinterface is moeilijk te begrijpen.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

4/18. De tekstinterface vertelt de waarheid.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

5/18. De tekstinterface stelt anderen gerust.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

6/18. De tekstinterface begrijpt dingen niet.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

7/18. De tekstinterface voltooit taken succesvol.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

8/18. De tekstinterface zegt ongepaste dingen.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

9/18. De tekstinterface heeft ongepaste emoties.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

10/18. De emoties van de tekstinterface zijn echt.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

11/18. De tekstinterface kijkt anderen aan.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

12/18. De tekstinterface is vriendelijk.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

13/18. De tekstinterface is intelligent.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

14/18. De tekstinterface is beleefd.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

15/18. De tekstinterface is onbeschoft.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

16/18. De tekstinterface wekt vertrouwen.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

17/18. De tekstinterface is deskundig.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

18/18. De tekstinterface is geloofwaardig.

Oneens ○ ○ ○ ○ ○ ○ ○ Eens

Last Questions

Zou u een van de interfaces thuis willen hebben? Zo ja, welke?

○ Ja, de... ○ Nee

Hoe vond u de eerste interface?

○ Erg goed ○ Goed ○ Neutraal ○ Slecht ○ Erg slecht

Hoe vond u de tweede interface?

○ Erg goed ○ Goed ○ Neutraal ○ Slecht ○ Erg slecht

Hoe vond u de derde interface?

○ Erg goed ○ Goed ○ Neutraal ○ Slecht ○ Erg slecht

Van welk van de drie interfaces vond u de dialoog het meest prettig?

○ De eerste, omdat.. ○ De tweede, omdat. ○ De derde, omdat...

Welke van de drie interfaces vond u het meest geloofwaardig?

○ De eerste, omdat.. ○ De tweede, omdat. ○ De derde, omdat...

Welke van de drie interfaces vond u het meest deskundig?

○ De eerste, omdat.. ○ De tweede, omdat. ○ De derde, omdat...

Welke van de drie interfaces vond u het meeste vertrouwen wekken?

○ De eerste, omdat.. ○ De tweede, omdat. ○ De derde, omdat...

Heeft u nog algemene opmerkingen?

○ Nee ○ Ja, namelijk ...

Appendix 5: Questions during the experiment

Diet scenario

Every day starts with:

Vraag.Text = "Hoe gaat het ermee?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."

dag == 1

dagvraag == 1

Vraag.Text = "Probeert u extra veel groenten te eten?"
Goed.Text = "Dat klinkt goed. 2 ons groenten per dag is een goede richtlijn om je aan te houden."
Fout.Text = "2 ons groenten per dag is een goede richtlijn om je aan te houden."

dagvraag == 2

Vraag.Text = "Mensen met diabetes moeten extra veel groenten eten.\n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Heel goed. Mensen met diabetes moeten regelmatig en gevarieerd eten."
Fout.Text = "Mensen met diabetes moeten regelmatig en gevarieerd eten."

dagvraag == 3

Vraag.Text = "Als je een hypo hebt dan is je bloedglucose te hoog.\n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Juist. Een hypo houdt in dat je bloedglucoseniveau te laag is en dat je snel suiker moet binnen krijgen."
Fout.Text = "Een hypo houdt in dat je bloedglucoseniveau te laag is en dat je snel suiker moet binnen krijgen."

dagvraag == 4

Vraag.Text = "Vindt u dat u uw levensstijl heeft moeten aanpassen?"
Goed.Text = "Dat is prettig."
Fout.Text = "Dat is vervelend."

dagvraag == 5

Vraag.Text = "Diabetes patiënten moeten vaak ook midden in de nacht insuline bijspuiten. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dat is goed. Diabetes patiënten hoeven niet midden in de nacht insuline in te nemen."
Fout.Text = "Diabetes patiënten hoeven niet midden in de nacht insuline in te nemen."

dagvraag == 6

Vraag.Text = "Hoeveel minuten heeft u de afgelopen twee dagen ongeveer bewogen?"
Goed.Text = "U heeft de afgelopen twee dagen ... minuten bewogen."
Fout.Text = "U heeft de afgelopen twee dagen ... minuten bewogen."

dagvraag == 7

Vraag.Text = "Bewegen verlaagt het bloedsuikergehalte. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Prima. Bewegen zorgt ervoor dat je beter op gewicht blijft, betere conditie krijgt en je bloedsuikerniveau daalt. Daarnaast zorgt bewegen voor een betere bloedsomloop en versterkt het je hart, waardoor de kans op hartziekten of een herseninfarct wordt verkleind."
Fout.Text = "Bewegen zorgt ervoor dat je beter op gewicht blijft, betere conditie krijgt en je bloedsuikerniveau daalt. Daarnaast zorgt bewegen voor een betere bloedsomloop en versterkt het je hart, waardoor de kans op hartziekten of een herseninfarct wordt verkleind."

dagvraag == 8

Vraag.Text = "Hoe gaat het ermee?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."
rtbPrefab.Text = "Bedankt voor het beantwoorden van de vragen en tot overmorgen."

dag == 2

dagvraag == 1

Vraag.Text = "Heeft u er problemen mee dat u diabetes heeft?"
Goed.Text = "Dat is prettig."
Fout.Text = "Dat is vervelend."

dagvraag == 2

Vraag.Text = "Diabetes is een chronische ziekte.\n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Diabetes is inderdaad een chronische ziekte."
Fout.Text = "Diabetes is een chronische ziekte."

dagvraag == 3

Vraag.Text = "Als je een hypo hebt moet je iets eten zonder suiker.\n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Juist. Een hypo houdt in dat je bloedglucoseniveau te laag is en dat je snel suiker moet binnen krijgen."
Fout.Text = "Een hypo houdt in dat je bloedglucoseniveau te laag is en dat je snel suiker moet binnen krijgen."

dagvraag == 4

Vraag.Text = "Beweegt u regelmatig?"
Goed.Text = "U beweegt regelmatig."
Fout.Text = "U beweegt niet regelmatig."

dagvraag == 5

Vraag.Text = "Bewegen is niet goed voor diabetici. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Prima. Bewegen zorgt ervoor dat je beter op gewicht blijft, betere conditie krijgt en je bloedsuikerniveau daalt. Daarnaast zorgt bewegen voor een betere bloedsomloop en versterkt het je hart, waardoor de kans op hartziekten of een herseninfarct wordt verkleind."
Fout.Text = "Bewegen zorgt ervoor dat je beter op gewicht blijft, betere conditie krijgt en je bloedsuikerniveau daalt. Daarnaast zorgt bewegen voor een betere bloedsomloop en versterkt het je hart, waardoor de kans op hartziekten of een herseninfarct wordt verkleind."

dagvraag == 6

Vraag.Text = "Wat heeft u gisteravond gegeten?"
Goed.Text = "Dank u wel."
Fout.Text = "Dank u wel."

dagvraag == 7

Vraag.Text = "Mensen met diabetes moeten veel suikers eten. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Heel goed. Mensen met diabetes moeten regelmatig en gevarieerd eten."
Fout.Text = "Mensen met diabetes moeten regelmatig en gevarieerd eten."

dagvraag == 8

Vraag.Text = "Hoe gaat het ermee?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."
rtbPrefab.Text = "Bedankt voor het beantwoorden van de vragen en tot overmorgen."

dag == 3

dagvraag == 1

Vraag.Text = "Wat doet u aan beweging op een dag?"
Goed.Text = "Oke, bedankt."
Fout.Text = "Oke, bedankt."

dagvraag == 2

Vraag.Text = "Bewegen versterkt je hart.\n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Prima. Bewegen zorgt ervoor dat je beter op gewicht blijft, betere conditie krijgt en je bloedsuikerniveau daalt. Daarnaast zorgt bewegen voor een betere bloedsomloop en versterkt het je hart, waardoor de kans op hartziekten of een herseninfarct wordt verkleind."
Fout.Text = "Bewegen zorgt ervoor dat je beter op gewicht blijft, betere conditie krijgt en je bloedsuikerniveau daalt. Daarnaast zorgt bewegen voor een betere bloedsomloop en versterkt het je hart, waardoor de kans op hartziekten of een herseninfarct wordt verkleind."

dagvraag == 3

Vraag.Text = "Bent u stressgevoelig?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."

dagvraag == 4

Vraag.Text = "Stress verlaagt het bloedsuikerniveau. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Stress verhoogt inderdaad de bloedsuikerspiegel."
Fout.Text ="Stress verhoogt de bloedsuikerspiegel."

dagvraag == 5

Vraag.Text = "Als je een hypo hebt moet je suikers binnen krijgen. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Juist. Een hypo houdt in dat je bloedglucoseniveau te laag is en dat je snel suiker moet binnen krijgen."
Fout.Text = "Een hypo houdt in dat je bloedglucoseniveau te laag is en dat je snel suiker moet binnen krijgen."

dagvraag == 6

Vraag.Text = "Wat heeft u gesnoept gisteren?"
Goed.Text = "Aha."
Fout.Text = "Aha."

dagvraag == 7

Vraag.Text = "Mensen met diabetes moeten geen koolhydraten eten. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Heel goed. Mensen met diabetes moeten regelmatig en gevarieerd eten."
Fout.Text = "Mensen met diabetes moeten regelmatig en gevarieerd eten."

dagvraag == 8

Vraag.Text = "Hoe gaat het ermee?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."
rtbPrefab.Text = "Bedankt voor het beantwoorden van de vragen en tot overmorgen."

dag == 4

dagvraag == 1

Vraag.Text = "Heeft u tijdens uw werk last van uw diabetes?"
Goed.Text = "Dat is prettig."
Fout.Text = "Dat is vervelend."

dagvraag == 2

Vraag.Text = "U bent verplicht uw werkgever in te lichten als u diabetes heeft.\n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Daar bent u inderdaad niet toe verplicht."
Fout.Text = "Daar bent u niet toe verplicht."

dagvraag == 3

Vraag.Text = "Welke sport lijkt u leuk om te doen?"
Goed.Text/ Fout.Text = "Aha. ...."

dagvraag == 4

Vraag.Text = "Bewegen vergroot de kans op een hartinfarct. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Prima. Bewegen zorgt ervoor dat je beter op gewicht blijft, betere conditie krijgt en je bloedsuikerniveau daalt. Daarnaast zorgt bewegen voor een betere bloedsomloop en versterkt het je hart, waardoor de kans op hartziekten of een herseninfarct wordt verkleind."
Fout.Text = "Bewegen zorgt ervoor dat je beter op gewicht blijft, betere conditie krijgt en je bloedsuikerniveau daalt. Daarnaast zorgt bewegen voor een betere bloedsomloop en versterkt het je hart, waardoor de kans op hartziekten of een herseninfarct wordt verkleind."

dagvraag == 5

Vraag.Text = "Waarmee heeft u ontbeten?"
Goed.Text = "Dus u heeft goed ontbeten."
Fout.Text = "Dus u heeft niet ontbeten."

dagvraag == 6

Vraag.Text = "Mensen met diabetes mogen alles eten. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Heel goed. Mensen met diabetes moeten regelmatig en gevarieerd eten."
Fout.Text = "Mensen met diabetes moeten regelmatig en gevarieerd eten."

dagvraag == 7

Vraag.Text = "Als je een hypo hebt moet je jezelf extra insuline toedienen. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Juist. Een hypo houdt in dat je bloedglucoseniveau te laag is en dat je snel suiker moet binnen krijgen."
Fout.Text = "Een hypo houdt in dat je bloedglucoseniveau te laag is en dat je snel suiker moet binnen krijgen."

dagvraag == 8

Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."
rtbPrefab.Text = " Bedankt voor het testen van dit apparaat. Op de rechter computer zullen nu een aantal vragen gesteld worden over het apparaat."

Selfcare scenario

Every day starts with:

Vraag.Text = "Hoe gaat het ermee?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."

dag == 1

dagvraag == 1

Vraag.Text = "Hoe hoog was uw bloedsuiker vandaag?"
Goed.Text = "Uw bloedsuikerniveau van .. wordt doorgegeven aan uw arts."
Fout.Text = "Uw bloedsuikerniveau van .. wordt doorgegeven aan uw arts."

dagvraag == 2

Vraag.Text = "Een bloedsuiker niveau van 5 is gezond.\n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dat klopt. Een bloedsuikerniveau tussen de 4 en 10 millimol per liter is gezond."
Fout.Text = "Een bloedsuikerniveau tussen de 4 en 10 millimol per liter is gezond."

dagvraag == 3

Vraag.Text = "Vindt u dat diabetes inbreuk maakt op uw leven?"
Goed.Text = "Het is prettig dat u dat gevoel niet heeft."
Fout.Text = "Het is vervelend dat u dat gevoel heeft."

dagvraag == 4

Vraag.Text = "Diabetes patiënten moeten net als nierpatiënten hun bloed laten zuiveren. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Diabetes patiënten hoeven hun bloed inderdaad niet te laten zuiveren."
Fout.Text = "Diabetes patiënten hoeven hun bloed niet te laten zuiveren."

dagvraag == 5

Vraag.Text = "Controleert u uw voeten dagelijks?"
Goed.Text = "U controleert uw voeten dagelijks."
Fout.Text = "U controleert uw voeten niet dagelijks."

dagvraag == 6

Vraag.Text = "Door beschadiging van de zenuwbanen is je voet extra kwetsbaar. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dat klopt. Je moet je voeten dagelijks controleren, want deze zijn extra kwetsbaar door beschadiging van je zenuwbanen, verminderde weerstand en vernauwing van je kleine en grote bloedvaten. Kleine wondjes kunnen groeter worden en infecteren doordat je ze niet opmerkt."
Fout.Text = "Je moet je voeten dagelijks controleren, want deze zijn extra kwetsbaar door beschadiging van je zenuwbanen, verminderde weerstand en vernauwing van je kleine en grote bloedvaten. Kleine wondjes kunnen groeter worden en infecteren doordat je ze niet opmerkt."

dagvraag == 7

Vraag.Text = "Als je diabetes type 2 hebt dan slik je soms pillen. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Inderdaad, bij mensen met diabetes type 2 wordt geprobeerd eerst zonder medicatie de diabetes onder controle te krijgen, maar het kan ook zo zijn dat men pillen slikt of insuline spuit om de diabetes onder controle te krijgen."
Fout.Text = "Bij mensen met diabetes type 2 wordt geprobeerd eerst zonder medicatie de diabetes onder controle te krijgen, maar het kan ook zo zijn dat men pillen slikt of insuline spuit om de diabetes onder controle te krijgen."

dagvraag == 8

Vraag.Text = "Hoe gaat het ermee?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."
rtbPrefab.Text = "Bedankt voor het beantwoorden van de vragen en tot overmorgen."

dag == 2

dagvraag == 1

Vraag.Text = "Hoe hoog was uw bloedsuiker vandaag?"
Goed.Text = "Uw bloedsuikerniveau van .. wordt doorgegeven aan uw arts."
Fout.Text = "Uw bloedsuikerniveau van .. wordt doorgegeven aan uw arts."

dagvraag == 2

Vraag.Text = "Een bloedsuikerniveau van 12 is gezond. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dat klopt. Een bloedsuikerniveau tussen de 4 en 10 millimol per liter is gezond."
Fout.Text = "Een bloedsuikerniveau tussen de 4 en 10 millimol per liter is gezond."

dagvraag == 3

Vraag.Text = "Als je diabetes type 2 hebt dan spuit altijd insuline.\n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Inderdaad, bij mensen met diabetes type 2 wordt geprobeerd eerst zonder medicatie de diabetes onder controle te krijgen, maar het kan ook zo zijn dat men pillen slikt of insuline spuit om de diabetes onder controle te krijgen."
Fout.Text = "Bij mensen met diabetes type 2 wordt geprobeerd eerst zonder medicatie de diabetes onder controle te krijgen, maar het kan ook zo zijn dat men pillen slikt of insuline spuit om de diabetes onder controle te krijgen."

dagvraag == 4

Vraag.Text = "Heeft u veel last van koude vingers?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is jammer."

dagvraag == 5

Vraag.Text = "Wanneer u diabetes heeft kunt u ernstige problemen krijgen met de doorbloeding van vingers en tenen. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dat is inderdaad waar. Diabetici kunnen last van hun doorbloeding krijgen."
Fout.Text = "Diabetici kunnen last van hun doorbloeding krijgen."

dagvraag == 6

Vraag.Text = "Hoe vaak heeft u in de afgelopen week uw voeten gecontroleerd op wondjes?"
Goed.Text = "U heeft uw voeten dus ... keer gecontroleerd."
Fout.Text = "U heeft uw voeten dus ... keer gecontroleerd."

dagvraag == 7

Vraag.Text = "Wanneer men diabetes heeft is de voet extra kwetsbaar door een vernauwing van de kleine bloedvaten. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dat klopt. Je moet je voeten dagelijks controleren, want deze zijn extra kwetsbaar door beschadiging van je zenuwbanen, verminderde weerstand en vernauwing van je kleine en grote bloedvaten. Kleine wondjes kunnen groeter worden en infecteren doordat je ze niet opmerkt."
Fout.Text = "Je moet je voeten dagelijks controleren, want deze zijn extra kwetsbaar door beschadiging van je zenuwbanen, verminderde weerstand en vernauwing van je kleine en grote bloedvaten. Kleine wondjes kunnen groeter worden en infecteren doordat je ze niet opmerkt."

dagvraag == 8

Vraag.Text = "Hoe gaat het ermee?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."
rtbPrefab.Text = "Bedankt voor het beantwoorden van de vragen en tot overmorgen."

dag == 3

dagvraag == 1

Vraag.Text = "Hoe hoog was uw bloedsuiker vandaag?"
Goed.Text = "Uw bloedsuikerniveau van .. wordt doorgegeven aan uw arts."
Fout.Text = "Uw bloedsuikerniveau van .. wordt doorgegeven aan uw arts."

dagvraag == 2

Vraag.Text = "Een bloedsuikerniveau van 8 is gezond.\n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dat klopt. Een bloedsuikerniveau tussen de 4 en 10 millimol per liter is gezond."
Fout.Text = "Een bloedsuikerniveau tussen de 4 en 10 millimol per liter is gezond."

dagvraag == 3

Vraag.Text = "Heeft u wel eens wondjes aan uw voet?"
Goed.Text = "Dat is mooi."
Fout.Text ="Dat is vervelend."

dagvraag == 4

Vraag.Text = "Door een verminderde weerstand zijn de voeten extra kwetsbaar bij diabetici. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dat klopt. Je moet je voeten dagelijks controleren, want deze zijn extra kwetsbaar door beschadiging van je zenuwbanen, verminderde weerstand en vernauwing van je kleine en grote bloedvaten. Kleine wondjes kunnen groeter worden en infecteren doordat je ze niet opmerkt."
Fout.Text = "Je moet je voeten dagelijks controleren, want deze zijn extra kwetsbaar door beschadiging van je zenuwbanen, verminderde weerstand en vernauwing van je kleine en grote bloedvaten. Kleine wondjes kunnen groeter worden en infecteren doordat je ze niet opmerkt."

dagvraag == 5

Vraag.Text = "Als je diabetes type 2 hebt dan krijg je geen medicatie. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Inderdaad, bij mensen met diabetes type 2 wordt geprobeerd eerst zonder medicatie de diabetes onder controle te krijgen, maar het kan ook zo zijn dat men pillen slikt of insuline spuit om de diabetes onder controle te krijgen."
Fout.Text = "Bij mensen met diabetes type 2 wordt geprobeerd eerst zonder medicatie de diabetes onder controle te krijgen, maar het kan ook zo zijn dat men pillen slikt of insuline spuit om de diabetes onder controle te krijgen."

dagvraag == 6

Vraag.Text = "Denkt u dat uw ogen achteruit gaan?"
Goed.Text = "U denkt dus niet dat uw ogen achteruit gaan."
Fout.Text = "U denkt dus dat uw ogen achteruit gaan."

dagvraag == 7

Vraag.Text = "Diabetes patiënten wordt geadviseerd om eens per jaar, of eens per twee jaar naar de opticien te gaan om naar de bloedvaten in het netvlies te laten kijken. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dit wordt inderdaad geadviseerd."
Fout.Text = "Dit wordt wel geadviseerd."

dagvraag == 8

Vraag.Text = "Hoe gaat het ermee?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."
rtbPrefab.Text = "Bedankt voor het beantwoorden van de vragen en tot overmorgen."

dag == 4

dagvraag == 1

Vraag.Text = "Hoe hoog was uw bloedsuiker vandaag?"
Goed.Text = "Uw bloedsuikerniveau van .. wordt doorgegeven aan uw arts."
Fout.Text = "Uw bloedsuikerniveau van .. wordt doorgegeven aan uw arts."

dagvraag == 2

Vraag.Text = "Een bloedsuikerniveau van 3 is gezond.\n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dat klopt. Een bloedsuikerniveau tussen de 4 en 10 millimol per liter is gezond."
Fout.Text = "Een bloedsuikerniveau tussen de 4 en 10 millimol per liter is gezond."

dagvraag == 3

Vraag.Text = "Wanneer neemt u meestal uw medicatie?"
Goed.Text = "U neemt uw medicatie dus meestal ...."
Fout.Text = "U neemt uw medicatie dus meestal ...."

dagvraag == 4

Vraag.Text = "Insuline kan het beste na de maaltijd ingenomen worden. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dit is inderdaad niet waar. Insuline kan het beste voor de maaltijd genomen worden."
Fout.Text = "Insuline kan het beste voor de maaltijd genomen worden."

dagvraag == 5

Vraag.Text = "Als je diabetes type 2 hebt dan is daar niets aan te doen. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Inderdaad, bij mensen met diabetes type 2 wordt geprobeerd eerst zonder medicatie de diabetes onder controle te krijgen, maar het kan ook zo zijn dat men pillen slikt of insuline spuit om de diabetes onder controle te krijgen."
Fout.Text = "Bij mensen met diabetes type 2 wordt geprobeerd eerst zonder medicatie de diabetes onder controle te krijgen, maar het kan ook zo zijn dat men pillen slikt of insuline spuit om de diabetes onder controle te krijgen."

dagvraag == 6

Vraag.Text = "Waarom controleert u uw voeten niet dagelijks?"
Goed.Text = "Aha. ...."
Fout.Text = "Aha. ...."

dagvraag == 7

Vraag.Text = "Door een verwijding van de grote bloedvaten zijn de voeten van diabetici extra kwetsbaar. \n a Juist \n b Onjuist\n c Weet ik niet"

Goed.Text = "Dat klopt. Je moet je voeten dagelijks controleren, want deze zijn extra kwetsbaar door beschadiging van je zenuwbanen, verminderde weerstand en vernauwing van je kleine en grote bloedvaten. Kleine wondjes kunnen groeter worden en infecteren doordat je ze niet opmerkt."

Fout.Text = "Je moet je voeten dagelijks controleren, want deze zijn extra kwetsbaar door beschadiging van je zenuwbanen, verminderde weerstand en vernauwing van je kleine en grote bloedvaten. Kleine wondjes kunnen groeter worden en infecteren doordat je ze niet opmerkt."

dagvraag == 8

Vraag.Text = "Hoe gaat het ermee?"

Goed.Text = "Dat is mooi."

Fout.Text = "Dat is vervelend."

rtbPrefab.Text = " Bedankt voor het testen van dit apparaat. Op de rechter computer zullen nu een aantal vragen gesteld worden over het apparaat."

Medication scenario

Every day starts with:

Vraag.Text = "Hoe gaat het ermee?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."

dag == 1

dagvraag == 1

Vraag.Text = "Bent u weleens licht in het hoofd?"
Goed.Text = "Bedankt."
Fout.Text = "Bedankt."

dagvraag == 2

Vraag.Text = "Diabetici kunnen trillerig worden bij een te laag bloedsuikerniveau.\n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dit is inderdaad waar. De hersenen krijgen dan te weinig brandstof."
Fout.Text = "De hersenen krijgen dan te weinig brandstof."

dagvraag == 3

Vraag.Text = "Bij een hyper moet men extra suiker innemen. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Inderdaad. Een hyper houdt in dat je bloedsuikerniveau te hoog is en je het best jezelf extra insuline kan toedienen."
Fout.Text = "Een hyper houdt in dat je bloedsuikerniveau te hoog is en je het best jezelf extra insuline kan toedienen."

dagvraag == 4

Vraag.Text = "Vindt u het moeilijk om uw medicatie regelmatig te nemen?"
Goed.Text = "Aha ...."
Fout.Text = "Aha ...."

dagvraag == 5

Vraag.Text = "Als je diabetes hebt dan heb je een hoog bloedsuikerniveau. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Inderdaad. Als je diabetes hebt dan schommelt je bloedsuikerniveau te veel. Je moet het niveau regelmatig meten om de wisselingen in de gaten te houden en je behandeling misschien aan te passen."
Fout.Text = "Als je diabetes hebt dan schommelt je bloedsuikerniveau te veel. Je moet het niveau regelmatig meten om de wisselingen in de gaten te houden en je behandeling misschien aan te passen."

dagvraag == 6

Vraag.Text = "Houdt u zich goed aan uw dieet?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is jammer."

dagvraag == 7

Vraag.Text = "Diabetes type 2 heeft altijd te maken met overgewicht. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Prima. Diabetes type 2 is meestal genetisch bepaald in combinatie met een andere factor, zoals overgewicht, weinig beweging, zwangerschapsdiabetes gehad of problemen met cholesterol en bloeddruk."
Fout.Text = "Diabetes type 2 is meestal genetisch bepaald in combinatie met een andere factor, zoals overgewicht, weinig beweging, zwangerschapsdiabetes gehad of problemen met cholesterol en bloeddruk."

dagvraag == 8

Vraag.Text = "Hoe gaat het ermee?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."
rtbPrefab.Text = "Bedankt voor het beantwoorden van de vragen en tot overmorgen."

dag == 2

dagvraag == 1

Vraag.Text = "Vergeet u af en toe uw medicatie?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."

dagvraag == 2

Vraag.Text = "Als je diabetes type 2 hebt dan hoef je je glucosegehalte niet zelf te meten. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Inderdaad. Als je diabetes hebt dan schommelt je bloedsuikerniveau te veel. Je moet het niveau regelmatig meten om de wisselingen in de gaten te houden en je behandeling misschien aan te passen."
Fout.Text = "Als je diabetes hebt dan schommelt je bloedsuikerniveau te veel. Je moet het niveau regelmatig meten om de wisselingen in de gaten te houden en je behandeling misschien aan te passen."

dagvraag == 3

Vraag.Text = "Vindt u dat u goed met uw diabetes omgaat?"
Goed.Text = "Dan gaat u inderdaad goed om met uw diabetes."
Fout.Text = "Dan gaat u niet goed om met uw diabetes."

dagvraag == 4

Vraag.Text = "Een te laag bloedsuikerniveau kan ontstaan door te weinig insuline te spuiten. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dit is inderdaad onjuist."
Fout.Text = "Dit is onjuist."

dagvraag == 5

Vraag.Text = "Als je een hyper hebt betekend dat de insuline niet goed genoeg werkt. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Inderdaad. Een hyper houdt in dat je bloedsuikerniveau te hoog is en je het best jezelf extra insuline kan toedienen."
Fout.Text = "Een hyper houdt in dat je bloedsuikerniveau te hoog is en je het best jezelf extra insuline kan toedienen."

dagvraag == 6

Vraag.Text = "Waarom vindt u het moeilijk om u aan uw dieet te houden?"
Goed.Text = "Oke ..."
Fout.Text = "Oke ..."

dagvraag == 7

Vraag.Text = "Als je zwangerschaps diabetes hebt gehad dan heb je een grotere kans op diabetes type 2. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Prima. Diabetes type 2 is meestal genetisch bepaald in combinatie met een andere factor, zoals overgewicht, weinig beweging, zwangerschapsdiabetes gehad of problemen met cholesterol en bloeddruk."
Fout.Text = "Diabetes type 2 is meestal genetisch bepaald in combinatie met een andere factor, zoals overgewicht, weinig beweging, zwangerschapsdiabetes gehad of problemen met cholesterol en bloeddruk."

dagvraag == 8

Vraag.Text = "Hoe gaat het ermee?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."
rtbPrefab.Text = "Bedankt voor het beantwoorden van de vragen en tot overmorgen."

dag == 3

dagvraag == 1

Vraag.Text = "Weet u wat het verschil tussen type 1 en type 2 diabetes is?"
Goed.Text = "Inderdaad dat klopt."
Fout.Text = "Inderdaad dat klopt."

dagvraag == 2

Vraag.Text = "Type 1 diabetes wordt ook wel 'ouderdoms diabetes' genoemd.\n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Type 1 wordt inderdaad geen ouderdomsdiabetes genoemd. Type 2 wordt wel zo genoemd."
Fout.Text = "Type 1 wordt geen ouderdomsdiabetes genoemd. Type 2 wordt wel zo genoemd."

dagvraag == 3

Vraag.Text = "Waarom vindt u het moeilijk om uw medicatie te nemen?"
Goed.Text = "Aha ..."
Fout.Text = "Aha ..."

dagvraag == 4

Vraag.Text = "Als je diabetes hebt mag je zelf de medicatie aanpassen. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Inderdaad. Als je diabetes hebt dan schommelt je bloedsuikerniveau te veel. Je moet het niveau regelmatig meten om de wisselingen in de gaten te houden en je behandeling misschien aan te passen."
Fout.Text = "Als je diabetes hebt dan schommelt je bloedsuikerniveau te veel. Je moet het niveau regelmatig meten om de wisselingen in de gaten te houden en je behandeling misschien aan te passen."

dagvraag == 5

Vraag.Text = "Controleert u uw cholesterol af en toe?"
Goed.Text = "Okee."
Fout.Text = "Okee."

dagvraag == 6

Vraag.Text = "Als je een hoog cholesterol hebt dan heb je een grotere kans op diabetes type 2. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Prima. Diabetes type 2 is meestal genetisch bepaald in combinatie met een andere factor, zoals overgewicht, weinig beweging, zwangerschapsdiabetes gehad of problemen met cholesterol en bloeddruk."
Fout.Text = "Diabetes type 2 is meestal genetisch bepaald in combinatie met een andere factor, zoals overgewicht, weinig beweging, zwangerschapsdiabetes gehad of problemen met cholesterol en bloeddruk."

dagvraag == 7

Vraag.Text = "Als je een hyper hebt betekend dat dat je bloedsuikerniveau te hoog is. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Inderdaad. Een hyper houdt in dat je bloedsuikerniveau te hoog is en je het best jezelf extra insuline kan toedienen."
Fout.Text = "Een hyper houdt in dat je bloedsuikerniveau te hoog is en je het best jezelf extra insuline kan toedienen."

dagvraag == 8

Vraag.Text = "Hoe gaat het ermee?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."
rtbPrefab.Text = "Bedankt voor het beantwoorden van de vragen en tot overmorgen."

dag == 4

dagvraag == 1

Vraag.Text = "Hoeveel weegt u vandaag?"
Goed.Text = "Uw gewicht van ... kilo zal worden doorgegeven aan uw huisarts."
Fout.Text = "Uw gewicht van ... kilo zal worden doorgegeven aan uw huisarts."

dagvraag == 2

Vraag.Text = "Diabetes type 2 wordt niet genetisch bepaald. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Prima. Diabetes type 2 is meestal genetisch bepaald in combinatie met een andere factor, zoals overgewicht, weinig beweging, zwangerschapsdiabetes gehad of problemen met cholesterol en bloeddruk."
Fout.Text = "Diabetes type 2 is meestal genetisch bepaald in combinatie met een andere factor, zoals overgewicht, weinig beweging, zwangerschapsdiabetes gehad of problemen met cholesterol en bloeddruk."

dagvraag == 3

Vraag.Text = "Vindt u het vervelend om uw suiker te meten?"
Goed.Text = "Dat is prettig."
Fout.Text = "Dat is vervelend."

dagvraag == 4

Vraag.Text = "Diabetes patiënten kunnen thuis hun bloedsuiker meten. Ze doen dit door met een injectienaald een beetje bloed af te nemen uit de onder arm. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Dat is inderdaad niet waar."
Fout.Text = "Dat is niet waar."

dagvraag == 5

Vraag.Text = "Als je een hyper hebt mag je zeker niet extra bewegen. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Inderdaad. Een hyper houdt in dat je bloedsuikerniveau te hoog is en je het best jezelf extra insuline kan toedienen."
Fout.Text = "Een hyper houdt in dat je bloedsuikerniveau te hoog is en je het best jezelf extra insuline kan toedienen."

dagvraag == 6

Vraag.Text = "Vindt u het moeilijk uw medicatie te nemen?"
Goed.Text = "Aha ...."
Fout.Text = "Aha ....."

dagvraag == 7

Vraag.Text = "Als je diabetes hebt kan het glucosegehalte per meting zeer verschillen. \n a Juist \n b Onjuist\n c Weet ik niet"
Goed.Text = "Inderdaad. Als je diabetes hebt dan schommelt je bloedsuikerniveau te veel. Je moet het niveau regelmatig meten om de wisselingen in de gaten te houden en je behandeling misschien aan te passen."
Fout.Text = "Als je diabetes hebt dan schommelt je bloedsuikerniveau te veel. Je moet het niveau regelmatig meten om de wisselingen in de gaten te houden en je behandeling misschien aan te passen."

dagvraag == 8

Vraag.Text = "Hoe gaat het ermee?"
Goed.Text = "Dat is mooi."
Fout.Text = "Dat is vervelend."
rtbPrefab.Text = " Bedankt voor het testen van dit apparaat. Op de rechter computer zullen nu een aantal vragen gesteld worden over het apparaat."

Appendix 6: Personal assistants

Personal assistant				
Agents				Text
Embodied		Virtual		
Social	Non-social	Social	Non-social	