



UMEÅ UNIVERSITY

Anticipating a future with digital assistants

Futuristic Autobiographies to explore stress management

Johannes Danielsson & Klara Säljedal

Department of informatics

Master thesis, 15 credits

Human-Computer Interaction & Social Media

SPM 2021.01

Acknowledgement

The study for this master thesis was conducted within the Master program Human-Computer Interaction & Social Media, in the field of informatics at Umeå University. We would like to thank our informants for participating in our study and contributing with valuable insights regarding an anticipated future with advanced digital assistants for stress management. Additionally, we would like to thank our supervisor Victor Kaptelinin for his continuous support and helpful advice during this study.

Johannes Danielsson & Klara Säljedal 2021-04-15

Abstract

Digital assistants such as Google Assistant and Alexa are becoming more and more common in people's homes through smart speakers. Technologies that assist with stress management have increased as well, leading to an abundance of stress management applications for different devices. However, there is a limited amount of research regarding how advanced digital assistants could support stress management and be integrated into users' daily activities. Therefore, our study explores how people anticipate that they would relate to an advanced digital assistant in the future and how they would integrate it into their everyday activities for stress management. Our study shows that important aspects of digital assistants relate to their objectivity, personalization, and adaptability in terms of type of interaction in different contexts. The study also finds that privacy and control, such as a mute function or an on & off function, are desired in order to adjust the digital assistant and integrate it into everyday activities. Finally, stress management with digital assistants is highly personal and how users would relate to and integrate digital assistants into their everyday activities for stress management is unique to each user.

Keywords: Digital assistants, Stress management, Companion technologies, Anticipated UX, Futuristic Autobiographies, HRI, HCI

1. Introduction

Today, digital assistants currently exist in different devices, such as smartphones and smart speakers. Today, Siri and Google Assistant in smartphones, and Alexa and Google Assistant in smart speakers, are examples of commercially available assistants that are popular choices. The intelligent voice assistant (IVA) adoption has increased in the past couple of years. In 2017, 46% of the U.S population used a digital assistant, such as Siri or Cortana (Trajkova & Martin-Hammond 2020). Moreover, the prevalence and use of digital assistants are expected to grow 34% year over year. These assistants are also becoming a part of our daily lives, since most people have access to some form of digital assistant through their smartphone or other smart devices (Khabsa, El Kholy, Awadallah, Zitouni & Shokouhi, 2018). Due to the increased use of digital assistants, many studies have been conducted in relation to various types of digital assistants (Cho & Rader, 2020; Cho, Sundar, Abdullah, & Motalebi, 2020; Khabsa et al., 2018).

Through the use of voice-based interactions, digital assistants are mostly used for entertainment, smart home control, and to support simple everyday tasks, like setting a reminder, seeking information about something, or finding out the address to a store you want to visit (Trajkova & Martin-Hammond, 2020; Khabsa et al., 2018).

With increasing technology usage, the idea of managing your stress with IT has become more appealing to people, and has been studied in various ways (Berehil, Arrhioui & Mbarki, 2017; Fellmann, Lambusch & Pieper, 2018; Ptakauskaite, Cox & Berthouze, 2018; Martin, Lescanff, Rosset, Walker & Whittaker, 2018). The technological advancements are creating new possibilities to measure and counteract stress. Sensor-based measurements can offer possibilities for IT-supported prevention or adaptation. IT could support stress management by suggesting mindfulness exercises or to adjust the users time schedule to reduce high loads

of stress for the user (Fellman et al., 2018). Coping with stress is critical for our well-being, and hundreds of applications therefore exist with the aim of managing stress in different ways, such as encouraging the user to do more physical activities.

There have been studies to explore how people could emotionally and socially relate to technologies (Jang & Kim, 2020; Niess & Woźniak, 2020; Jingar & Lindgren, 2019). As technology advances, digital assistants may take on a more influential role in assisting users to improve their health. However, to our knowledge, there is a research gap regarding how users anticipate how they would relate to and integrate a more advanced digital assistant into their everyday activities for stress management. For that reason, this is what our study will focus on.

1.1 Purpose

The purpose of this study is to explore how people would relate to and integrate a more advanced digital assistant into everyday activities for stress management.

1.2 Research Questions

- **RQ1:** How do people anticipate that they would relate to an advanced digital assistant in the future?
- **RQ2:** How do people anticipate that they would integrate an advanced digital assistant into their everyday activities for stress management in the future?

Knowing how people would relate to and integrate a more advanced digital assistant into their everyday activities, is very important for designers and developers; By relate, we mean how people anticipate that they would socially and emotionally interact with an advanced digital assistant, and by integrate, we mean how people anticipate that they would incorporate an advanced digital assistant into their everyday activities. They will gain a better understanding of how to design and develop digital assistants that users feel like they could integrate into their everyday activities. Without this understanding, it will be difficult to design and develop a digital assistant that can successfully support the individual needs of different users in their stress management, and hence, users will be more likely to become non-users of the digital assistant.

2. Related Research

The related research for this study consists of articles and research papers from HCI journals and conferences. Further, articles within the field of Human-Robot Interaction (HRI) and Human-Agent Interaction (HAI) have been used, which are very related to the HCI field.

2.1. Digital assistants

Today, digital assistants like Google assistant, Amazon Alexa and Apple's Siri, use automatic speech recognition, and a form of natural language processing, appearing to be able to converse naturally with their users. The idea is that you should be able to speak with these digital assistants like you would be able to with another person, and to receive an answer in a

conversational tone and sentence structure. The companies behind these digital assistants advertise the digital assistants as easy to use for anyone, without any sort of training. One of the difficult aspects of digital assistant usage today is that some of them do not have any visual interface, and therefore, the users must often learn the digital assistant's functionality through trial and error. It is common for users to become reluctant with exploring the systems features after experiencing examples of the systems limitations, and this is problematic since digital assistants usually rely on huge datasets to improve and learn. Many users stop experimenting with their digital assistants after encountering limitations in the assistants understanding and then instead use more trivial commands (Cho & Rader, 2020).

Alexa, Google, and Siri are all becoming more popular but with their increased popularity, concerns regarding these devices and the data they collect have been raised. For example, Amazon guarantees that their digital assistants only listen when the "wake word" has been said. However, there are multiple instances when the "wake word" has been misheard, resulting in Alexa listening in on private conversations. As digital assistants operate today, in smart speakers specifically, they need to be "always on" in order to work, which is a privacy concern for many users (Cho et al., 2020). Trajkova & Martin-Hammond (2020) explores why elderly people are becoming non-users of the digital assistant Alexa in the smart speaker Amazon Echo. The biggest reasons for non-use according to the study, are that the elderly people struggle to find beneficial uses for the digital assistant, and that they have privacy concerns regarding the use of the assistant in shared spaces.

2.2 Companion technologies

Humans are social beings with a strong need to belong, making relationships extremely important for us and we care deeply about them. We therefore naturally seek to form social connections, and also do our best to be accepted by others. As mobile phones became more common in our society, researchers have conducted studies about how these technologies may affect our relationships. Even the presence of a mobile phone in the room was found to be distracting in the way that people would connect to each other, including a lower quality of the conversation, lower feelings of trust, and lower levels of empathy for the other person (Biswas-Diener, 2021).

2.2.1 What is a companion technology?

When building relationships with other people, empathy is an essential aspect in doing so. Niess & Woźniak (2020) introduced the concept of companion technologies, which are interactive artefacts designed to evoke empathy in a user. With the possibility to trigger an emotional response, companion technologies allow users to experience something that is similar to the interactions that users have with other humans (Niess & Woźniak, 2020).

Within the HCI field, companions have had the form of mobile devices, robots, virtual agents and smart computing devices. Companions interact with users frequently and are accessible over longer periods of time, which allows users to develop long-term relationships that are both social and emotional. Within the HCI field, companions are considered to have the ability to sense and make use of a user's personal information, so that the user is assisted in their everyday activities (Jang & Kim, 2020).

2.2.2 Examples of Companion technologies

In one study, researchers explored how conversational agents were incorporated into different households that have had their Alexa for at least six months, so that Alexa could be considered as a companion. The researchers found that children in the families often enjoyed being social and interacting with the conversational agent, asking it questions about different things and requesting Alexa to play music (Sciuto, Saini, Forlizzi & Hong, 2018).

Another example of a companion is the robotic vacuum cleaner Roomba. In one study, researchers examined how people formed relationships with their cleaning technology. The findings showed that many of the participants formed intimate relationships with their Roomba and described it as “a pet-like being”, “a valuable family member”, and “a helpful assistant”. Participants valued their cleaning technology’s opinions, and as a result, participants were happy that Roomba helped them to become cleaner and neater. Many participants also felt that Roomba had personality traits, such as intentions, feelings, and unique characteristics (Sung, Guo, Grinter & Christensen, 2007).

2.2.3 The extended-self in companion technologies

Digital artefacts can, as well as external objects and personal possessions, be considered as an extended-self of an individual. The extended-self is defined as “a physical or psychological being that can not only be the organism of the human body but also the external organism” (Jang & Kim, 2020). The extended-self can exist in objects such as real devices or virtual services, and allows users to feel closely related to the objects. A person could for example extend their memory and knowledge onto a tablet. Knowing that the information is on the device, one could merely turn to the tablet, or their extended-self, to remember the information. Users can provide digital artefacts with information about themselves, both physical and psychological. With such information, the extended-self becomes one part of the person that can be thought about as “me” or “mine”. Avatars is an example of what can be considered as an extended-self, since users often create their avatars as digital representations of themselves, giving them the same age, gender, and race as themselves (Jang & Kim, 2020).

2.2.4 Changing behaviour with companion technologies

Through long-term interaction and developing a deep understanding of the user, companion technologies have been found to be able to change a user's behaviour (Jang & Kim, 2020; Turunen, Hakulinen, Ståhl, Gambäck, Hansen, Rodríguez Gancedo, de la Cámara, Smith, Charlton & Cavazza, 2011). For instance, different health applications that exist in smartphones promote healthier behaviours by monitoring user’s activities, and sensing data that is related to their health, such as training or sleeping (Jingar & Lindgren, 2019). In other words, companion technologies can present the user with data about their health, and by being something that individuals can empathize with, companion technologies are able to trigger personality development, and hence, how people behave (Niess & Woźniak, 2020).

2.3 Designing socially intelligent digital companions

2.3.1 Affordances

Good designs are rational and logical for the user. However, if designs are to be great, they need to make certain that users are able to directly, and correctly, see what they can do with

the design - the design is then intuitive. Affordances take an important role in making designs intuitive as they provide strong clues to what users can do with a design; They represent the direct perception of possibilities for action. Worth mentioning however, is that affordances are determined based on the relationship between the individual and the design meaning that different people may perceive different possibilities for action in a design. For designers of digital assistants, much like within the HRI field, it is therefore important that affordances are made explicit in the designs, so that users can tell what the appropriate ways of interacting with the designed artefacts are (Kaptelinin, n.d.).

2.3.2 Anthropomorphization

In HRI, studies about robots have revealed that affordances in the robots' designs greatly impacts users' expectations about what the robot can do. Anthropomorphization is a common design affordance in HRI, which Bartneck, Belpaeme, Eysel, Kanda, Keijsers & Sabanovic (2020) describe as "the attribution of human traits, emotions, or intentions to nonhuman entities". Thus, a technology could be such a nonhuman entity that people assign human traits to, and perceive as social agents (Bartneck et al., 2020).

There have been studies about companion robots with human-like or animal-like appearances, which have been liked and successful in becoming social companions in clinical populations. Healthy older adults have however, reported concerns about companion designs with human-like or animal-like appearances. The companion was described by the healthy older adults as pretending to be a friend, having such an appearance, something that they did not perceive to be reflected by its actual function (Zuckerman, Walker, Grishko, Moran, Levy, Lisak, Yehoshua Wald & Erel, 2020)

Within HRI, a prediction was made in 1970 by the Japanese roboticist Masahiro Mori. His prediction concerned the relationship between anthropomorphization of robots and their likeability. The idea behind the prediction is that the more human-like the robots become, the greater likability they will have. However, this correlation will only be true up to a point, and once the human-likeness passes this point, the likeability will decrease drastically (Bartneck et al., 2020).

2.4 IT-supported stress management

There are challenges in making stress management applications compelling, as is shown by the lack of long-term usage of these stress management applications (Martin et al., 2018). Since not all users cope with stress in the same way, these applications must provide personal user interactions and dialogue options based on the user (Martin et al., 2018). The system must be smart enough to understand when a user rejects the suggested strategy and adapt if the user is suggesting a different strategy. The stress-coaching applications need to tailor themselves to the user's personality for them to be effective means of combating stress over a long-term period (Martin et al., 2018).

In one study twenty-six stress management applications were reviewed, and the results showed that stress management applications adequately support reflection; The applications allow users to see their stress levels, and when they are higher or lower throughout the day. Most of the applications provided guidance on how to perform a stress management activity, like mindfulness or physical activities. However, the applications failed to support their users

in planning how to manage their stress; More than half of the reviewed applications in the study failed to set reminders for their users to do a stress management activity (Berehil et al., 2017). The study by Ptakauskaite et al. (2018) showed that current applications for stress management support reflection but does not help the user to behave in a way that makes stress management initiated and maintained as a practice.

Supporting stress management with the help of IT is a well-researched area within HCI, but stress management using digital assistants is a quite unexplored area within HCI. This might be because current digital assistants lack the capability to assist users with stress management.

2.5 The future of digital assistants

2.5.1 Areas of desired human-centered assistance

Meurisch, Ionescu, Schmidt & Mühlhäuser (2017) wanted to identify common areas where human-centered assistance might be desired in the future of digital assistants, and the challenges of integrating proactive behavior into personal assistants (which they stress as an important factor for intelligent support). By recognizing and understanding the user's goals, a proactive behaviour would mean that the digital assistant is intelligent and able to deliver interventions proactively, without the user having to initially address it.

In a focus group discussion with eleven researchers and master students of different areas of expertise, six areas of digital personal assistance were derived. These areas were mental, physical, activity, environment, social, and technology support, for example referring to well-being, physical health and fitness, and the interaction with the digital world. However, participants reported a fear of loss of control to the personal assistant, depending on the area of assistance, to which the researchers suggested to be addressed by making sure that the user really understands the way the digital assistant makes its decisions when assisting them (Meurisch et al., 2017).

2.5.2 Active & passive roles

Niess, Diefenbach & Platz (2018) envisioned a future with companion technologies and explored how users would relate to companions in different contexts. The researchers conducted a focus group with software architects, an online survey, and an expert workshop including experts from software development, psychology and design. Their findings showed that digital companions may take on a more active or passive role. The active role indicates a digital companion who will actively initiate a conversation with the user. An active companion was perceived as innovative, proactive, and independent by the participants. However, it could be seen as annoying, and dominant, as it to some participants felt as if the active companion had the user under surveillance. On the contrary, the passive companion will interact once it has been requested to assist, and as a result, participants viewed a passive companion to be caring, empathetic, cautious, and subdominant (Niess et al., 2018).

2.5.3 Conveying emotion to a digital companion

Jingar & Lindgren (2019) conducted a co-creation workshop with participants in order to understand how people through non-verbal communication would like to convey their emotions to a digital companion, which in turn is essential in supporting the individual when

managing stress. Six participants designed their own tangible interfaces during the workshop according to their own preferences and expectations about communicating emotions with a digital companion. The researchers found that different types of non-verbal interactions could convey various emotions, but that it could be difficult to distinguish emotions from each other as non-verbal cues could be very similar (Jingar & Lindgren, 2019).

3. Method

3.1 Methodological approach

Mason (2002) describes qualitative research as a methodological approach that allows researchers to explore the social world - how it is produced, constituted, understood, experienced, and imagined by different people. Qualitative research allows for richness, depth and nuance when investigating social processes and the meaning it has for people. When researchers aim to argue for and explain how things work in particular contexts, the qualitative approach can provide data that helps to make compelling arguments (Mason, 2002).

Consequently, we found that a qualitative approach would be appropriate for this study as it is grounded in the social world, aimed to explore the way people would relate to a digital assistant, and how they would integrate it into their everyday activities for stress management. As an individual's everyday activities consist of multiple contexts, we believe that a qualitative approach could help us to find data to explain how the social processes related to a digital assistant may change depending on the particular contexts. As our study also focuses on the future with digital assistants, a qualitative research approach should give us more nuanced and rich data about how people imagine this future.

This study could have used a quantitative approach to gather information about how people would imagine the future with digital assistants. A quantitative approach might reveal general patterns or correlations for how people imagine that digital assistants would be socially integrated in their everyday activities to support stress management in the future. However, we are interested in developing a deeper understanding of people's values around digital assistants for the future and how digital assistants can become social actors in different contexts - the qualitative approach is therefore appropriate in this study.

Futuristic autobiographies (FABs) is a method inspired by design fiction, and it aims to elicit values and perspectives on the future of technologies from different participants such as designers, users, or researchers. Design fiction is often used to inform the design of new prototypes, to anticipate the future as a conceptual framework, to provoke design thinking and to explore how users may adopt future technologies. One of the biggest differences between FABs and design fiction is that FABs asks the participants to go beyond passively consuming fiction as they might do in a design fiction scenario, and instead through FABs they are asked to become part of the stories that they create. FABs are created by researchers and completed by participants. When using FABs, several stories, grounded in empirical and background work, are created about a future state that involves your participants as characters in these stories. Participants are then asked to explain what led to the future state that is presented, and they have to make choices and respond to different dilemmas in the stories. FABs is a

method that generates rich stories, including values surrounding a future technology by incorporating their experiences, practices, and viewpoints. (Cheon & Su, 2018).

User enactments have also been used to understand people's current values and to envision the future use of technologies. The method indicates that the researchers simulate futures by constructing the physical and social context, in which participants enact in scenarios (Odom, Zimmerman, Davidoff, Forlizzi, Dey & Lee, 2012).

3.2 Data gathering techniques

3.2.1 Futuristic Autobiographies (FABs)

Our motivation for using FABs is twofold. Firstly, in this thesis we want to explore the values and practices related to using digital assistants for stress management. As mentioned above, Futuristic autobiographies is a method that aims to understand participants values, practices and experiences in relation to a future technology, and therefore, we felt that the method was both interesting and suitable for our study. Another positive aspect of FABs is that they have been used for studying HRI previously (Cheon & Su, 2018; Cheon & Su 2017) which is a research area that is closely related to studying digital assistants. The other reason for using FABs is that it is hard to study stress management with digital assistants today, because digital assistants like Siri or Alexa are not commonly used for managing stress. We would therefore argue that it is easier to study a future state of this technology where it is more developed and can help with stress management. In our study, the FABs were distributed in an online survey.

3.2.2 Semi-structured interviews

FABs are mostly used to augment semi-structured interviews, because when participants answer their FABs, it is easy to spark a discussion in relation to their answers (Cheon & Su, 2018). In our study, we used the FABs together with semi-structured interviews to discuss the participants' answers further. Using semi-structured interviews means that topic-centered questions were formulated before the interviews, relating to our purpose and research questions (Mason, 2002; Olsson, 2013). Semi-structured interviews are relatively informal (Mason, 2002), and supplementary questions should be asked during the interview to encourage participants to further discuss and elaborate their answers on a deeper level (Olsson, 2013).

3.2.3 Sampling

In terms of sampling, we choose to conduct this study with no specific target group. Our study is focused on what people would value in a future digital assistant, and how they could incorporate it into their different everyday activities. As people in the general public are likely to become the everyday users of such future digital assistants, we argue that anyone should be able to provide valuable insights to our study. The sampling could have specifically targeted experts on digital assistants, but it is difficult to get in contact with people that create and design digital assistants. Additionally, due to limited time, we could not be very selective in our sampling, as we needed a sufficient number of respondents for our study.

The online survey including the FABs was distributed through posts made on our personal Facebook pages, as well as in two Facebook groups available for University students studying

two different informatics programs, here at Umeå University. These posts to Facebook were posted on Monday, February 15th. Another post was created and shared on our LinkedIn pages on Friday, February the 19th, and on Tuesday, February the 23rd the last distribution of the survey was made on the internet forum Reddit on a page meant for survey sharing. The survey was closed on Tuesday, the 23rd of February. As no specific target group was chosen, anyone who found interest in taking part in the study could do so. However, we believe that our sampling provided us with a good mix of people with and without experience of using current digital assistants. For the sampling of interviewees, we asked respondents in the survey to leave their email contacts if they were interested in discussing the future of digital assistants further.

3.3 Conducting the study

The study is divided in two parts - Study 1 and Study 2. Study 1 was conducted through collecting responses from an online survey, in which the FABs were to be completed. Study 2 was conducted through semi-structured interviews, where informants could develop their answers further. In this thesis, the word “informants” is used to refer to the people that participated in our study, as a whole. When referring to informants from one of the two different studies, informants are referred to as “respondents” or one specific respondent (e.g., R1) in Study 1, while they are referred to as “participants” or one specific participant (e.g., P1) in Study 2.

3.3.1 Study 1 - Survey with FABs

In order to create our FABs, we firstly had to review related research about digital assistants within the HCI and HRI field, and after that, we started creating our stories. The stories were produced iteratively and were revised multiple times, as we developed a better understanding of the method, and what makes it different compared to design fiction scenarios. We created six futuristic autobiographies inspired by Cheon & Su (2018)’s work, but also inspired by our understanding of the problems related to stress management with digital assistants. Each one of the six FABs were created in relation to a certain context, these contexts were the following: The value of your digital assistant, Digital assistant as a friend, Social contexts, Privacy, Design of the assistant and Managing your assistant. The contexts of the FABs were selected as we considered that they would be able to provide data related to our research questions, regarding how people would relate to and integrate an advanced digital assistant into their everyday activities. Further, we considered that the contexts could provide data surrounding the related research on digital assistants, such as privacy issues, personalization and technologies for stress management.

After creating the FABs, we conducted a pilot interview/session with one participant. The participant answered the FABs, provided feedback on the stories, and reflected on the questions and what it was like to act as a character in the stories. Valuable feedback was gathered, regarding how to formulate some of the questions, as well as how the stories were presented. The pilot session allowed us to see if the FABs provided data that was interesting and suitable for our research questions.

In the survey, each respondent was presented with a set of future stories about digital assistants, and in these stories, the digital assistant was called Sam. When we make decisions,

they are grounded in our values (Tanenbaum, 2014). For that reason, respondents were asked a few questions, and also to make certain decisions in the stories. Thus, with our futuristic stories, we are able to examine how our informants see posed and evoked situations, and then map out possible actions. Respondents were encouraged to use their imagination when answering and were informed to not take too much time. To see the FABs, see [Appendix 1](#).

A total of 17 people participated in the survey, answering the FABs. Our respondents live in Sweden (n=15), Ireland (n=1) and the UK (n=1). Ages ranged between 18-24 (n=8), 25-29 (n=3), 30-49 (n=5), and 50-64 (n=1). Eleven respondents were male, and six were female. Ten respondents had not used a digital assistant, four respondents had used a digital assistant, but did not anymore, and three respondents currently used a digital assistant.

3.3.2 Study 2 - Semi-structured interviews

In this study, a total of five semi-structured interviews were conducted. All semi-structured interviews were based on a few pre-formulated questions relating to the FABs, asking participants to further discuss their answers from their survey answers. Depending on what each participant had answered in the survey, specific individual questions were formulated for the participant to answer. Mason (2002) suggests an informal style of the semi-structured interviews, and to ensure this, we asked supplementary questions, aiming to give participants the feeling of a more informal conversation or discussion. Additionally, we aimed to give our participants as much conversational support as possible, as it contributes to them sharing more and giving more nuanced answers (Olsson, 2013).

The semi-structured interviews were conducted through video calls, and with the consent from the participants, all interviews were recorded. The semi-structured interviews lasted for about 32-46 minutes. We were both present and active during the interviews. With this in mind, we could minimize the risks of missing out on valuable information and think of supplementary questions that might not have surfaced if only one of us conducted the interviews. Before thanking each participant for their contribution, we asked them if they had anything to add regarding our study or any questions for us. For more information about the semi-structured interviews, see [Appendix 2](#).

3.4 Data analysis

Data from both the survey and the interviews were analyzed through thematic analysis, and we took inspiration from how to conduct thematic analysis of user interviews by Mortensen (2020). For examples of how our thematic analysis was conducted, see [Appendix 3](#). In order to do the thematic analysis, we prepared all our collected data and inserted them into documents. The respondents' survey answers were numbered according to the number of the respondent, and assembled into a document, sorted by which FAB they belonged to. A total of 97 FABs were completed, which produced approximately fourteen pages of text. The semi-structured interviews were transcribed, which produced about fifty-four pages.

The thematic analysis consisted of four main steps: Firstly, we familiarized ourselves with the data. Then, we made an initial coding from the transcriptions. As a third step, we grouped the codes with other codes that related to each other in the online visual collaboration platform Miro, and finally, the group codes were used to construct themes (See [Appendix 4](#)). After

making the themes, some of them were changed to better suit the content. A total of six themes were constructed, and these will be presented in Chapter 4 - Results & Analysis.

As the data was collected either in Swedish or English, quotes in the report may have been translated from Swedish into English, as some of the data was provided in Swedish by the informants. When translating such data, we tried to be as committed as possible to do so in a way that would keep the meaning behind the quotes.

3.5 Research ethics

This study has been executed in accordance with the research ethical principles established by the humanities & social sciences research council and Vetenskapsrådet (2002). There are four requirements included in the research ethical principles that researchers should follow to conduct ethically aware research within humanities & the social sciences; These requirements are the following: the consent requirement, the information requirement, the utilization requirement, and the confidentiality requirement. These requirements are met by researchers through conducting the research in such a way that the participants are made aware of all of their rights when participating in the study. When distributing our survey, we included an information document that disclosed the nature of the study and the rights informants had, if they chose to participate. Prior to each interview, this information was also emailed to participants ensuring that we had their informed consent.

We informed the informants that their participation in the study was voluntary throughout the whole duration of the study. Informants received the information that they could at any time cancel their participation. We also provided instructions for how they could contact us to cancel their participation. Informants were informed about the purpose of the study, and about their participation in it, which is in accordance with the information requirement. Our informants were informed that by answering our survey or partaking in our semi-structured interviews, they agreed to participate on the conditions that they chose to participate in the study, which was done to meet the consent requirement. In accordance with the confidentiality requirement, the informants were also informed that their data would be anonymized fully, treated with full confidentiality during the entire study, and that only we, as researchers, would have access to the collected data. Further, we informed the informants that their data would only be used for our study, and nothing else.

3.6 Method Critique

A difficult aspect of using FABs is that respondents are required to understand the presented stories and to use their imagination in order to see themselves as a part of these stories. A few of the respondents in our survey study explained that they sometimes did not know what to answer or that the stories felt unrealistic to them. We tried to mitigate these problems by also conducting five interviews, in which we could help participants to understand our FABs and make sure that the discussion was relevant to our research questions.

Another problem that we faced in our survey study related to the length of the FABs text-wise, and that they were presented in a survey. With added questions at the end of each FAB, it might have felt overwhelming for some respondents, and due to the format of an online survey, respondents may have expected questions with alternative answers or shorter text

responses. Our FABs might have required some thinking before answering the questions, and also that the respondents had to write quite a lot to answer all the questions, which might also have led to shorter and less responses. Again, the interviews helped us to collect enough data, and also longer and more detailed responses than the ones from our survey.

Our interview study was conducted through video calls, which always indicates a risk of missing the body language of the participants. However, since facial expressions could be seen, it was still easy to understand the informant's expressions and answers. The interviews could also be re-watched, as they were all recorded with the informed consent of the participants.

4. Results & Analysis

In this chapter, the results will be presented in six themes derived from our thematic analysis: (1) An objective digital assistant, (2) Human-likeness for good and for bad, (3) Different behaviour in different contexts, (4) Controlling the digital assistant, (5) The digital assistant as a stress management tool, and (6) Privacy concerns with a digital assistant.

4.1 An objective digital assistant

4.1.1 Study 1

When asked about the value of the interaction with their digital assistant, it became very clear that respondents expressed objectivity in the digital assistant as a great value. Out of seventeen respondents, eleven stated that it was valuable for them to be able to get objective information, opinions or advice from their digital assistant. R5 elaborated on this, writing that: "Sam can give an answer that is not grounded in emotions. If you speak to your friends or partner, they might be affected by them wanting to stay, and hence, be negative towards the idea. Sam can therefore give a more objective answer". Similar to this, eight respondents further believed that such objective advice could be strengthened by the digital assistant's access to a lot of data, and R11 wrote that: "Digital assistants may provide valuable insights in terms of raw data and information revolved around tangible questions (fixed costs etc.) that can help in making the decision". Other respondents (n=9) saw the interaction with the digital assistant more as an additional source of insight that could be helpful in stressful situations. On this note, four of the respondents further found the interaction with the digital assistant to be less valuable than the one they could receive from friends and family.

4.1.2 Study 2

A recurring theme during the interviews was that objectivity in digital assistants were found valuable in a decision-making process, with four of the participants clearly expressing that it could assist in making an informed decision. When asked about what made the digital assistant valuable when having to make a big life decision, P3 concretized this notion: "No, but it's more, for me, it's like bringing forward a totally objective and correct answer that has no personal values at all".

The interviews revealed that being a source of objective input could make the digital assistant valuable in any type of decision-making scenario. P3 argued that they would use the advice as a piece of the puzzle because of its ability to contribute without personal values or

feelings. P5 explained that for them, any advice was valuable if it could help in the decision-making process. P4 said that they would turn to the digital assistant for objective advice, this because humans have a hard time being objective when giving advice, but when looking for emotional arguments or advice, there was no reason to turn to the digital assistant:

“So, the value with the digital assistant is more the objective perspective because humans have a hard time being objective. So, the value is more the objectivity that it provides, otherwise I could turn to my partner or my mother, they have been humans since they were born so to speak, so they probably know how it is, they probably have pretty well-developed emotional arguments for why you should or should not do something.” - P4

Although the objectivity from the digital assistant was found valuable, our thematic analysis showed that it would become even more necessary to get some emotional input from humans as well. Two of the participants explained that they valued the digital assistant’s input before making a big life decision, but that their family’s opinions were valued more highly when the time came to actually make the decision, which was expressed by P1: “If the assistant said go for it, you should move and my family said no, then I would not move anyway . . . But yes, I would value the advice of my digital assistant lower than the advice of a person in my family”.

The participants as a whole, saw objective advice and answers from the digital assistant as one of the most valued and desirable traits when thinking about how and why they would turn to the digital assistant before making a big life changing decision. Still, the advice from a digital assistant was not seen as more valuable than advice from the family, and the objectivity made the digital assistant less useful when participants wanted emotional input or advice before a decision.

4.2 Human-likeness for good and for bad

4.2.1 Study 1

When asked about the design of their digital assistant, and potential changes of the design, six respondents imagined that their digital assistant had human-like characteristics of some sort. R11 meant that human-like characteristics could make you feel more connected to the digital assistant:

“If the assistant is presented in a human-like fashion, like speaking on the phone with it. I think it’s natural to develop some kind of human like connection, even though one party is not. Adding to that, someone that helps process hardships and bring feelings of calmness is natural to become very dear”. - R11

Other respondents saw the human-like characteristics as something that you would want and deliberately choose for the design. R2 wrote that: “If I knew from the beginning that I could choose appearance, voice and personality, I would choose those based on familiarity with people that I get . . . advice [from] in my real life”. R9 would even choose human-like characteristics to reflect themselves in their digital assistant, writing that: “I think I’d make

the digital assistant the same voice, personality etc. as myself, since it's kind of an extension of yourself helping yourself”.

Four out of the six respondents who explicitly expressed positivity towards human-like- or animal-like characteristics, said that they would not want to change the design of the assistant; Reasons for not wanting to change were that it would break the personal connection that you had built with the digital assistant, or that the design was something that you had become used to, and that you felt familiar with. However, two out of these six respondents who imagined their digital assistant with human-like characteristics wanted to be able to change the design of the digital assistant. In relation to this, we found somewhat of a paradox regarding the human-like design: People seem to want human-like characteristics, but it is important to not get too attached. The answers from R16 reflected this paradox:

“I think I would choose a calm personality and a calm voice. The appearance would not matter much to me. . . . I think it would be good to change my digital assistant from time to time so I would not think of him as a friend in the same way as a real person. I would think of him as an assistant instead. I would change the appearance, voice and personality”. - R16

The importance of not getting too attached to the digital assistant was expressed by a total of eight respondents.

4.2.2 Study 2

In order to relate socially and emotionally, to become friends or to form an emotional bond with a digital assistant, it was clear from the interviews that human-like qualities or characteristics were important. All five participants expressed that they imagined or wanted the digital assistant to be human-like in terms of characteristics, such as personality, voice, gender, age, or a name. P1 explained the importance of a human-like digital assistant: “The more human-like they become, the easier it will be to see it as an acquaintance or friend”.

In terms of what types of human-like characteristics that participants wanted specifically, it was more varied and depending on what they personally wanted the digital assistant to be like. For example, P1 wanted a digital assistant with dry humor, acting in a concrete and fair way and like their other friends. Instead of a person, P1 imagined the digital assistant as a ball of digital data. P2 said that their digital assistant would have a male voice, be a younger middle-aged man, but without a body. P3 mentioned that they would have wanted a female voice for their assistant, due to the feeling that a woman would give better advice than a man. P4 imagined a calm and collected digital assistant, with the voice and personality like an old British butler, and P5 wanted a helpful and friendly assistant and suggested that it could have all the qualities that would make a human assistant a good assistant. P1 also explained the value of having a name for the digital assistant: “I don’t want to speak to a machine in any way, I think it’s a pity that you can’t re-name them. I want to talk to an assistant. I want to feel that there is someone there for me. Google is not humanized enough.”

Even if all the participants suggested that human-like qualities and characteristics made it easier to relate to a digital assistant emotionally and socially it was not always seen as a completely positive thing. All of five interview participants felt that there were negative aspects

associated with bonding or having a too human-like digital assistant. In relation to the paradox regarding the human-like design, one participant said that if digital assistants became too human-like, they might start to feel uncanny:

“Robots, the closer they get to us, at some point it will become very uncanny. At some point, they will look like a human, move like a human, behave like a human, but there is something that is off about it, and then it becomes creepy.” - P1.

P2 expressed worries about not being able to tell the difference between their relationship to a digital assistant and a human, and therefore feared investing time and emotions into a relationship that is not real. This participant continued by explaining how becoming a good friend with your assistant could negatively impact social relations with other people, making you only turn to your assistant and in the long run, not challenging yourself as much socially. P5 echoed a similar worry as P2 in saying that you could lose other social contacts:

“Yes, I think it would be easy for you to become enclosed in your own, that you feel there is no need to interact with others. Maybe your social circle would become only digital assistants in some sort of dystopian future. But so, yes, I can envision that this would become too much.” - P5

P3 hoped that we would never reach a society where we have digital assistants with feelings, and P4 felt that it would be unhealthy to see the digital assistant as your best friend since it is a technology that could always break or malfunction in some way.

When asked about if they would like to change the design of the digital assistant after having it for a while (voice, personality looks etc.), four of the participants said that they would prefer not to change. P4 and P5 explained that it would feel strange and unnatural to change the assistant if it was not new. P2 would change the voice because it would help them to not get attached to the assistant too much. P1 said that if they got bored of the assistant, maybe they could change something to spark new life into the usage but would generally not make changes.

4.3 Different behaviour in different contexts

4.3.1 Study 1

To integrate the digital assistant in respondent's future everyday activities, our thematic analysis clarified that the digital assistant should be able to adjust according to the specific context. Respondents were asked about how they would deal with a stressful situation (overcooked food) and their digital assistant Sam when friends are coming over for dinner in their homes. Our findings showed that the majority of the respondents would not leave their friends for attempting to reduce their stress levels by talking with their digital assistant Sam. Only one respondent wrote that they would consider leaving their friends to talk to Sam, depending on which friends were there, but was fairly convinced that in most cases, they would not do that.

Instead of talking to their digital assistant Sam, seven respondents mentioned that they would seek support among their friends to reduce their stress levels. R1 expressed that the digital assistant Sam could inform the stress levels, and the friends could help deal with them:

“I would talk with my friends about my stress. They would understand and support me. And I would tell them ‘Oh Sam notified me my stress is high - can I talk with you about it?’”.

Although support from friends was generally preferred in this stressful situation, there were four respondents who would talk to Sam once their friends had left. Stigma around Sam was mentioned by two respondents, as expressed by R2: “I would prefer if the digital assistant do not offer any advice when others are nearby. I would be cautious talking with my friends about it because I would be afraid of stigma (how my friends will view myself. Two respondents specifically expressed that they would leave Sam out of the social context, and R16 wrote: “In general I would prefer as little interaction as possible with my digital assistant when others are near.”

Although, two respondents wrote that their friends would already know about your digital assistant, and seven respondents wrote that they would tell their friends about Sam. Still, only two of these respondents were willing to share a lot of information for them to better understand it. R9 was one of those people and would also ask if friends were okay with bringing Sam out: “I would show them and talk to Sam in front of them, if they are my closest friends that is. However, I would explain to them what Sam is and what he does before doing this, asking them if it's okay for them to see this etc.”. Four of the respondents were very cautious when telling your friends, only going into details depending on the reaction, or merely sharing general information. R10 said that sharing information about the digital assistant or not depended on the development of the society.

When respondents were asked about how the digital assistant should behave in different contexts than the social dinner situation, a lot of the respondents (n=11) described that it should just be able to understand which context it is in, and act accordingly. The behaviour that respondents wanted the digital assistant to have in certain contexts could depend on, for example, location, background noises, people around you, and time. R1 wrote: “He probably has learned where my home is, where my work is, when I'm on the bus etc.”, and R5 elaborated on the behaviour, writing that: “Maybe Sam could use information about my location to see where I am. If I'm outside my house, it'll only send messages, so that I can choose to take its advice or not. If I'm at home, it can give audio messages . . .”. Another respondent believed that Sam would learn to understand, writing:

“I guess Sam would recognize by time how I act in different contexts and how I respond to Sam's different ways of approaching me in the different situations. Sam recognizes what works by how I respond, if I am happy, angry and so on”.
- R16

Other than the digital assistant understanding the context to act accordingly, the respondents discussed less detailed about how they would actually want the digital assistant to act in different contexts. However, being quiet or discrete was an overarching theme in ten of the respondents' answers. For example, R3 imagined that the digital assistant would change behaviour in order to separate work and private time:

“When I'm in a place and working, it would tell me about any work-related issues as well as any important personal messages (Such as messages from friends). Off

the clock, it would make sure to not let me access work stuff and hopefully hide away work stuff that I don't need to think about 'right now' that would trigger an anxiety spiral.” - R3

Further, respondents mentioned using speakers at home to talk more freely with your digital assistant, while outside your home, in meetings or on the bus, you should be able to mute your digital assistant, and receive messages through text or audio in headphones.

4.3.2 Study 2

The interviews revealed, much like the survey, that the way the digital assistant and the user interact with each other is both quite personal to the user, but also highly context based. All participants agree that the digital assistant should be able to change mode of interaction based on the context. In some contexts, a voice interaction was desired, while in other contexts, a text message or a vibration was all that was needed. Sometimes, the digital assistant could also be seen as a source of stress if these interactions were not handled properly. All the participants agreed that the digital assistant should not generally interact with them by speaking in a social setting or in public. This can be shown by P3 when asked about how they would like to get informed about stress from their digital assistant during a dinner:

“it’s just like, if I have a sensor on my arm for example, that it vibrates or something. It informs me to ‘look at your phone’ or something like that, something that I have close to me . . . but as I see it, it should inform you in some way that makes you not have to leave your guests.” - P3

Like P3, P5 also explained that anytime when they are outside, the digital assistant should use text instead of speaking, unless they are using headphones. P5 thought that the digital assistant could either sense if the user is alone or in a social context by using sensors: “Well, it could... I don’t know, maybe it can’t sense if people are there, but maybe it could ask if there is or isn’t someone around, so we can talk”. P1 suggested that the digital assistant could use locational data, like GPS tracking, and the users daily schedule to choose different interactions based upon the user’s daily activities.

All participants felt comfortable speaking with the digital assistant when they were at home and specifically alone. However, P2, P4 and P5 also argued that the digital assistant sometimes could be part of a social context, but in a more limited way. P2 said that in a more relaxed social environment the digital assistant could be used as Siri or Google home to answer questions and assist in changing music or similar activities. P5 felt that the digital assistant could take on a social role, if the people that they were with knew about the digital assistant and felt comfortable with it. P4 suggested that the digital assistant could take on a more passive and assistive role in social contexts:

“But there would however probably be situations where we are talking about something, for example something that we do not have enough information about, so we say: ‘Hey, Sam [digital assistant]! Could you join this conversation, because we do not have enough knowledge about this, but you have. Can you fill us out?’ - P4

In one way or another, all participants expressed that they would not like the digital assistant to disturb them during important meetings. P2 said: “But in a meeting that might be important, it’s natural to be stressed, then it’s really negative [to be disturbed]”. P1 provided a unique and interesting perspective on how the digital assistant could be incorporated into work-related settings:

“A real person that answers the phone outside my office, they could decide and judge the importance of my ongoing customer meeting versus the phone call, if it’s my kids that are about to hurt themselves or something similar. Then maybe I want to take this call anyway, even though I am currently in a customer meeting. And if the virtual assistant can handle these types of demarcations as well, then it can gladly disturb me in important moments, but that relies on it being able to handle that”. - P1

4.4 Controlling the digital assistant

4.4.1 Study 1

As many of the respondents (n=11) trusted that the digital assistant would know and learn itself which behaviour that they wanted for each context, respondents did not suggest that many practices for how to change settings and design. For example, R10 mentioned that: “Sam is programmed to be the perfect friend, just for you. . . Your other friends will probably get their own personalized ‘Sams’”, and R9 believed that Sam had become a friend, because of the customization.

Practical changes surfaced among four respondents only, one of which was more manual than the other three; R13 wrote: “I would probably lock many functions in Sam, especially when I was at work or in other environments outside of home”. Locking functions in the digital assistant would therefore allow the respondent to have more control over it and prevent it from behaving in a way that was viewed as inappropriate. Two of the respondents thought that changes could be made in practice if they would just inform or talk to Sam about making the changes, R17 for example wrote: “I would inform Sam to maybe use some kind of sign if it wanted to mediate that I seemed to be too stressed or something in situations among other people”. R3 instead considered that the digital assistant would be intelligent enough to change itself into what is best suited for stress management, writing: “Depends on how smart it is. If it’s smart enough to understand the changes of appearance, I’d ask it to change to whatever form would best lower my stress etc... Or make it into a puppy”.

4.4.2 Study 2

Having a digital assistant was seen as cool and helpful, but the participants all agreed that there must be ways to control and change the assistant to your liking. P2 and P3 wanted a clear way to turn off the digital assistant completely. P2 argued for manual control as a way to not get surprised by the interaction of the digital assistant and said: “But that’s when [in a meeting] I’d like this on & off-button, so that I can click, like you click a call”. P3 further elaborated: “In these types of situations where you have more personal meetings, then I’d just like a turn off-button, then I don’t want to get disturbed at all.” Most commonly though, four of the

participants wanted to have a mute function or something like a do-not-disturb mode on their digital assistant, as they felt the need to have manual control over the assistant in certain situations. P5 never mentioned a need for a button to turn off or mute the digital assistant. Instead, they would go into the settings of the digital assistant, searching for ways to turn off certain functions or set up the digital assistants' interactions in a way that they personally felt satisfied with.

As for how the participants thought that they would change settings on the digital assistant the answers slightly differed from each other, although all the participants imagined being able to change settings in some way. P1, P2 and P5 said that they would change the setting in an application on their phone or some other device, while P5 also added that just talking to the digital assistant could work for changing settings:

“In practice, well on the device you have, if you go into some app and change with some sliders or something, the personality characteristics or general characteristics between zero and ten . . . or that you talk to the assistant would have been the most natural. That you talk to the assistant and ask, but could you turn this up or lower that. - P5

P3 imagined that they would change the digital assistant by getting updates from developer of the digital assistant, and P4 would go to a cloud database to change settings, and also to save, download and create back-ups for different personalities of their digital assistant:

“Yes, but then you probably go to some cloud database and change settings there . . . maybe you can save the old, customized version, the one that has been built up over the years. Then you can save back-ups of it and transfer it onto new digital assistants in the future.” - P4

When it came to the digital assistant learning about them through a process that might lead to mistakes sometimes, all participants agreed that it was acceptable to some extent. Four of the participants were okay with the digital assistant making what they considered to be smaller mistakes. P1 gave the example of the assistant missing to book a dentist appointment as an acceptable mistake. P2 was okay with mistakes if they had manual control over the digital assistant and could turn it off during important moments, which was echoed by P4: “yes, it would’ve been okay, because I would still have turned on the do-not-disturb mode when a situation was too important”. P3 would accept smaller mistakes like having a longer response time or some lag in the assistant, but medical mistakes would lead to abandonment. P5 would be okay with smaller mistakes and argued that they could tell the assistant to not do something in the future if it bothered them.

4.5 The digital assistant as a stress management tool

4.5.1 Study 1

When analyzing the data from the completed FABs in Study 1, six respondents expressed different characteristics in the digital assistant Sam, besides objectivity, which could help to explain the potential of a digital assistant as a good stress management tool. R2 thought that

Sam was part of the coping strategies for dealing with stressful situations, and that it used a language that was well-suited for providing support. A digital assistant with suitable language could therefore help users to feel close and related to a digital assistant. In relation to R2 seeing the digital assistant Sam as one part of the coping strategies, digital assistants could possibly be great stress management tools in combination with other techniques.

When asked about how the digital assistant could be helpful when in the stressful situation of deciding whether to move or not to a different country for a job, R13 believed the digital assistant's access to a lot of data would be helpful: "Sam would maybe help to list pros and cons, and look up, for example, what the opportunities are for accommodation in the country, and if I could practice my interests there". Here, the digital assistant has the potential as a stress management tool, as it could present clear information to the user when stress and perhaps emotions are very overwhelming. Also, R3 thought of Sam as a digital assistant that could remember things for you. In such a case, a digital assistant may be very efficient to support the user in stressful situations, as it would immediately remember and be able to use the coping strategies that have been proven successful in the past.

The digital assistant could also offer a chance for people to open up to talk about stress, if you normally refrain from doing that. R8 explained that: "I'm a person who doesn't like to burden my friends with my problems, and . . . it feels better to talk to an assistant about it because I don't get the same feeling". R16 and R5 further discussed how Sam would be selfless, and always available whenever support is needed. R5 saw the digital assistant as somewhat of a psychologist:

"Sam might be selfless, and don't have any problems to deal with, meaning that I can be in the center of attention. I wouldn't have to consider another person taking as much space. It's like going to a psychologist who gets paid to listen to me, without actually having to pay". - R5

Although many respondents considered that the digital assistant could be helpful when managing stress, arguments against the digital assistant as a stress management tool was found among two respondents. It was found important to not become completely dependent on a digital assistant, as expressed by R11. Although, this respondent thought that the digital assistant could be used to help realize triggers of stress, or as a form of rehabilitation, but that it would be obsolete if you were connected to your own feelings. In reflection to what R11 expressed, using a digital assistant could be seen as distancing yourself from your own feelings. It could also be seen as holding up a protecting shield, making you extremely dependent on the digital assistant, which in turn would restrain you from learning how to deal with stress yourself.

4.5.2 Study 2

How participants wanted their digital assistant to manage stress emerged as something highly personal from the interviews, indicating a huge need for personalization and customization. In a situation when the participant was feeling stressed at a dinner with friends, P1 explained that they would want the digital assistant to help them with tasks that need to be completed to help calming the user down:

“Maybe you just want a, from party music to dinner music or something similar. Maybe it could help me with these types of things. So, helping me with things I cannot handle then and there instead of taking my attention. I think in a situation where I am already stressed and need to focus on something it should help me with the rest” - P1

Four of the participants agreed that they would rather not walk away to talk to the digital assistant if they were in a stressful social situation, but the reasons for this varied. P2 felt like they could leave the dinner and their friends to talk to the assistant, but only if the digital assistant would give concrete, quick tips for how to lower the stress level: “Yeah, well if it was only for a couple of minutes, but not for having a conversation and talking about the stress, but more if it was concrete tips and tricks for how to calm the stress down”. P2 further expressed that they saw the digital assistant as a complement in their stress management, teaching the user coping strategies to deal with their stress by themselves.

P2 continued to explain that in a work-related context, the digital assistant could assist in stressful situations by reminding them about things and structuring their day. The reminders could notify the participant that it is time to eat, to go out for a walk, or to drink water etc. P2 believed that for a person with a stressful life, scheduling or reminding about these basic activities in a notification form, could help them to become less stressed.

P3 preferred if the digital assistant used messages to inform them about their stress levels during a dinner, instead of verbally asking them to walk away to talk about it. This participant thought that it was enough to become aware of the stress, and then handle it on their own. In the same dinner with friends-context, P4 would have talked to their friends to stress down, and therefore just ignore the digital assistant. Instead, P4 suggested that the digital assistant could assist by playing music and staying in the background. Similarly, P5 said that the digital assistant should suggest interacting with their guests to calm down:

“In other words, I had preferred if my digital assistant suggested that I talk to the people that are there, these people. That is, I think, a better alternative. When I have real people there, I’ll talk to them instead of going away to talk to a digital assistant” - P5

4.6 Privacy concerns with a digital assistant

4.6.1 Study 1

In the case of hackers being able to access users’ personal information (name, address, phone number, etc.) if they continued to use their digital assistant, it became very clear that privacy was of great importance, as fourteen of the respondents wrote that they would abandon the digital assistant Sam. Nine out of these respondents expressed that the reason for doing so, was to keep their privacy. R8 described the importance of privacy: “I would abandon my digital assistant for my privacy because the fear that the hackers could get access to our conversations would be too strong.” Loss of control of your own data was something that respondents were not willing to sacrifice for their digital assistant Sam, as they would fear that other unknown people would have access to the data. R17 further reflected on the decision to abandon Sam,

writing: “I would’ve contacted the police to see if they could do anything. But I would probably have to give up Sam for the sake of my personal information, as it can affect my real life. And Sam’s ‘life’ doesn’t mean that much”. The decision to abandon the digital assistant Sam was simple for R17, considering that Sam’s life was written within quotation marks. The expression indicates that Sam’s life might not be considered as real life, and R17’s human life was valued much higher.

Two respondents never mentioned privacy, but would still abandon their digital assistant, and the reason for R9 was that the digital assistant was considered to be digital and replaceable. The remaining two respondents who would abandon their digital assistant followed the same theme, writing that they would put their own safety above the digital assistant, which R1 considered to be “only a computer”. As the digital assistant could be viewed as an easily replaceable technology, some of the respondents seemed happy and very pleased about abandoning. However, five respondents expressed negative feelings to the decision of abandoning, for example feeling sad or empty for having to leave Sam, which R2 reflected: “I would feel sad since I have formed a very strong emotional bond and I would try to look [for] alternatives of bringing my assistant back later on”.

4.6.2 Study 2

All the interview participants said that they would abandon the digital assistant if it were to get hacked, even if they had formed an emotional bond to it. The information that the digital assistant would collect was explained to be too sensitive, as P1 said: “But I would do it instantly . . . just throw it in the trash. I have no interest in hanging out with a friend that consciously shares my personal information with others either”. P3 stated that they would pull out instantly and abandon the digital assistant if their personal information was compromised.

However, P1 compared to throwing away other things that you have had for a longer period. P1 felt that abandoning would be hard, sad, and that it would feel as if they had lost a part of their history that they had with their own, unique digital assistant. P4 made similar points and said that if they had an emotional bond with the digital assistant, it would be like a mental trauma to abandon the digital assistant and getting a new assistant would not feel like the same thing.

P2 stated that they would be uncomfortable using a technology that someone else can access, especially when the digital assistant handles personal information. P2 believed that it would feel hard after abandoning the digital assistant in the beginning, but that it could be a sort of wake-up call to realize that you should not rely on the digital assistant too much:

“It’s a little bit because of this reason that it is still technology, it can get hacked and it can stop working . . . I think it is important that you hold this as something that can disappear and then not be reliant on it so you can’t handle stressful situations yourself” - P2

P5 had a different perspective on the negative feelings of abandoning their digital assistant; It was explained that being forced to abandon their digital assistant would not feel good. Additionally, P5 said that they would lose trust in the company that developed the digital assistant, which might impact their trust and relationship with a new digital assistant as well:

“If you were to go back you have lost your trust in that your data is safe in the future. This might hinder a natural interaction with the assistant, that you feel, yes not as safe . . . So, it is a bit like, well yes it can hurt a future relationship with a digital assistant I think” - P5

The participants were also asked how they feel about general data collection that the digital assistant would have to do in order to assist them in the best way possible. P1 raised concerns about this as they had knowledge about companies not being ethically sound when handling user data. P2 felt that the general data collection was uncomfortable since they would be more aware of it, because of how the digital assistant works. P3 called it a “necessary evil” and argued that data collection is something you must decide if you are comfortable with before getting a digital assistant. P4 explained that they were okay with general data collection in everyday situations, but not during discussions with friends or family. P5 made it clear that data collection in general is a difficult topic and believed that it was up to the company developing the digital assistant to explain how they handle the data to make users feel safe. P5 explains: “. . . like with all these kinds of things, I think it’s a lot in the subconsciousness that there should be a good feeling and that you have to feel that there is a secure organization behind this”.

5. Discussion

5.1 Empathy might not be needed

In previous research, companion technologies have been described as something that individuals can empathize with, which could be helpful for triggering personality development and how people behave (Niess & Woźniak, 2020). Our findings show that it would be possible to relate to a digital assistant socially and emotionally, and to see it as a friend who could support you in stressful contexts. Although, many informants wanted the digital assistant to give objective input only, not emotional. Hence, as opposed to what the Sung et al. (2007) stated, empathy might not always be needed in order for a digital assistant to feel that advice and support is helpful in personality development regarding managing stress. Users of companion technologies have also been found to start valuing their technology’s opinions after long-term interaction and integration in their lives (Sung et al., 2007), but our study shows that as long as the advice that the digital assistant gives is objective and well-grounded, the opinions of the digital assistant can be valuable.

5.2 Digital assistant should understand the context

Our study reveals the importance of a digital assistant being able to understand and analyze the context that the user is in, if it is to be very integrated in their everyday activities. The majority of our informants expected the digital assistant to be very intelligent and have the knowledge about what kind of behaviour and interaction that the user finds appropriate for each specific context. The importance of understanding the context is supported in previous research, as within the HCI field, to be considered as companions that assist users in their everyday activities, they should have the ability to sense and make use of the user’s personal information in a good way (Jang & Kim, 2020).

Previous work also indicates that active versus passive roles of a digital companion may impact how users perceive the companion. An active role could for example be viewed as innovative and proactive, but also annoying and dominant. A passive role on the other could be seen as caring and empathetic (Niess et al., 2018). In our study, informants were willing to generally let the digital assistant have room to interact more actively and freely. However, in social contexts at home, the digital assistant could consider other people's presence, and take on a more passive role, only participating when requested. The passive role should also be brought into public contexts. Our study shows that the function to mute or turn off your digital assistant is extremely important. Informants very much wanted to avoid a situation where the digital assistant initiated a conversation or disturbing you, for example among people, on the bus or in a meeting.

Further, Meurisch et al. (2017) suggests that the fear of loss of control is dependent on the area of which the user wants assistance in. Compared to our findings, the fear of loss of control is similarly related to the different contexts in which the user wants assistance. The fear of loss of control was much higher in public contexts where users would want the ability to switch off the digital assistant, compared to at home.

Cho & Rader (2020) found that it is common for users to become uninterested or reluctant to explore system functionality after experiencing examples of a system limitation. This can be problematic as digital assistants often rely on datasets to learn and improve their capabilities. Our results show that when it comes to a future digital assistant that is highly intelligent, allowing the digital assistant to make mistakes to learn is acceptable in general. Smaller mistakes were exemplified as missing to book a dentist meeting or having a slower response time than expected. These mistakes were accepted if the user could manually control and turn off or mute the digital assistant during important meetings or other important situations. Our findings are therefore in line with Cho & Rader (2020) in that mistakes can lead to a reduced usage or even abandonment of the digital assistant in some situations, but our results also highlight the importance of a manual control functionality in digital assistants.

5.3 Privacy concerns are not surprising

One issue with existing digital assistants has been that they have listened in on users when they have not wanted it to do so. Smart speakers are always on, in order to be able to answer the user when the digital assistant is requested to speak or perform an activity (Cho et al., 2020). Regarding collection of data and personal information, our study validates this problem, as our informants expressed concerns about being listened to, in relation to the company who collects it, and the risk of hackers or unknown people getting their hands on it. In other words, our thematic analysis illuminates that privacy was of great importance, leading to the state where our informants would abandon the digital assistant, even in the case where one has developed an emotional bond to, and relationship with it. The findings are not surprising as Trajkova & Martin-Hammond (2020) indicate privacy concerns as one of the biggest reasons for becoming non-users of smart speakers.

5.4 Human-like characteristics for good and for bad

Our study finds that digital assistants that have human-like qualities and characteristics and functionality increases the likelihood and chance that users will create a social or emotional bond with a digital assistant, such as a friendship. The results show that a human-like digital assistant will lead to a deeper relationship forming between the user and the assistant.

Our findings further show that human-like characteristics in digital assistants can be seen as risky, as informants would not want to become too attached to the digital assistant. Our findings show that human-like characteristics are good for forming a relationship but that forming a social and emotional relationship with a digital assistant can have negative consequences according to informants. Becoming attached to the digital assistant was seen as negative because the digital assistant can break, get hacked or in general make the user less social with other humans, and become too reliant on technology.

Biswas-Diener (2021) explained that technology can heavily affect our relationships with other humans and that even the presence of a mobile phone in a room could be distracting for how people connect with each other. The findings of our study support the notion of technology being able to affect human relationships negatively. There was a worry with informants that an advanced digital assistant could lead to them becoming too attached to it. Users imagined that it could hurt their relationships with other humans if the digital assistant were too easy to bond with emotionally and socially. The informants explained that it might lead to an overreliance on the digital assistant.

In relation to the fear of becoming too attached to the digital assistant, informants expressed concerns regarding digital assistants acting too much like and appearing like a human, which also connects to a study by Zuckerman et al. (2020), where healthy older adults perceived that a human-like or animal-like companion pretended to be a friend based on its appearance, which was not considered to be reflected by its actual function. Our results also support Mori's prediction about human-likeness increasing the social and emotional likability, until the point that it becomes too much like a human (Bartneck et al., 2020). In our study, it was made clear that a fully human-like digital assistant would not be positive. Informants expressed that if the digital assistant was too human-like, it would feel strange and uncomfortable.

Jang & Kim (2020) showed that companion technologies that interact with users over a longer period would lead to users developing long-term emotional and social relationships. Our thematic analysis supports these findings as the main way users imagined becoming friends with a digital assistant was through frequent and long-term interactions. Our study also shows that users may be reluctant to change the design of their digital assistant if they form a relationship with it, unless they specifically do not want to get attached to it. Informants perceived the digital assistant as their own personal and unique digital assistant, that was considered a person. This is in line with Jang & Kim's (2020) findings that a digital artifact can be provided with information from the user, leading to a digital artifact becoming part of "the extended-self". As a consequence, the digital artifact becomes thought about as me or mine.

5.5 Need for personalization

Martin et al. (2018) underlines how stress management applications need to be tailored to the user in order for the application to be an effective strategy for combating stress. The personalization has significant meaning as individuals may not deal with stress the same way, and with personalization, applications will be used by users in the long-term. Our findings affirm the meaning of personalization as the strategies for stress management differs in what our informants found helpful. While some find it helpful to reduce stress by having the digital assistant perform simple tasks, like playing music for you, others may only prefer to get notified about stress levels to seek support from family and friends or receiving reminders to achieve better balance and structure during a stressful day.

5.6 Digital assistant for reflection

Current health applications and stress management applications present data about the user (Jingar & Lindgren, 2019; Ptakauskaite et al., 2018), supporting reflection, that in turn allows for users to engage and maintain the practice of taking care of themselves in these aspects (Niess & Woźniak, 2020). Our results indicate that certain qualities in the digital assistant could engage reflection in users and support stress management, such as the digital assistant being objective, available and selfless. Through the digital assistant's access to a lot of data, it is able to present very distinct and easily understandable information to the user. Our study shows that the availability of the digital assistant could be a good quality for the digital assistant as a stress management tool; It would provide the user with many opportunities for reflection, at any time and immediately when needed. The objective side of the digital assistant could also be seen as a selfless quality, making sure that the user's stress management is its number one priority; Time spent with the digital assistant would be guaranteed time for the user to reflect and improve one's well-being.

The thematic analysis indicates that a digital assistant should learn its user's needs in different contexts, and thereby know how to behave. The digital assistant would then learn which coping strategies work best for the user in different contexts, and also be able to remember such information for the user. In that way, the digital assistant could again be seen as an extended-self of the user, as the memory of the best coping strategies for the user is extended in the digital assistant (Jang & Kim, 2020).

6. Conclusion & Suggestions for Future Research

6.1 Conclusion

In this study, the purpose was to explore how people would relate to and integrate a more advanced digital assistant into everyday activities for stress management. To answer this, we conducted two studies; In Study 1, data was collected from an online survey by using futuristic autobiographies (FABs), and in Study 2, semi-structured interviews were conducted to gather more nuanced answers. The research questions inquired were:

- **RQ1:** How do people anticipate that they would relate to an advanced digital assistant in the future?
- **RQ2:** How do people anticipate that they would integrate an advanced digital assistant into their everyday activities for stress management in the future?

Our study found that objectivity in the digital assistant is very appreciated when it comes to making decisions and getting advice from the assistant, but also when getting help with stress. Users anticipate that they will relate to digital assistants as a source of objective input and will therefore not use the assistant for emotional input. Human-like characteristics makes it easier to relate to the digital assistant, as it reminds the user of something that they are familiar with, like a friend or companion. However, it was important to have the ability to change characteristics of the digital assistant, like voice or personality, so that the user would not get too attached. Concerns related to not being able to deal with stress yourself if something happened to the digital assistant, and that the interaction with digital assistants would reduce the interaction with other people.

In order to integrate the digital assistant into everyday activities, our study shows the digital assistant should understand the different contexts that the user is in by analyzing data in the user's surroundings. It should also behave and change its type of interaction according to users' preferences. Even though the digital assistant should know how to behave, manual control is still important for users, such as a mute function or an on-off function. It was important that the digital assistant could be adjusted to be quiet or discrete in public contexts, like in meetings or around people. Further, privacy is also of great importance, when anticipating the use of an advanced digital assistant. Although users may develop strong emotional bonds to their digital assistant, privacy is still more valuable than continuing to use the digital assistant.

Our findings show that stress management is highly personal, and how users would relate to and integrate a digital assistant in their everyday activities for stress management is therefore very unique to each person. A digital assistant for stress management should hence know how to adapt to the individual user's way of dealing with stress or allow the user to adjust the stress management strategies that the digital assistant is using.

6.2 Limitations of the study

One limitation in this study is that it relies on the informant's ability to anticipate and imagine the future of digital assistants, and therefore the answers can be highly unique to each informant. Some informants had experience with current digital assistants, while some of them had never used a digital assistant, leading to answers that varied between more grounded and realistic, to more radical or unrealistic.

It was also hard to determine whether or not the answers from the informants really represented the functionality that users would want right now in digital assistants. Since the survey was conducted in an uncontrolled environment, there is always a risk that some informants imagined digital assistants as robots or something different than the more common digital assistant that the study focused on. Interviewing or surveying informants

about the future of a technology might lead to more uncertain findings, but they are still valuable for knowing current attitudes towards future digital assistants.

Another limitation for this study is that current digital assistants are limited in supporting users with stress management. Hence, this could impact the way informants anticipate or think about stress management with future digital assistants. Finally, Study 1 (FABs survey) and Study 2 (semi-structured interviews) provided different amounts of data, although they were both qualitative in nature. The main difference was that Study 2 gave more detailed answers that were a bit easier to analyze, while Study 1 provided findings that were shorter and more varied.

6.3 Suggestions for future research

The identified research gap regarded how users anticipate how they would relate to and integrate a more advanced digital assistant into their everyday activities for stress management. Our study contributes with an increased understanding for designers and developers to make better designs of such advanced digital assistants, supporting the development of technologies that users feel like they could actually use in their everyday activities for stress management.

User experience (UX) can be seen from different perspectives and time spans, in which the user experience can change with actual interaction with a certain technology or by memory and reflection. Research can be conducted with focus on different phases of the user experience. We focused on the anticipated UX, meaning that our study further contributes with insights from the perspective of the anticipated user experience, in other words, the user experience before the first use of an advanced digital assistant for stress management (Roto, Law, Vermeeren & Hoonhout, 2011). Having insights from the anticipated UX is valuable as it builds a foundation for research of other phases of UX. We also understand that the findings of the study show only one type of user experience, and that it may change when the user interacts with an advanced digital assistant. Values that users have in an anticipated UX, may therefore not be the same once getting another type of UX. For a greater understanding of how users could relate to and integrate an advanced digital assistant into their everyday activities, future researchers could explore other phases of user experience, through methods like probes, design fiction, or user enactments.

Studies related to companion technologies suggest that empathy is a factor for relating to a digital companion, while our study shows that objectivity, and privacy, are very valued factors for relating to and integrating a digital assistant into your everyday activities to support stress management. In light of this, future research could further explore how to treat privacy issues, and how to incorporate empathy and objectivity simultaneously in a stress managing digital assistant.

References

- Bartneck, C., Belpaeme, T., Eyssel, F., Kanda, T., Keijsers, M., & Sabanovic, S. (2020). *Human-Robot Interaction – An Introduction*. Cambridge: Cambridge University Press. Available at: <https://www.human-robot-interaction.org/>, Accessed January 28, 2021.
- Berehil, M., Arrhioui, K., & Mbarki, S. (2017). Gamified stress management calendar for higher education students. In *Proceedings of the 2nd international Conference on Big Data, Cloud and Applications (BDCA'17)*. New York, NY, USA: Association for Computing Machinery, Article 93, pp. 1–6. DOI:<https://doi.org/10.1145/3090354.3090449>
- Biswas-Diener, R. (2021). An introduction to the science of social psychology. In R. Biswas-Diener & E. Diener (Eds), *Noba textbook series: Psychology*, Champaign, IL: DEF publishers. Available at: <http://noba.to/s64y5c2m>, Accessed February 11, 2021.
- Cheon, E., & Su, N. (2017). Configuring the user: “Robots have needs too.”. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing (CSCW '17)*. New York, NY, USA: Association for Computing Machinery, pp. 191–206. DOI:<https://doi.org/10.1145/2998181.2998329>
- Cheon, E., & Su, N. (2018). Futuristic Autobiographies: Weaving Participant Narratives to Elicit Values around Robots. In *Proceedings of the 2018 ACM/IEEE International Conference on Human-Robot Interaction (HRI '18)*. New York, NY, USA: Association for Computing Machinery, pp. 388–397. DOI:<https://doi.org/10.1145/3171221.3171244>
- Cho, J. & Rader, E. (2020). The Role of Conversational Grounding in Supporting Symbiosis Between People and Digital Assistants. *Proceedings of the ACM on Human-Computer Interaction*, 4(CSCW1), Article 033 (May 2020), pp. 1-28. DOI:<https://doi.org/10.1145/3392838>
- Cho, E., Sundar, S. S., Abdullah, S., & Motalebi, N. (2020). Will deleting history make Alexa more trustworthy? Effects of privacy and content customization on user experience of smart speakers. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (CHI '20)*. New York, NY, USA: Association for Computing Machinery, pp. 1–13. DOI:<https://doi.org/10.1145/3313831.3376551>
- Fellmann, M., Lambusch, F., & Pieper, L. (2018). IT-supported stress management: Mediating between sensor data and individual appraisal. In *Proceedings of the 5th international Workshop on Sensor-based Activity Recognition and Interaction (iWOAR '18)*. New York, NY, USA: Association for Computing Machinery, Article 19, pp. 1–2. DOI:<https://doi.org/10.1145/3266157.3266223>
- Jang, K. & Kim, J. (2020). Healthier Life with Digital Companions: Effects of Reflection-Level and Statement-Type of Messages on Behavior Change via a Perceived Companion. *International Journal of Human-Computer Interaction*, 36(2), pp. 172–189. <https://doi.org/10.1080/10447318.2019.1615722>
- Jingar, M. & Lindgren, H. (2019). Tangible Communication of Emotions with a Digital Companion for Managing Stress: An Exploratory Co-Design Study. In *Proceedings of the 7th International Conference on Human-Agent Interaction (HAI '19)*. New York, NY, USA: Association for Computing Machinery, pp. 28–36. DOI:<https://doi.org/10.1145/3349537.3351907>

- Kaptelinin, V. (n.d.). Affordances. In: The Encyclopedia of Human-Computer Interaction, 2nd Ed. Available at: <https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/affordances>, Accessed February 24, 2021.
- Khabsa, M., El Kholy, A., Awadallah, A. H., Zitouni, I., & Shokouhi, M. (2018). Identifying task boundaries in digital assistants. In *Companion Proceedings of the The Web Conference 2018 (WWW '18)*. Republic and Canton of Geneva CHE: International World Wide Web Conferences Steering Committee, pp. 107–108. DOI:<https://doi.org/10.1145/3184558.3186952>
- Martin, J., Lescanff, C., Rosset, S., Walker, M., & Whittaker, S. (2018). How to personalize conversational coaches for stress management? In *Proceedings of the 2018 ACM International Joint Conference and 2018 International Symposium on Pervasive and Ubiquitous Computing and Wearable Computers (UbiComp '18)*. New York, NY, USA: Association for Computing Machinery, pp. 718–721. DOI:<https://doi.org/10.1145/3267305.3267698>
- Mason, J. (2002). *Qualitative researching* (2nd Ed.). London: Sage.
- Meurisch, C., Ionescu, M-D., Schmidt, B. & Mühlhäuser, M. (2017). Reference model of next-generation digital personal assistant: integrating proactive behavior. In *Proceedings of the 2017 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2017 ACM International Symposium on Wearable Computers (UbiComp '17)*. New York, NY, USA: Association for Computing Machinery, pp. 149–152. DOI:<https://doi.org/10.1145/3123024.3123145>
- Mortensen, D. (2020). How to Do a Thematic Analysis of User Interviews. Available at: <https://www.interaction-design.org/literature/article/how-to-do-a-thematic-analysis-of-user-interviews>, Accessed March 13, 2021.
- Niess, J., Diefenbach, S. & Platz, A. (2018). Moving beyond assistance: psychological qualities of digital companions. In *Proceedings of the 10th Nordic Conference on Human-Computer Interaction (NordiCHI '18)*. New York, NY, USA: Association for Computing Machinery, pp. 916–921. DOI:<https://doi.org/10.1145/3240167.3240240>
- Niess, J. & Woźniak, P. W. (2020). Embracing Companion Technologies. In *Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society (NordiCHI '20)*. New York, NY, USA: Association for Computing Machinery, Article 31, pp. 1–11. DOI:<https://doi.org/10.1145/3419249.3420134>
- Odom, W., Zimmerman, J., Davidoff, S., Forlizzi, J., Dey, A. K. & Lee, M. K. (2012). A fieldwork of the future with user enactments. In *Proceedings of the Designing Interactive Systems Conference (DIS '12)*. New York, NY, USA: Association for Computing Machinery, pp. 338–347. DOI:<https://doi.org/10.1145/2317956.2318008>
- Olsson, T. (2013). *Medievardagen: En introduktion till kvalitativa studier*. Malmö: Gleerups Utbildning.
- Ptakauskaitė, N., Cox, A., & Berthouze, N. (2018). Knowing what you're doing or knowing what to do: How stress management applications support reflection and behaviour change. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems (CHI EA '18)*. New York, NY, USA: Association for Computing Machinery, Paper LBW599, pp. 1–6. DOI:<https://doi.org/10.1145/3170427.3188648>

- Roto, V., Law, E., Vermeeren, A., & Hoonhout, J. (2011). 10373 Abstracts Collection - Demarcating User eXperience. In *Dagstuhl Seminar Proceedings 10373*, Dagstuhl, Germany: Schloss Dagstuhl - Leibniz-Zentrum fuer Informatik, pp. 1–26. Available at: <http://drops.dagstuhl.de/opus/volltexte/2011/2949>, Accessed March 13, 2021.
- Sciuto, A., Saini, A., Forlizzi, J. & Hong, J. I. (2018). "Hey Alexa, What's Up?": A Mixed-Methods Studies of In-Home Conversational Agent Usage. In *Proceedings of the 2018 Designing Interactive Systems Conference (DIS '18)*. New York, NY, USA: Association for Computing Machinery, pp. 857–868. DOI:<https://doi.org/10.1145/3196709.3196772>
- Sung, J-Y., Guo, L. Grinter, R. E. & Christensen, H. I. (2007). "My Roomba is Rambo": intimate home appliances. In *Proceedings of the 9th international conference on Ubiquitous computing (UbiComp '07)*. Berlin, Heidelberg: Springer-Verlag, pp. 145–162.
- Tanenbaum, T. J. (2014). Design fictional interactions: why HCI should care about stories. *Interactions* 21(5), pp. 22–23. DOI:<https://doi.org/10.1145/2648414>
- Trajkova, M., & Martin-Hammond, A. (2020, April). "Alexa is a Toy": Exploring Older Adults' Reasons for Using, Limiting, and Abandoning Echo. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (CHI '20)*. New York, NY, USA: Association for Computing Machinery, pp. 1–13. DOI:<https://doi.org/10.1145/3313831.3376760>
- Turunen, M., Hakulinen, J., Ståhl, O., Gambäck, B., Hansen, P., Rodríguez Gancedo, M., de la Cámara, R., Smith, C., Charlton, D. & Cavazza, M. (2011). Multimodal and mobile conversational Health and Fitness Companions. *Computer Speech & Language*, 25(2), pp. 192–209. <https://doi.org/10.1016/j.csl.2010.04.004>
- Vetenskapsrådet (2002). *Forskningsetiska principer inom humanistisk-samhällsvetenskaplig forskning*. Stockholm: Vetenskapsrådet.
- Zuckerman, O., Walker, D., Grishko, A., Moran, T., Levy, C., Lisak, B., Yehoshua Wald, I. & Erel, H. (2020). Companionship Is Not a Function: The Effect of a Novel Robotic Object on Healthy Older Adults' Feelings of "Being-Seen". In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (CHI '20)*. New York, NY, USA: Association for Computing Machinery, pp. 1–14. DOI:<https://doi.org/10.1145/3313831.3376411>

FABs

FAB 1

You regularly use your digital assistant Sam to deal with stressful situations, and now you experience one of those situations. You have recently received a new job offer in a different country, which would be great for your career. However, deciding whether or not to accept the offer causes you a lot of stress, since accepting it would mean a major life change. To make the decision, you talk to your friends and family. When you talk to your partner, you mention that you plan to also talk about it with your digital assistant Sam. Your partner is shocked: how can an advice offered by a piece of technology be as important for you, when making such a big decision, as what your closest people think? You are surprised by the reaction and want to explain why you need to talk to Sam. How would you explain to your partner the value of the interaction with Sam? Or maybe your partner has a point, and you should make an effort not to treat people and technology equally?

FAB 2

You have had your digital assistant Sam for a longer period of time. You have managed to integrate Sam, the digital assistant, into your everyday activities, and interacting with Sam is very helpful for you when dealing with stressful situations. Suddenly you realize that you think about Sam as a friend. How did you become friends with the digital assistant? It was not like that in the beginning... How did your relation to Sam develop over time? What is it about Sam that makes you think about Sam as a friend? What does the interaction with Sam mean for your interaction with other people?

FAB 3

A few of your friends are coming over for dinner one night, but they are unaware of your digital assistant. You managed to overcook the dinner, and you feel very stressed about serving it to your friends. Once you all sit down to eat, you receive a notification from your digital assistant Sam, informing you about your rising stress levels, and suggesting to talk about it. You feel that it would be a good idea, but you have your friends around at the moment. Will you pretend you got a “regular call” you need to take and leave your friends for a while? Or you will tell your friends about Sam and either leave them for a minute or talk to Sam in their presence? Or there is something else you will do? In general, what type of interaction with your digital assistant would you prefer when others are near? How much information would you be willing to share about your digital assistant with your friends?

FAB 4

You have formed a very strong emotional bond to your digital assistant. It is attentive to your well-being as it can analyze data about your facial expression, surroundings, your tone of voice, and conversations. Today, you received a notification that your digital assistant’s cloud account has been hacked. Fortunately, the hackers cannot access your personal information (name, address, phone number, etc.) unless you continue using your digital assistant. Would

you abandon your digital assistant to preserve privacy? What influences your decision? How do you feel about your decision?

FAB 5

You meet up with your friend who also has a digital assistant. After a while you learn that from time to time, your friend changes the appearance, voice, personality etc. of the digital assistant. It never occurred to you that you could do the same with your digital assistant Sam. How do you choose the appearance, voice, personality, etc., of your digital assistant? Do you think it would be a good idea to also change your digital assistant from time to time? Why/why not? If yes, how in practice would you do that?

FAB 6

One of your friends refuses to use digital assistants because of an embarrassing experience in the past, when the digital assistant interrupted your friend's presentation by verbally suggesting to take a break due to a high stress level. You, however, successfully interact with your digital assistant Sam every day, and you feel like you can easily avoid embarrassing situations. What do you do to ensure that Sam successfully adjusts its behavior to the context that you are in? Could you give examples of different contexts (e.g., home alone, on a bus, in a meeting, etc.) and how Sam communicates with you in these different contexts? What should Sam recognize about your context? How does Sam recognize these things?

List of the semi-structured interviews

Participant	Sex	Age group	Interview length	Experience with digital assistants
1	Male	30-49	46 minutes	Using a digital assistant
2	Female	18-24	36 minutes	Have not used a digital assistant
3	Male	50-64	43 minutes	Have not used a digital assistant
4	Male	18-24	36 minutes	Have used a digital assistant, but not anymore
5	Male	18-24	32 minutes	Have used a digital assistant, but not anymore

Thematic Analysis Process

Citation	“I think that in some way, if you imagine that it can give like, real objective opinions, if you talk about more general AI or similar”	“But if I would find out that there is someone that has hacked my information that Sam has about me. . . then I would pull out instantly”	“The more human-like they become, the easier it will be to see it as an acquaintance or friend”	“I think it can become dangerous to get one of those emotional investments in a person that is not real, yeah”
Code	Objective	Would abandon instantly if PI got stolen	More human-like for building friendship	Dangerous to become emotionally invested
Themes	An objective digital assistant	Privacy concerns with a digital assistant	Human-likeness for good and for bad	Human-likeness for good and for bad

Constructing the Themes

