Towards a new concept of therapy: virtual agents and users, who should have the final word?

The degree of decision-making users should have in an eHealth technology to foster therapeutic alliance and intention to use.

Valentina Bartali

Master thesis

Supervisor: Joyce Karreman

Second (external) supervisor: Lex van Velsen

External supervisor: Lena Brandl

Date: 23/08/2021

Abstract

Background. In traditional therapeutic settings, patients are given the possibility to decide what to do about therapists' suggestions. This partly leads to therapeutic alliance and positive treatment outcomes. A literature gap was found on the degree of decision-making users should have in a self-help eHealth technology with therapeutic purposes, such as LEAVES, in order to reach similar therapeutic results. Research showed that self-determination theory and trust are related to decision-making and the creation of a patient-technology alliance and intention to use. Finally, the level of stakes of the situation and if users have PG disorder symptoms play a role in the degree of decision-making people could have.
Aim. By applying concepts used in traditional therapeutic settings, the first aim of this study is to investigate the influence of decision-making on perceived patient-technology alliance and intention to use. The second aim is to get experts' opinions on the degree of decision-making elderly adults should have when they have PG disorder or in critical situations.
Methods. The topic is explored through a quantitative online study and a qualitative study. A 2x2 between-subjects design was conducted. 72 elderly people were recruited and randomly assigned to one of four prototypes with a different degree of decision-making and level of stakes. Afterwards, they were asked to fill in a survey. 10 (clinical) experts with different backgrounds and nationalities were interviewed about the degree of decision-making elderly people should have when using a self-help technology, about safety, and about elderly people and therapists' intention to use.
Results. For the first study, perceived patient-technology alliance significantly influences intention to use. Moreover, perceived relatedness significantly influences patient-technology alliance and intention to use. Finally, all variables, but two, significantly and positively correlate with each other. For the second study, control is central for users, even if it is more difficult for people in a critical situation. As for safety, a self-help eHealth technology cannot be fully safe, but there are features which can enhance safety. Finally, elderly people of this generation may have difficulty in using this technology due to low technological literacy. Personalisation could be a motivating factor and a way to improve decision-making.
Conclusions. It was confirmed that most concepts used in traditional therapy settings can also be applied to self-help technologies with therapeutic purposes. Additionally, finding the factors, together with relatedness and control, which influence the creation of patient-technology alliance could ensure technological usage. Finally, personalisation plays an important role in eHealth technology for therapeutic purposes.

Keywords. eHealth technology, decision-making, virtual agent, therapeutic alliance, intention to use

1. Background

eHealth technologies are revolutionizing the world's health system. In general, the healthcare staff are in need of these technologies due to the increasing demand of work. This is particularly true for the mental health sector where there are not enough therapists: in developed countries, there are only 9 therapists per 100.000 people (Abd-Alrazaq et al., 2019). Self-help eHealth technologies could solve this problem.

At Roessingh Research and Development, in Enschede (NL), researchers from different backgrounds with the collaboration of psychiatric and research institutes, universities, and associations from the Netherlands, Portugal and Switzerland, are developing a web-application with a virtual agent, called LEAVES, with the aim to help elderly adults to process the loss of their spouse (van Velsen et al., 2020). Losing a spouse is an event that happens to many people. Unfortunately, many mourners get symptoms of depression, anxiety, post-traumatic stress disorder (Newson, Boelen, Hek, Hofman, & Tiemeier, 2011), weight loss or weight gain, suicidal thoughts and a reduction of overall wellbeing and life satisfaction (Infurna et al, 2017). When people grieve for a period longer than six to twelve months is called Prolonged Grief disorder (PG) (Newson et al., 2011) or also Persistent Complex Bereavement (PCB) disorder (Brodbeck, Berger, Biesold, Rockstroh, & Znoj, 2019). This grief process is different from normal grief due to the fact that mourners are not able to accept the death and they keep worrying about the deceased (Newson et al., 2011). Lastly, people with PG disorder can have more severe symptoms than people with normal grief. Consequently, LEAVES is being developed to help mourners to prevent or treat PG disorder and to help them to go back to lead a fulfilling life (van Velsen et al., 2020).

With the creation of LEAVES, different factors which could facilitate the implementation of the service need to be taken into account. One of them is decision-making, which, in this context, is the degree of freedom that the user has when using the technology. Accordingly, decision-making falls under the definition of patient empowerment (Akeel & Mundy, 2019; Risling, Martinez, Young, & Thorp-Froslie, 2017) because by giving or denying patients the possibility to decide, they feel they have more or less control over their health.

At the moment of writing, the existing prototype only gave suggestions and it was the user to decide what to do. This choice was made because it is also what happens in traditional therapeutic settings. However, it is unknown the degree of decision-making people should have when they are using a self-help eHealth technology for therapeutic purposes. Additionally, in traditional therapeutical settings, the degree of decision-making a person has partly influences the patient's recovery by forming an alliance between the therapist and the patient, namely a therapeutic alliance (Cook & Doyle, 2002). With a self-help technology such as LEAVES, a similar alliance, called patient-technology alliance, could be fundamental to efficiently help users, and to facilitate the usage of the service and, thus, the implementation of the product (Venkatesh, Thong, & Xu, 2012).

In literature, how to create the therapeutic alliance between a person and a self-help technology is not being defined yet. The rationale behind this could be explained by the resistance that a part of society, especially older adults (Xie, 2011; Yusif, Soar, & Hafeez-Baig, 2016), still has towards technologies and the need to understand what technologies can do that people cannot (Laumer & Eckhardt, 2010; Palanica, Flaschner, Thommandram, Li, & Fossat. 2019).

However, creating an alliance between a person and a technology could also be influenced by applying theories which are usually applied to the interaction among humans to the interaction between LEAVES and the user, like self-determination theory. Nonetheless, it is unclear which degree of decision-making LEAVES should have when it needs to help users in severe situations. Also, by taking into account the privacy and the safety of users (Palanica et al., 2019).

Eventually, a literature gap was found on how decision-making affects the alliance of the user with the technology, and the intention to use the service. Additionally, there is no literature on how this alliance with eHealth technologies, such as LEAVES, can influence usage. Furthermore, although it has not been explored yet, research showed a link among the three components of self-determination theory, trust, decision-making, intention to use, and therapeutic alliance. It is also to investigate how level of stakes, low and high, can affect the dependent variables due to the fact that, in a situation where

the user is not well - high stakes situation - users may have a different perception of what they need from LEAVES. Accordingly, the first main research question was formulated:

RQ1: To what extent does decision-making affect perceived patient-technology alliance and intention to use that the user has (with a self-help eHealth technology meant to help elderly people to process the loss of their spouse)?

Finally, from a literature review on decision-making, it was found that there is little literature regarding decision-making when a person is seriously depressed or (s)he is in a critical situation (Hindmarch, Hotopf, & Owen, 2013). Moreover, this can also depend on culture. Consequently, the following main research question was formulated:

RQ2: What do experts think about the degree of decision-making elderly adults with PG disorder or in critical situations should have (when using a self-help eHealth technology meant to help them process the loss of their spouse)?

In the next chapter, the literature regarding this study is presented. Afterwards, per each study which was conducted, the method and the results are described. As follow, a discussion of the main results is presented. Moreover, the limitations, strengths, and implications of this paper are described. The last chapter is a conclusion with the main findings.

2. Theoretical Framework

This theoretical framework investigates and applies concepts which are used to explain how relationships work among people and between a therapist and a patient in traditional therapy settings, onto the relationship between a patient and an eHealth technology designed to help people process grief. Ossebaard and van Gemert-Pijnen (2016) and Kowatsch et al. (2018) also suggested that using features of how interactions work among humans could help improve the chances of the eHealth technology to lead to positive outcomes for the users and the chances to be used. Moreover, thinking that certain theories could be applied to the interaction between eHealth technologies and people is quite logical. This is because people subconsciously interact with virtual agents as if they were humans, like the 'Computers Are Social Actors' (CASA) paradigm explains (Feine, Gnewuch, Morana, & Maedche, 2019; Araujo, 2018). eHealth technologies are becoming more and more present in society and they could improve people's health and resolve the shortage of mental health workers. Moreover, if a therapist is not included in the recovery of the user and the latter is the only one responsible for his or her own health, it should be possible to refer to known concepts and theories which could facilitate the usage of the technology and the process of recovery.

To start, in traditional therapeutic settings, the therapist usually guides patients and gives them the possibility to decide how to manage their health. This degree of decision-making is also applied to eHealth technologies with therapeutic purposes which are used for blended therapy (Kip, Wentzel, & Kelders, 2020). Nonetheless, in the case of LEAVES, the therapist is replaced by a virtual agent and it is to investigate if the degree of decision-making should be the same as in traditional settings.

A theory which was chosen for this paper is self-determination theory, which is usually used to explain how strong relationships among people are formed (Quinn & Dutton, 2005). The reasoning behind this choice is that decision-making could influence the creation of these strong relationships. Moreover, this theory could help to establish an alliance between a technology and a user and it could help to boost the motivation of people to use the technology.

Moreover, trust in the technology is fundamental. Elderly people, who are the target group of LEAVES, are inclined to use eHealth technologies, but they also feel overwhelmed by it because they do not know how they will impact them and they want their privacy to be respected (Arning & Ziefle, 2009). Giving users the chance to decide could let them feel that their privacy is not breached, that they are safe when using it, and that they are respected, as it would happen when an alliance is formed. Additionally, it could influence their willingness to use the technology. This is why perceived privacy and perceived safety were chosen as variables.

Consequently, in this theoretical framework, it is elaborated how such concepts can be applied to an eHealth technology meant to help older adults process the loss of their spouse. Firstly, theories regarding decision-making process and level of stakes are presented. Secondly, it is explained what therapeutic alliance is and how it can be linked to decision-making. Thirdly, it is described what intention to use is and how it can be influenced by the formation of a patient-technology alliance. Fourthly, self-determination theory used to explain how strong relationships are formed is applied to the possible creation of patient-technology alliance and the relation with intention to use. Finally, the last subchapter explores how trust towards LEAVES can be influenced by decision-making and how it can influence the creation of patient-technology alliance and intention to use the service. At the end of the chapter, the hypotheses are formulated.

Decision-making

Decision-making within eHealth technologies is seen, in literature, as part of patient empowerment which is about "patients taking control or responsibility for their health, illness and treatment care, as well as the ability to participate in the consultation and decision-making process" (Akeel & Mundy, 2019, p. 1280; Risling et al., 2017). In traditional therapy settings, it is up to the patient to follow the suggestions of the therapist. Link to this, shared-decision making is really important for patients, even more than being given the right treatment (Ossebaard & van Gemert-Pijnen, 2016). However, it is to wonder what would happen if the therapist is replaced by a virtual agent.

Chatbots are “agnostic when it comes to diagnosis” (Meadows, Hine, & Suddaby, 2020, p.6). This statement can also be applied to virtual agents which means that, if the user says something which the virtual agent is not programmed for, the latter cannot adequately respond to the users’ needs. Moreover, a grieving process is not linear; it has its ups and downs and the virtual agent needs to be flexible and good enough to monitor all different situations and to react accordingly as it could happen in real-life therapy (Jovanovic, Baez, & Casati, 2020).

Additionally, a person with PG disorder symptoms may suffer from depression, and it is unknown if this person would be able to make rational decisions, in particular in critical situations, like when the user is thinking about ending his or her life. Depressed people might have a hard time making decisions in difficult situations for two different reasons. Firstly, depressed individuals can have difficulty in concentrating which could diminish their ability to critically think in order to make decisions (van Randenborgh, de Jong-Meyer, & Hüffmeier, 2010). Secondly, depressed people see the world more negatively and are also less motivated which could lead them to shut down and take decisions where minimum contact is required (van Randenborgh et al., 2010). Therefore, when suggested to see a friend or to call a professional for help, they may decide not to do it.

To conclude, there is no literature regarding users’ perception of a virtual agent as a therapist which gives suggestions. Additionally, it is unknown how to actually increase patient empowerment (Barello et al., 2016; Risling et al., 2017), but giving more or less freedom to the patients through decision-making could be a way to do that. Finally, it is unknown which degree of decision-making users should have when they suffer from PG disorder or when the risks for the user are higher, so when stakes are higher (referring to RQ2).

Level of Stakes

Level of stakes, in this study, refers to the level of gravity of a situation, the perceived risks of that situation, and the performance risks LEAVES poses to users in that situation. ‘Perceived risks’ is defined as ‘‘the potential for loss in the pursuit of a desired outcome of using an e-service.’’ (Feathermana & Pavloub, 2003, p. 454). Moreover, Grewal, Gotlieb, and Marmorstein (1994) defined ‘performance risk’ as ‘‘the possibility of the product malfunctioning and not performing as it was designed and advertised and therefore failing to deliver the desired benefits.’’ (p. 145).

To illustrate, when LEAVES suggests an activity to do, the level of stakes is low because the perceived risks and the performance risks are not that many. When LEAVES need to help users in a moment of escalation in which they need immediate help, the level of stakes is high because users are in a fragile position, they may feel more risks when using a technology like LEAVES, and their life could be endangered. Therefore, LEAVES has to be able to react to all the possible inputs from users. Moreover, at a high level of stakes, perceiving risks using LEAVES could lead to an increase in anxiety (Feathermana & Pavloub, 2003) which is absolutely undesirable for people who are already in a vulnerable situation.

Because of this, it is worth it to explore and understand how the level of stakes, with decision-making, influences the creation of patient-technology alliance and intention to use. In the next subchapters, it is explained how and why decision-making and, if applicable, the level of stakes can influence the dependent variables of this study.

Therapeutic alliance

Therapeutic alliance is “the degree to which health professionals and patients interact with each other in order to achieve an attachment bond and a shared understanding about therapeutic goals and tasks” (Cook & Doyle, 2002; Kowatsch et al., 2018, p. 2). In this definition, three components of therapeutic alliance were mentioned. Firstly, attachment bond refers to the feelings the patient and the therapist nourish for each other, such as like, trust, and respect (Cook & Doyle, 2002; Horvath & Luborsky, 1993; Kowatsch et al., 2018). Secondly, therapeutic goals refers to what the patient and also the therapist want to achieve with the therapy (Cook & Doyle, 2002; Horvath & Luborsky, 1993; Kowatsch et al., 2018). Thirdly, therapeutic tasks are the actions that need to be taken to fulfil the agreed goals (Cook & Doyle, 2002; Horvath & Luborsky, 1993; Kowatsch et al., 2018). In other words, it could be said that

to create an alliance the patient and the therapist need to have an agreement about the goals to be achieved with therapy and the tasks which will help both the patient and the therapist to achieve these goals. With this agreement, a bond will form which will help to smooth the healing process.

In 2018, Kowatsch et al. (2018) presented a model to measure if text-based healthcare chatbots (THCB) positively influence working alliance between the client and the THCB. One of the hypotheses of this model was "Experience with chat applications positively moderates the positive relationship of attachment bond between THCB and patient and the desire of a patient to continue interacting with that THCB" (Kowatsch et al., 2018, p. 5). Accordingly, people could subconsciously think of and treat the virtual agent as a person and experience a feeling of closeness, as the CASA paradigm (Feine et al., 2019; Araujo, 2018) and the media equation (Kowatsch et al., 2018) explain. Unfortunately, this study was not conducted or, at least, it has not been published yet.

As it happens in traditional therapy settings, therapeutic alliance between a technology and a user should be established for optimal recovery. Decision-making given to users could influence the establishment of an alliance between the user and the technology due to the fact that, in general, putting the patient at the centre and letting him or her decide if taking the action or not is what helps create therapeutic alliance (Horvath & Luborsky, 1993). Therefore, it is to investigate if decision-making given to users influences the creation of patient-technology alliance.

Intention to use

Intention to use is linked to the definition of 'behavioural intention' by Fishbein and Ajzen (1977) and it is defined as "the strength of one's intention to perform a specified behavior" (p. 288). To ensure that the LEAVES service meets users' needs and that users are helped by it, the factors which could motivate people to use the technology need to be investigated. Especially, considering that people who have PG disorder and are depressed usually have motivational deficits which could contribute to quitting the program (van Randenborgh et al., 2010). Moreover, elderly people are usually less willing to use technology to improve their health (Xie, 2011).

Literature showed a lack of studies looking at the factors which can influence the usage of chatbots in mental health (Abd-Alrazaq et al., 2019). Precisely, factors that affect the use of virtual agents in mental health care needs to be deeply explored. For instance, there is still a lack of research on which features of the virtual agent actually lead people to use the technology (Abd-Alrazaq et al., 2019). This gap is also due to the assumption people have that eHealth technologies are based on medical knowledge and the assumption of developers that these technologies always work (Ossebaard & van Gemert-Pijnen, 2016). In addition to this, no study was found regarding facilitating the intention to use technologies which offer mental health support without the presence of a therapist. Many authors believe that therapeutic alliance in eHealth technologies may foster motivation in using the service (Barazzone, Cavanagh, & Richards, 2012). Accordingly, Wang, Blazer, and Hoenig (2016) explain that, overall, planning goals and agreeing on the tasks needed to achieve those goals can facilitate intention to use, adherence and help patients to change and get better (Cook & Doyle, 2002). Consequently, these studies led to the idea that the creation of a patient-technology alliance could be a factor influencing intention to use the technology.

Finally, the culture of the user could have an impact on the usage of the technology and, because LEAVES is a European project, it is worth exploring how culture can affect usage (referring to RQ2).

Self-determination theory

In positive psychology, strong relationships are explained through self-determination theory. Individuals, in a relationship, need to feel autonomous, relatedness, and competent in order to create strong relationships (Quin & Dutton, 2005).

A literature search showed that the use of self-determination theory to explain the interaction between people and virtual agents was also proposed in a study by Nguyen and Sidorova (2018). Nonetheless, it seems that the authors never finished the research. However, self-determination theory is also used in game studies to explain how people can be motivated to play games (Fei-Yin Ng,

Kenney-Benson, & Pomerantz, 2004; Ryan, Rigby, & Przybylski, 2006). Additionally, Quin and Dutton (2005), in their paper, explain how self-determination theory works in situations where directives are given.

Firstly, the user may feel autonomous when "he or she is free to accept or reject the directive" (Quin & Dutton, 2005, p. 46). Accordingly, when people can decide how to manage their grieving process, they might feel that they have more freedom and they feel more intrinsically motivated to do something because it is their own choice, and it is for their own good (Fei-Yin Ng et al., 2004; Ryan et al., 2006). As follows, they will have more control over their health and, thus, autonomy. Additionally, Akeel and Mundy (2019) presented a participative framework where it is highlighted that if people are given more control of their own health, they are also more likely to have a positive experience with the technology and they would have more intention to use it. Therefore, it is expected that, in the conditions where decision-making is given to users, no matter the level of stakes, participants will feel more autonomy, they will create a bond with the technology, and they will also have more intention to use the technology.

Secondly, when the users feel that the directive is given in a respectful manner, they also feel relatedness (Quin & Dutton, 2005). Accordingly, perceived relatedness refers more to the content of the suggestion and who is behind the suggestion. Regarding decision-making, there is not a direct connection to perceived relatedness. However, in general, it is expected that when users are feeling they are trusted to take action, their perceived relatedness also increases. Additionally, this variable is still relevant for the creation of therapeutic alliance and intention to use. Between a virtual agent and a person, there cannot be direct reciprocity. A solution could be to explain to users why some suggestions work better than others, as it was found as an efficient way for the creation of a supportive relationship (Fei-Yin Ng et al., 2004) and, consequently, it could create an alliance. Moreover, by supporting users, an attachment bond between these and the technology could be created towards the fulfilment of therapeutic alliance (Cook & Doyle, 2002). Related to intention to use, it was found that when users do not feel self-disclosure and reciprocity, they tend to be unsatisfied and they do not want to use the technology (Baumel, Birnbaum, & Sucala, 2017; Lee & Choi, 2017; Thies, Menon, Magapu, Subramony, & O'neill, 2017). Therefore, it is expected that when people feel relatedness, they would feel that they have an alliance with the technology and they would be more willing to use the technology.

Lastly, the users feel competent when they feel that they have the ability to accomplish the directive (Quin & Dutton, 2005). Feeling competent also means being reminded that every step, even if little and simple, counts and that there is no wrong and right. Accordingly, enhancing competence through decision-making could help depressed people to feel more efficient and to get better (van Randenborgh et al., 2010). Moreover, letting users feel that they are competent through decision-making could reduce the feeling of hopelessness that depressed individuals tend to experience (van Randenborgh et al., 2010) by boosting their self-confidence. When users feel that they understand the technology and they can accomplish something with it, they are also more likely to feel an alliance with the technology and want to use it. Therefore, it is expected that when people feel competent, they would feel that they have an alliance with the technology and they would be more willing to use the technology.

Trust

Trust in the online environment is defined by Beldad, de Jong, and Steehouder (2010) as: "[…] an attitude of confident expectation in an online situation of risk that one's vulnerabilities will not be exploited" (p. 860). Any suggestion given by the LEAVES service is related to trust towards the technology and it could also lead to perceived risks by the users.

Many antecedents of trust and many facets of risk have been found in online setting research, but for this study, only two will be taken into account, namely perceived privacy and perceived safety. These two were chosen because found relevant in studies where elderly people were asked what they would want from an eHealth technology (Arning & Ziefle, 2009) and because of the elderly's resistance (Xie, 2011; Yusif et al., 2016) and intimidation towards technologies (Aerts & van Dam, 2018; Proudfoot et al., 2010).

Perceived privacy happens when users believe that their personal information is safe and that they have control of it (Beldad et al., 2010; Chen & Dibb, 2010; Feathermana & Pavloub, 2003), which is linked to perceived autonomy. A way of increasing perceived privacy could be giving users the freedom to decide to share their personal information or not (Feathermana & Pavloub, 2003) as it could happen when decision-making is given to users. Moreover, research showed that people, especially elderly people (Arning & Ziefle, 2009), are less willing to use mobile technology if they feel that their privacy can be breached (Proudfoot et al., 2010). Accordingly, users need to feel that their privacy is respected in order to enhance intention to use.

Perceived safety is strictly related to the previous variables, but, in this study, it concerns the feeling of the person to be (physically) safe when using LEAVES. When people using LEAVES are seriously depressed, they may not be able to make rational decisions (van Randenborgh et al., 2010). For instance, if a user is worsening, the system may recommend making an appointment with the doctor or immediately contacting a friend. In worse scenarios, a user may have suicidal thoughts and be asked to take action rapidly. In both cases, the user may feel hopeless and do not want to do anything that is asked (van Randenborgh et al., 2010). In these high-stakes situations, by giving users the freedom to choose what to do, they may, even subconsciously, harm themselves. Consequently, the service could pose a threat to the life of the users which is the definition of physical risk (Feathermana & Pavloub, 2003; Milne, Pettinico, Hajjat, & Markos, 2017). When users think about these possible scenarios, they may feel that they cannot trust the service (Feathermana & Pavloub, 2003) and that they do not want to be the ones to have the responsibility to make decisions. Therefore, during the interviews with experts (referring to RQ2), it will also be asked how to maximise perceived safety. In general, it is expected that decision-making given to users decreases perceived safety, even more in the condition where a high-stakes situation is presented. Additionally, if users feel they are safe using the technology, they will be more intent to use it.

In general, trust is seen as essential for the stability of a relationship (Beldad et al., 2010; Feathermana & Pavloub, 2003). Additionally, when perceived safety is met, it will also be more likely the user creates an alliance with the technology.

Hypotheses

In LEAVES, an eHealth technology with a virtual agent to help older people process grief:

H1: There are significant differences in Perceived Patient-Technology Alliance and Intention to Use based on the interaction effect of Decision-Making and Level of Stakes.

H2: Perceived Autonomy, Perceived Relatedness, Perceived Competence, Perceived Privacy, and Perceived Safety significantly mediate the influence of Decision-Making and Level of Stakes on Perceived Patient-Technology Alliance and Intention to Use.

H3a: Decision-making given to the users positively influences Perceived Autonomy.

H3b: Decision-making given to users positively influences Perceived Relatedness.

H3c: Decision-making given to users positively influences Perceived Competence.

H3d: Decision-making given to the users positively influences Perceived Privacy.

H3e: Decision-making given to the users negatively influences Perceived Safety.

H3f: Decision-Making given to users and high Level of Stakes negatively influence Perceived Safety more than Decision-making given to users and low Level of Stakes.

H3g: Decision-Making given to users positively influences Patient-Technology Alliance.

H3h: Decision-Making given to users positively influences Intention to Use.

H4: Perceived Autonomy, Perceived Relatedness, Perceived Competence, Perceived Privacy, and Perceived Safety positively influence Perceived Patient-Technology Alliance.

H5: Perceived Autonomy, Perceived Relatedness, Perceived Competence, Perceived Privacy, and Perceived Safety positively influence Intention to Use.

H6: Perceived Patient-Technology Alliance positively influences Intention to Use.

H7: Perceived Privacy and Perceived Autonomy are positively correlated.

Research model

Below, in Figure 1, the model created for the quantitative study of this paper is presented.

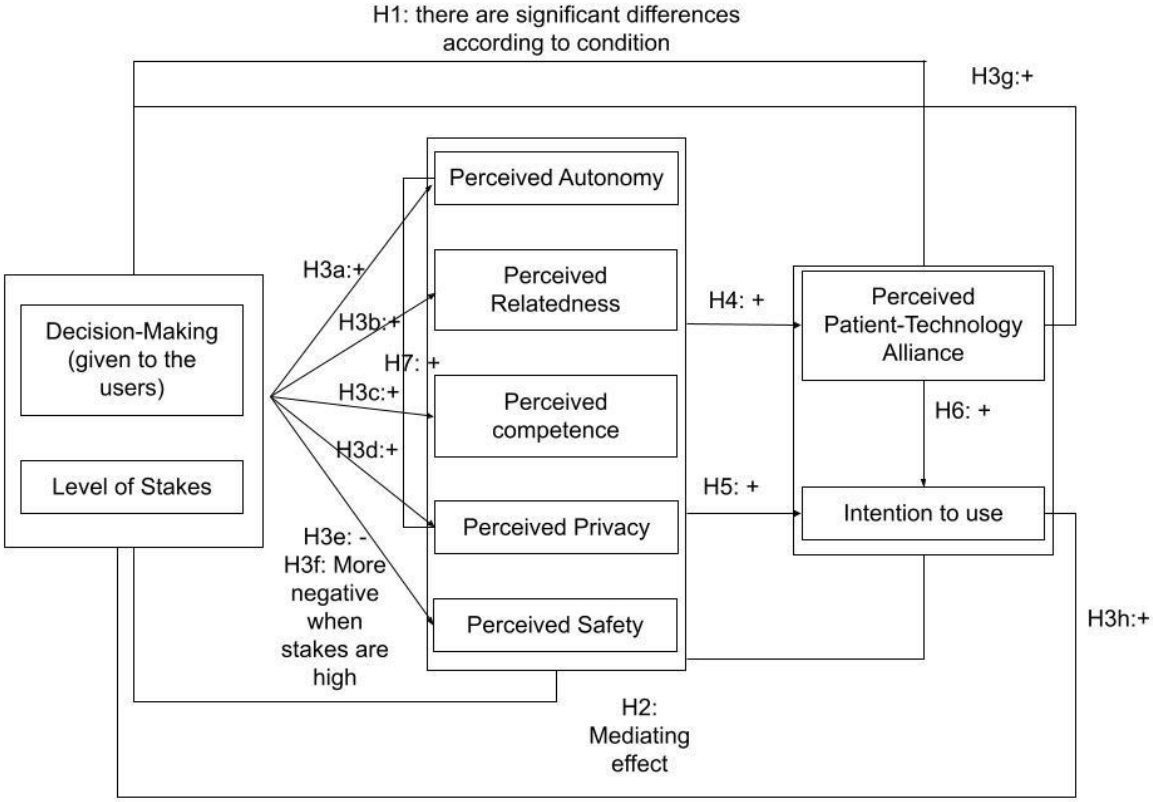

Figure 1. Research Model

3. Methods and Results per study

3.1 Study 1: An experimental study

3.1.1 Method

A quantitative method was used in order to investigate the influence of decision-making and level of stakes in eHealth technologies. This was chosen because it was considered the most reliable way to measure the influence of decision-making given to users and level of stakes on patient-technology alliance and intention to use.

This study was approved by the ethics committee of the Faculty of Behavioural, Management, and Sciences at the University of Twente.

Design

To find out the influence of decision-making and level of stakes given to users on the creation of patient-technology alliance and intention to use, a quantitative online study, precisely 2x2 between subjects' design, was conducted (Figure 2). Participants interacted with one of four prototypes and, afterwards, they were asked to fill in a survey. Two groups had a prototype where decision-making was given to users, whilst two groups had a prototype where decision-making was given to the system (so taken away from users). Within the same degree of decision-making, participants either had a low-stakes situation or a high-stakes situation. That is, in the first situation, participants were shown a task which can be done with the LEAVES program, precisely going to see a movie. In the second situation, participants were shown how the LEAVES program reacts when the user is not doing well. This set-up was created to measure the interaction effect of decision-making given to users or decision-making given to the system with level of stakes, high and low. Additionally, in this way, different functionalities of the LEAVES program were shown to participants.

The independent variables of this study are decision-making and level of stakes. Perceived autonomy, perceived competence, perceived relatedness, perceived privacy, and perceived safety are covariates. Patient-technology alliance and intention to use are dependent variables. The effect of patient-technology alliance on intention to use was tested separately, which means that, in that case, the patient-technology alliance is the independent variable and intention to use the dependent variable.

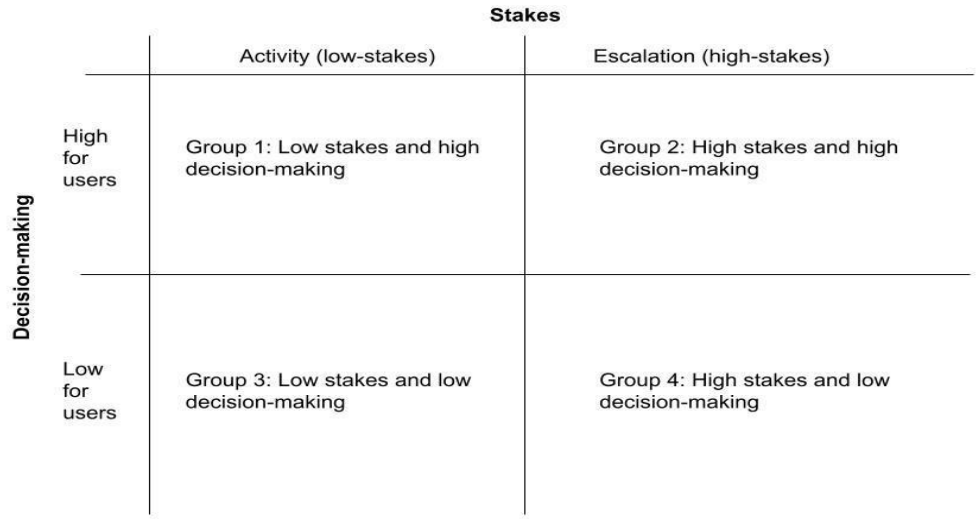

Figure 2. Set-up study

Material

The four prototypes (Appendix D) were created based on the version of the LEAVES prototype that was present at the moment of the study (March 2021). Two flowcharts made to create these prototypes can be found below (Figure 3 and 4). Two prototypes only gave suggestions to users which means that they needed to decide what to do. The other two prototypes had less degree of decision-making for users and the system took actions when needed. Moreover, between the same degree of decision-making, the prototypes differed between low stakes – task - and high stakes situation – escalation.

All prototypes were divided into two parts. In the beginning, 'Sun', the virtual agent, presents itself as a virtual guide and it states what the goals and tasks of the program are. In Prototype 1 and 2, 'Sun' tries to make a pact with the user where it promises to want the best for the user and it states that the user has the freedom to choose if doing what the virtual agent suggests. In Prototype 3 and 4, 'Sun' presents itself by giving directives and stating its predominant role in the program.

In the second part of the prototypes either an activity, 'going to the cinema', or an escalation moment is presented. In Prototypes 1 and 3, there is an activity, which is a low stakes situation. In the first one, the user has the possibility to choose if doing the activity or not and (s)he is solely responsible to contact a friend or family member to do this activity with. Additionally, 'Sun' explains to the user why this activity is considered important. Furthermore, it suggests writing down the reasons to do this activity as well as with whom because it can help him to actually do the activity. In Prototype 3, 'Sun' tells the user that he should do this activity and once the user clicks on the option, the system starts asking access to the contacts of the user to be able to reach his or her friend or family member and it asks access to the calendar of the user to set the time and date of the appointment. If the user does not allow this, 'Sun' states that it cannot help him or her to do this activity.

In Prototypes 2 and 4, an escalation moment is presented. This is a high stakes situation. LEAVES, by monitoring the user with some questions, intercepts that the user is worsening and immediate external help is needed. In Prototype 2, users' feelings are validated and (s)he is suggested to call either the emergency line, or the doctor, or a therapist (if applicable), or a family member, or the elderly association, or a friend. The user is the one responsible for doing that. In Prototype 4, a screen appears where the user is warned that someone is being contacted to ask for help. The user does not have a choice in this decision. Some screenshots of the prototypes are shown below (Figure 5, 6, 7, and 8) and some others can be found in Appendix D.

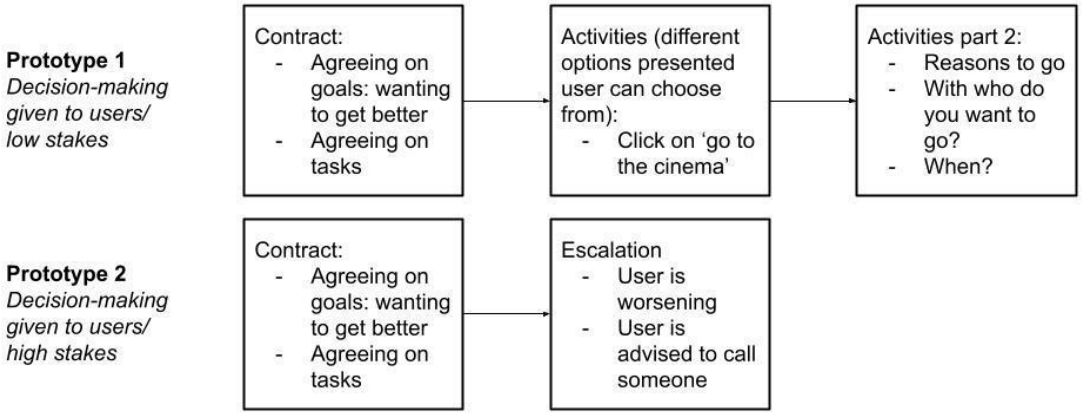

Figure 3. Flowchart Prototypes 1 and 2

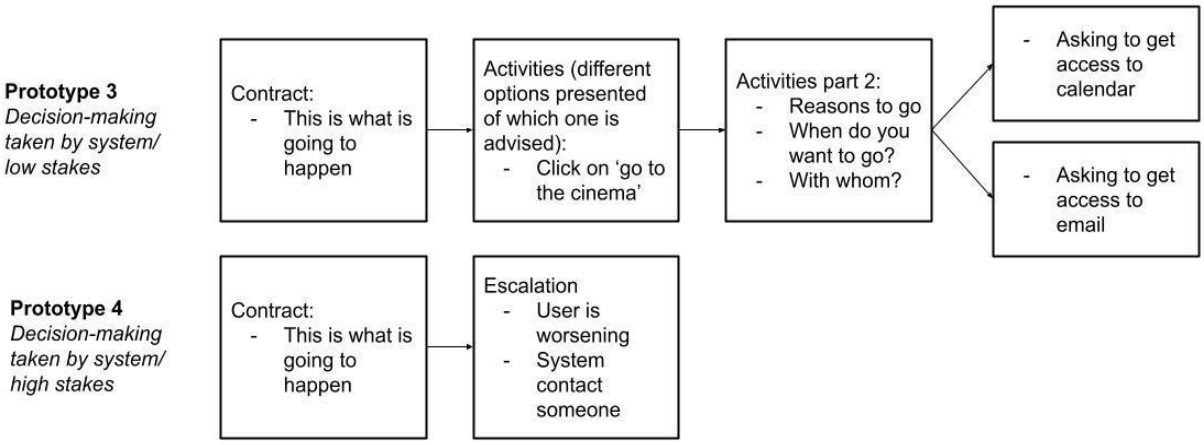

Figure 4. Flowchart Prototypes 3 and 4

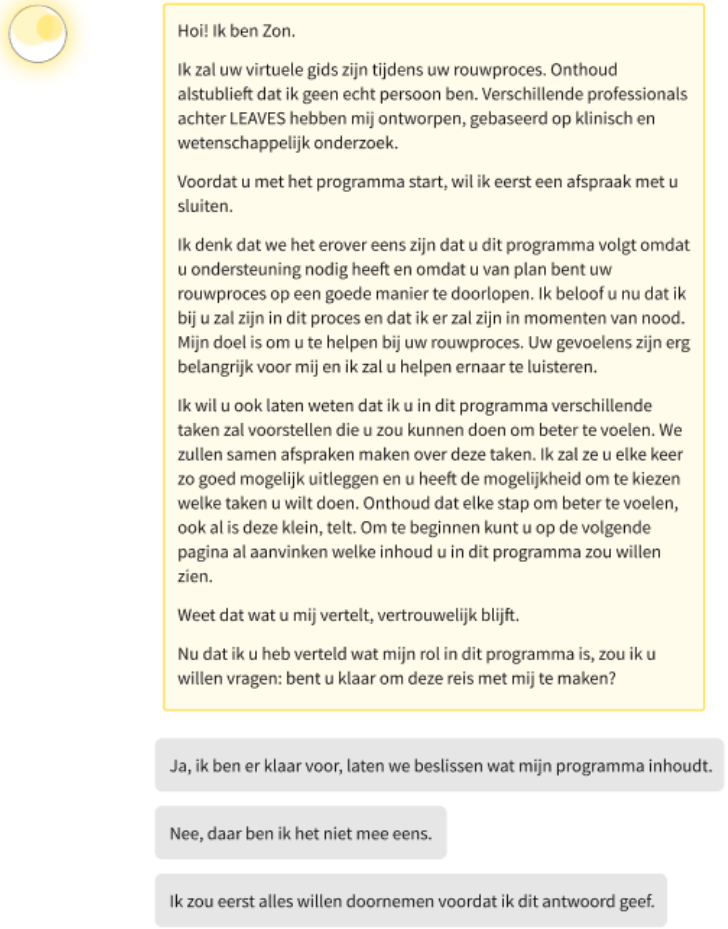

Figure 5. Presentation of Sun in Prototypes 1 and 2

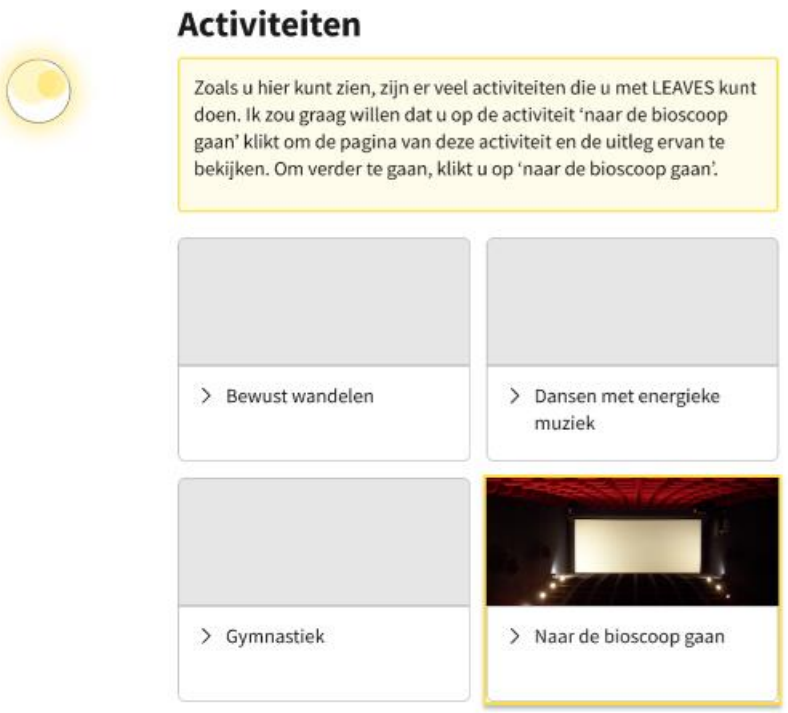

Figure 6. Activity in Prototype 1

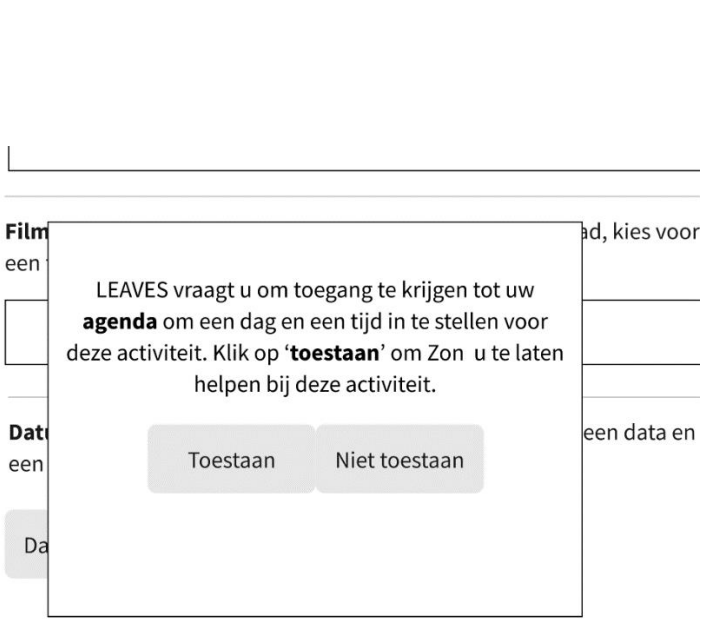

Figure 7. Privacy pop-up for calendar Prototype 3

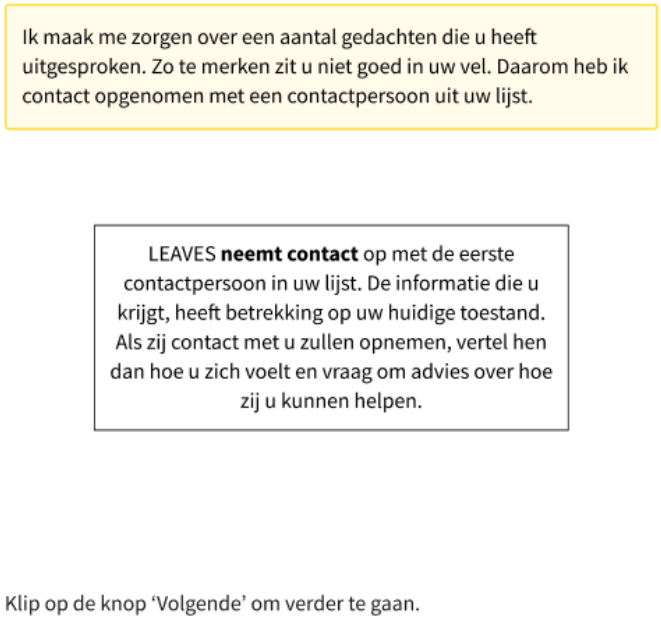

Figure 8. Escalation moment Prototype 4

Measure

To measure the effects of the prototypes, a survey was created (Appendix E). The first questions were open questions which asked participants to express their feelings regarding the prototype they had just seen. The last three questions regarded personal information about the participant, namely the year of birth, and if they lost someone close to them in their life, including pets, and who. The second and third questions were aimed to understand how much they could relate to the scenario given when looking at the prototype and answering the questions.

The remaining statements were assessed on a 5-points Likert scale which went from '1 = strongly disagree' to '5 = strongly agree'. Per each variable, three statements were formulated with the exception of patient-technology alliance. Patient-technology alliance had 6 questions due to the fact that, by definition, this variable is divided into tasks, goals, and attachment bond. These questions were created by taking inspiration from validated questionnaires from literature and readapted to the context and theoretical framework of this study (Table 2).

The reliability of the variables of this study was measured by measuring Cronbach's alpha. Because the alpha was higher than .60, the reliability of the variables was met (Table 1) and, in some cases, it was even higher than previous studies (Table 2 to compare).

Every statement referred to the prototype participants interacted with and to its degree of decision-making participants interacted with.

Table 1

Cronbach's alpha table

Variable	**Cronbach's alpha from this study**
Perceived Autonomy	**.83**
Perceived Relatedness	**.84**
Perceived Competence	**.67**
Perceived Privacy	**.74**
Perceived Safety	**.69**
Patient Technology Alliance	**.89**
Intention to Use	**.88**

Table 2

Overview of variables and questionnaire items

Variables	Definition	Literature used to create items + reliability	Example questions
Self-Determination Theory	Individuals, in a relationship, need to feel autonomous, relatedness, and competent in order to create strong relationships (Quin & Dutton, 2005).	The Player Experience of Need Satisfaction (PENS) (Ryan et al., 2006; Deci & Ryan as cited in Ryan et al., 2006). The Cronbach's alpha of the perceived autonomy, perceived relatedness and perceived competence were respectively **.66**, **.72**, and **.79** (Ryan et al., 2006). For perceived relatedness: benevolence towards a virtual agent (Philip et al., 2020). The Cronbach's alpha of this construct was .**71** (Philip et al., 2020).	Perceived autonomy: "I felt that I had control over my mourning process".
			Perceived relatedness: "I felt that my needs were understood by the virtual agent (LEAVES).".
			Perceived competence: "I felt capable to understand what was asked from me.".
Trust	Perceived privacy: when users believe that their personal information is safe and that they have control of it (Beldad et al., 2010; Chen & Dibb, 2010; Feathermana & Pavloub, 2003).	Perceived level of privacy and confidentiality' in e-commerce, which had a Cronbach's alpha of .**66** (Belanger, Hiller, & Smith, 2002).	"I trust that LEAVES will treat my data confidentially."
	Perceived (physical) safety: the service could pose a threat to the life of the users (Feathermana	'Perceived risk of purchase' something online (Dean & Biswas, 2001; Laroche, Yang, McDougall, & Bergeron 2005; Stone & Grønhaug, 1993; Del Vecchio & Smith,	"I felt safe using the LEAVES service."

	& Pavloub, 2003; Milne, Pettinico, Hajjat, & Markos, 2017).	2005). The Chronbach's alpha was calculated as .**88** (Dean & Biswas, 2001).	
Therapeutic alliance	The degree to which health professionals and patients interact with each other in order to achieve an attachment bond and a shared understanding about therapeutic goals and tasks (Cook & Doyle, 2002; Kowatsch et al., 2018, p. 2).	Working Alliance Inventory survey (Horvath & Greenberg, 1989; translated in Dutch by Paap, Schrier, & Dijkstra, 2019). The Cronbach's alpha of the whole construct was calculated as .**91**.	Tasks: "From the tasks suggested, it was clear how I can improve my health.".
			Goals: "The goals of the LEAVES were clear to me.".
			Attachment bond: "I believe that the virtual agent (LEAVES service) has my best interest in mind.".
Intention to use	The strength of one's intention to perform a specified behavior (Fishbein & Ajzen, 1977, p. 288).	Venkatesh et al. (2012); Items about the intention to use a website (Bart, Shankar, Sultan, & Urban, 2005). 'Behavioural intent' had a Chronbach's alpha of .**88**.	"If needed, I intend to use LEAVES"

Pilot study

To make sure that the prototypes and the questionnaire were good enough to fit the study, they were translated in good Dutch and, to avoid possible problems with the prototype which could bias the results, a pre-test was conducted.

Five pre-tests with people from the Netherlands (2), Switzerland (2), and Italy (1) were conducted. Three pre-tests were with end-users and two with clinical experts. The Dutch participants saw the Dutch version of prototypes whilst the other participants saw the English version. All participants gave many positive comments regarding the prototypes. They all found that it was easy to navigate through the prototypes and it was intuitive. Moreover, they said that the difference between the prototypes was really clear.

The major points of discussion regarded the scenario and the translation of the prototypes from English to Dutch. Firstly, some end-users said that it was difficult to relate to the character of the scenario, Heleen. Accordingly, some sentences were changed to make the story more applicable. Moreover, for the real study, participants were asked to think as Heleen but if they felt uncomfortable with it, they could imagine or think about losing someone they care about. Secondly, the end-user responsible for checking the Dutch language in the prototypes suggested how to change some sentences.

Regarding the structure of the questions, it was advised to insert an open question at the beginning of the questionnaire to give people the chance to tell what they thought about the prototype they had just seen.

The time estimated to conduct the study was 10 minutes to look at the prototypes and 10 minutes to fill in the questionnaire (max. 25 minutes).

Data collection procedure and participants

Dutch elderly people were approached via email with a description of the study and a link (Appendix B). Different strategies were used to find participants. One was the snowball method, which means that the researcher sent the link to some acquaintances asking to forward the link to other participants. Additionally, participants were part of two research panels: one from RRD and one from DELA Natura- en Levensverzekeringen N.V. Most of the participants were from the DELA.

Once participants had the link, Qualtrics (Qualtrics, n.d.) randomly assigned them to the four conditions. On the first page of the study, an online informed consent form was presented. By clicking on the 'next' button, participants agreed on participating and gave consent to use the data collected for research purposes. On a new page, a scenario of a potential user, called Heleen, was presented to them (Appendix C). This scenario was created to let participants relate more to the end-user situation when looking at the prototype and answering questions.

Afterwards, participants were asked to go through the prototype. Finally, they were asked to fill in a survey and write down their opinion and impressions regarding the prototype.

The total number of participants was 72. Precisely, 28 were in the condition where decision-making was given to users and an activity was shown, 19 were in the condition where decision-making was given to users and a moment of escalation was shown,14 were in the condition where decision-making was given to the system and an activity was shown, and 11 were in the condition where decision-making was given to the system and a moment of escalation was shown.

Most participants were 73 years old. The oldest was 84 years old and the younger 53 years old. Data showed that 69 out of 71 participants said that they have lost someone in their life. The most common examples were parents, parents in law, and brothers and sisters. Only ten participants said that they had lost their spouse: the most recent loss was 1.5 years ago and the least recent loss was 36 years ago.

Preparation for analysis

Participants' responses were retrieved from Qualtrics (Qualtrics, n.d.) and the dataset was cleaned in SPSS (IBM, SPSS software, n.d.). The total responses were 89, but only 72 were complete. All the

incomplete responses (16 of which, for each condition respectively, 3, 2, 4, and 7) were hidden for not taking them in consideration.

Five questions (one for perceived competence, two for perceived privacy, and two for perceived safety) had an opposite measuring scale. This means that instead of having 1 for not perceived competence, privacy, or safety, it had 5. Thus, their value was re-coded by changing 1 with 5, 2 with 4, and 3 stayed the same.

Once the dataset was ready for analysis and reliability was measured, the items were merged according to the variables they belonged to. To check the difference among the conditions, the frequencies and descriptive statistics were measured per each variable. Afterwards, a correlation analysis was run in order to see the relationship between the different variables. Eventually, a two-way Multivariate Analysis of Variance (MANOVA) was conducted to measure the influence of decision-making and level of stakes on patient-technology alliance and intention to use without the covariates. Afterwards, a two-way Multivariate Analysis of Covariance (MANCOVA) was conducted to measure the influence of the independent variable decision-making and level of stakes, on perceived patient-technology alliance and intention to use, after controlling for the covariates (perceived autonomy, perceived relatedness, perceived competence, perceived privacy, and perceived safety).

According to the results of the previous analyses, further analyses, specifically seven two-way Analyses of Variance (ANOVA), were conducted to investigate and compare the effects of decision-making and level of stakes on perceived autonomy, perceived relatedness, perceived competence, perceived privacy, perceived safety, perceived patient-technology alliance, and intention to use. Furthermore, to explore the effect of perceived autonomy, perceived relatedness, perceived competence, perceived privacy, and perceived safety on patient-technology alliance and on intention to use, two multiple linear regressions were conducted. Finally, a linear regression analysis was conducted to measure the effect of patient-technology alliance on intention to use.

3.1.2 Results

In this chapter, the results of the first study are described. Firstly, the frequencies and descriptive statistics of the different variables are presented. Secondly, a table with the correlations among the independent variables, covariates, and dependent variables is shown. Thirdly, the results of the different analyses are elaborated in order to answer the hypotheses of this study. Finally, the results of the open questions of the survey are presented.

3.1.2.1 Descriptive Statistics and Frequencies of variables

In the table below (Table 3), the mean and standard deviation values for each variable per each condition are shown.

Table 3

Mean and Standard Deviation of variable per condition

	Condition 1: Decision-making given to users and low level of Stakes: Activity (*N* = 28) M	Condition 2: Decision-making given to users and high level of Stakes: Escalation (*N* = 19) M	Condition 3: Decision-making given to the system and low level of Stakes: Activity (*N* = 14) M	Condition 4: Decision-making given to the system and high level of Stakes: Escalation (*N* = 11) M
Perceived Autonomy	3.54 (*SD* = .87)	3.28 (*SD* = 1.12)	3.14 (*SD* = 1.34)	3.12 (*SD* = 1.02)
Perceived Relatedness	3.49 (*SD* = .98)	3.70 (*SD* = .99)	3.41 (*SD* = 1.46)	3.30 (*SD* = .74)
Perceived Competence	3.66 (*SD* = 1.21)	3.74 (*SD* = .83)	3.69 (*SD* = .71)	3.79 (*SD* = .75)
Perceived Privacy	3.04 (*SD* = 1.21)	3.28 (*SD* = .82)	2.81 (*SD* = 1.21)	3.33 (*SD* = .56)
Perceived Safety	3.38 (*SD* = .87)	3.35 (*SD* = .93)	3.19 (*SD* = 1.22)	3.24 (*SD* = .47)
Patient-Technology Alliance	3.60 (*SD* = .96)	3.58 (*SD* = .82)	3.26 (*SD* = 1.13)	3.21 (*SD* = .94)
Intention to Use	2.96 (*SD* = 1.18)	3.04 (*SD* = 1.14)	1.83 (*SD* = 1.56)	2.58 (*SD* = .98)

3.1.2.2 Correlation analysis

With the correlation analysis, it was tested if the variables of this study correlated with each other. Additionally, one of the hypotheses (H7) was that Perceived Privacy and Perceived Autonomy are positively correlated.

All the correlations, but one, were significant and positive (Table 4). This means that with the increase of one variable, the other one also increases. The only two variables which did not significantly correlate were Perceived Competence and Intention to Use, $r = .12$, $N = 72$, $p = .32$.

To answer hypothesis 7, a weak positive correlation was found, $r = .40$, $N = 72$, $p = .001$. Therefore, the null hypothesis that 'Perceived Privacy and Perceived Autonomy are not positively correlated' can be rejected.

Table 4

Correlation

	Perceived Autonomy	Perceived Relatedness	Perceived Competence	Perceived Privacy	Perceived Safety	Patient-Technology Alliance	Intention to Use
Perceived Autonomy							
Perceived Relatedness	.66**			.			
Perceived Competence	.33*	.31*.					
Perceived Privacy	.40**	.48**	.43**				
Perceived Safety	.66**	.69**	.51**	.70**			
Patient-Technology Alliance	.60**	.77**	.32*	.48**	.66**		
Intention to Use	.56**	.69**	.12	.41**	.53**	.72**	

Notes: *Correlation is significant at the .01 level (2-tailed)

**Correlation is significant at the .001 level (2-tailed)

3.1.2.3 MANOVA

A two-way Multivariate Analysis of Variance (MANOVA) was conducted to measure the differences in perceived patient-technology alliance and intention to use based on decision-making and level of stakes. There was no statistically significant interaction effect between decision-making and level of stakes on perceived patient-technology alliance and intention to use, Wilks' Λ = 0.99, F (2, 67) = .24, p = .79. Additionally, the assumptions of normality and linear relationship were not met. However, the assumption of multicollinearity was met.

This means that the null hypothesis of H1 cannot be rejected.

Table 5

Multivariate test results

	Wilks' Λ	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	.08	388.59	2	67	.000	.92
Decision-making	.97	1.02	2	67	.37	.03
Level of Stakes	1	.05	2	67	.95	.002
Decision-making * Level of Stakes	.99	.24	2	67	.79	.01

Notes. Dependent variables: Perceived Patient-Technology Alliance and Intention to Use

3.1.2.4 MANCOVA

A two-way Multivariate Analysis of Covariance (MANCOVA) was conducted to measure the differences in patient-technology alliance and intention to use based on decision-making and level of stakes after controlling for perceived autonomy, perceived relatedness, perceived competence, perceived privacy, and perceived safety. There was no statistically significant interaction effect between decision-making and level of stakes on perceived patient-technology alliance and intention to use after controlling for the covariates, Wilk's Λ = 0.99, F (2, 62) = .27, p = .77. Additionally, the assumptions of normality and linearity were not met. But the assumption of homogeneity was met.

Consequently, the null hypothesis of H2 cannot be rejected.

Table 6

Multivariate test results

	Wilks' Λ	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	.96	1.27	2	62	.29	.04
Perceived Autonomy	1	-	.000	62.5	-	-
Perceived Competence	1	-	.000	62.5	-	-
Perceived Relatedness	1	-	.000	62.5	-	-

Perceived Privacy	.98	.73	2	62	.49	.02
Perceived Safety	.98	.62	2	62	.54	.02
Decision-making	.98	.65	2	62	.53	.02
Level of Stakes	.99	.24	2	62	.79	.01
Decision-making * Level of Stakes	.99	.27	2	62	.77	.01

Notes. Dependent variables: Perceived Patient-Technology Alliance and Intention to Use

3.1.2.5 ANOVAs

Perceived Autonomy

A two-way Analysis of Variance (ANOVA) was conducted that examined the effect of decision-making and level of stakes on perceived autonomy. There was not a statistically significant interaction between the effects of decision-making and level of stakes on perceived autonomy, F (1, 68) = .19, p = .66. Because of no significant interaction result, the difference among groups was also not significant. Additionally, the assumptions of normality and no outliers were not met. But the assumption of homogeneity was met. Consequently, the null hypothesis of H3a cannot be rejected.

Table 7

Two-way ANOVA with Perceived Relatedness as dependent variable

	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	602.60	1	68	.000	.89
Decision-making	1.07	1	68	.30	.02
Level of Stakes	.27	1	68	.61	.004
Decision-making * Level of Stakes	.19	1	68	.66	.003

Note. Dependent variable: Perceived Autonomy

Perceived Relatedness

A two-way Analysis of Variance (ANOVA) was conducted that examined the effect of decision-making and level of stakes on perceived relatedness. There was not a statistically significant interaction between the effects of decision-making and level of stakes on perceived relatedness, F (1, 68) = .35, p = .56. Because of no significant interaction result, the difference among groups was also not significant. Additionally, the assumptions of normality and no outliers were not met. But the assumption of homogeneity was met. Accordingly, the null hypothesis of H3b cannot be rejected.

Table 8

Two-way ANOVA with Perceived Relatedness as dependent variable

	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	681.38	1	68	.000	.91

Decision-making		.82	1	68	.37	.01
Level of Stakes		.04	1	68	.83	.001
Decision-making * Level of Stakes		.35	1	68	.56	.01

Note. Dependent variable: Perceived Relatedness

Perceived Competence

A two-way Analysis of Variance (ANOVA) was conducted that examined the effect of decision-making and level of stakes on perceived competence. There was not a statistically significant interaction between the effects of decision-making and level of stakes on perceived competence, F (1, 68) = .001, p = .98. Because of no significant interaction result, the difference among groups was also not significant. Additionally, the assumptions of normality and no outliers were not met. But the assumption of homogeneity was met. Eventually, the null hypothesis of H3c cannot be rejected.

Table 9

Two-way ANOVA with Perceived Competence as dependent variable

		F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept		941.11	1	68	.000	.93
Decision-making		.03	1	68	.86	.000
Level of Stakes		.14	1	68	.71	.002
Decision-making * Level of Stakes		.001	1	68	.98	.000

Note. Dependent variable: Perceived Competence

Perceived Privacy

A two-way Analysis of Variance (ANOVA) was conducted that examined the effect of decision-making and level of stakes on perceived privacy. There was not a statistically significant interaction between the effects of decision-making and level of stakes on perceived privacy, F (1, 68) = .29, p = .59. Because of no significant interaction result, the difference among groups was also not significant. Additionally, the assumptions of normality, no outliers, and homogeneity were not met. Consequently, the null hypothesis of H3d cannot be rejected.

Table 10

Two-way ANOVA with Perceived Privacy as dependent variable

	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	571.92	1	68	.000	.89
Decision-making	.11	1	68	.74	.002
Level of Stakes	2.18	1	68	.15	.03

Decision-making * Level of Stakes	*	.29	1	68	.59	.004

Note. Dependent variable: Perceived Privacy

Perceived Safety

A two-way Analysis of Variance (ANOVA) was conducted that examined the effect of decision-making and level of stakes on perceived safety. There was not a statistically significant interaction between the effects of decision-making and level of stakes on perceived safety, F (1, 68) = .03, p = .86. Because of no significant interaction result, the difference among groups was also not significant. Additionally, the assumption of normality was met, but the assumptions of no outliers and homogeneity were not met. Consequently, the null hypotheses of H3e and H3f cannot be rejected.

Table 11

Two-way ANOVA with Perceived Safety as dependent variable

		F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept		816.83	1	68	.000	.92
Decision-making		.42	1	68	.52	.01
Level of Stakes		.002	1	68	.96	.000
Decision-making * Level of Stakes	*	.03	1	68	.86	.000

Note. Dependent variable: Perceived Safety

Perceived Patient-Technology Alliance

A two-way Analysis of Variance (ANOVA) was conducted that examined the effect of decision-making and level of stakes on perceived patient-technology alliance. There was not a statistically significant interaction between the effects of decision-making and level of stakes on perceived patient-technology alliance, F (1, 68) = .01, p = .95. Because of no significant interaction result, the difference among groups was also not significant. Additionally, the assumptions of normality and no outliers were not met, but the assumption of homogeneity was met. Subsequently, the null hypothesis of H3g cannot be rejected.

Table 12

Two-way ANOVA with Perceived Patient-Technology Alliance as dependent variable

		F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept		785.01	1	68	.000	.92
Decision-making		2.07	1	68	.16	.03
Level of Stakes		.02	1	68	.89	.000
Decision-making * Level of Stakes	*	.01	1	68	.95	.000

Note. Dependent variable: Perceived Patient-Technology Alliance

Intention to Use

A two-way Analysis of Variance (ANOVA) was conducted that examined the effect of decision-making and level of stakes on intention to use. There was not a statistically significant interaction between the effects of decision-making and level of stakes on intention to use, F (1, 68) = .29, p = .59. Because of no significant interaction result, the difference among groups was also not significant. Additionally, the assumption of normality was not met, but the assumptions of no outliers and homogeneity were met. Accordingly, the null hypothesis of H3h cannot be rejected.

Table 13

Two-way ANOVA with Intention to Use as dependent variable

		F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept		345.32	1	68	.000	.84
Decision-making		.92	1	68	.34	.01
Level of Stakes		.09	1	68	.76	.001
Decision-making * Level of Stakes		.29	1	68	.59	.004

Note. Dependent variable: Intention to Use

3.1.2.6 Multiple Linear regressions

Perceived Patient-Technology Alliance

A multiple linear regression with perceived autonomy, perceived relatedness, perceived competence, perceived privacy, and perceived safety as independent variables and perceived patient-technology alliance as dependent variable was run. The proportion of variance, thus what was explained by the model, was 62%. This was significant, F(5, 66) = 21.95, p < .001. Nevertheless, the assumptions of normality and no outliers were not met.

The individual effect of perceived autonomy, perceived competence, perceived privacy and perceived safety on perceived patient-technology alliance is not significant (Table 14). However, the individual effect of perceived relatedness on perceived patient-technology alliance is significant, b = .51, t(66) = 4.92, p < .001. Therefore, perceived patient technology alliance increases .51 for each unit of perceived relatedness. This means that the null hypothesis of H4 cannot be completely rejected.

Table 14

Multiple Linear Regression Analysis with Perceived Patient-Technology Alliance as Dependent Variable

					95% CI	
	b	SE	t	p	LL	UL
(Constant)	11.55	6.87	1.68	.10	-2.18	25.27
Perceived Autonomy	.08	.10	.84	.40	-.12	.28
Perceived Relatedness	.51	.10	4.92	.000	.31	.72
Perceived Competence	.02	.09	.16	.87	-.17	.19
Perceived Privacy	.05	.10	.52	.60	-.15	.25
Perceived Safety	.18	.15	1.18	.24	-.13	.49

Notes. a. Dependent variable: Perceived Patient-Technology Alliance

b. CI = confidence interval; LL = Lower Limit, UL = Upper Limit

Intention to Use

A multiple linear regression with perceived autonomy, perceived relatedness, perceived competence, perceived privacy, and perceived safety as independent variables and intention to use as dependent variable was run. The proportion of variance, thus what was explained by the model, was 53%. This was significant, $F(5, 66) = 14.70$, $p < .001$. Nevertheless, the assumptions of normality and multicollinearity were not met.

The individual effect of perceived autonomy, perceived competence, perceived privacy and perceived safety on intention to use is not significant (Table 15). However, the individual effect of perceived relatedness on intention to use is significant, $b = .62$, $t(66) = 4.21$, $p < .001$. Therefore, intention to use increases .62 for each unit of perceived relatedness. This means that the null hypothesis of H5 cannot be completely rejected.

Table 15

Multiple Linear Regression Analysis with Intention to Use as Dependent Variable

					95% CI	
	b	SE	t	p	LL	UL
(Constant)	4.84	9.65	.50	.62	-14.44	24.11
Perceived Autonomy	.23	.14	1.61	.11	-.05	.51
Perceived Relatedness	.62	.15	4.21	.000	.32	.91
Perceived Competence	-.23	.13	-1.81	.08	-.48	.02
Perceived Privacy	.16	.14	1.11	.27	-.13	.44
Perceived Safety	.03	.22	.15	.88	-.40	.46

Notes. a. Dependent variable: Intention to Use

b. CI = confidence interval; LL = Lower Limit, UL = Upper Limit

3.1.2.7 Linear regression

A linear regression was run to test the effect of perceived patient-technology alliance on intention to use. The proportion of variance, thus what was explained by the model, was 51%. This was significant, $F(1, 70) = .27$, $p < .001$. There is a significant effect of perceived patient-technology alliance on intention to use, $b = .90$, $t(70) = 8.56$, $p < .001$. Therefore, intention to use increases .90 for each unit of perceived patient-technology alliance. Consequently, the null hypothesis of H6 can be rejected. Nevertheless, the assumption of normality was not met.

Table 16

Linear Regression Analysis with Intention to Use as Dependent Variable

					95% CI	
	b	SE	t	p	LL	UL
(Constant)	-4.08	7.53	-.54	.59	-19.09	10.93
Perceived Patient-Technology Alliance	.90	.11	8.56	.000	-.69	1.10

Notes. a. Dependent variable: Intention to Use

b. CI = confidence interval; LL = Lower Limit, UL = Upper Limit

Overview of results per hypothesis

Table 17

	Met/Not met
H1: There are significant differences in perceived Patient-Technology Alliance and Intention to Use based on the interaction effect of Decision-making and Level of Stakes.	Not met
H2: Perceived Autonomy, Perceived Relatedness, Perceived Competence, Perceived Privacy, and Perceived Safety significantly mediate the influence of Decision-Making and Level of Stakes on Perceived Patient-Technology Alliance and Intention to Use.	Not met
H3a: Decision-Making given to the users positively influences Perceived Autonomy	Not met
H3b: Decision-Making given to users positively influences Perceived Relatedness.	Not met
H3c: Decision-Making given to users positively influences Perceived Relatedness.	Not met
H3d: Decision-Making given to the users positively influences Perceived Privacy.	Not met
H3e: Decision-Making given to the users negatively influences Perceived Safety.	Not met
H3f: Decision-Making given to users and high Level of Stakes negatively influence Perceived Safety more than Decision-Making given to users and low Level of Stakes.	Not met
H3g: Decision-making given to users positively influences Patient-Technology Alliance.	Not met
H3h: Decision-making given to users positively influences Intention to Use.	Not met
H4: Perceived Autonomy, Perceived Relatedness, Perceived Competence, Perceived Privacy, and Perceived Safety positively influence Perceived Patient-Technology Alliance.	Only met for perceived relatedness ($p < .001$)
H5: Perceived Autonomy, Perceived Relatedness, Perceived Competence, Perceived Privacy, and Perceived Safety positively influence Intention to Use.	Only met for perceived relatedness ($p < .001$)
H6: Perceived Patient-Technology Alliance positively influences Intention to Use.	Met ($p < .001$)
H7: Perceived Privacy and Perceived Autonomy are positively correlated.	Met ($p < .001$)

3.1.2.8 Comments of participants

The survey had three open questions where participants could give comments regarding the prototype they had just seen. These questions were optional but all participants (*N* = 72) left at least a comment. In the next subsections, the main comments per each condition are presented.

Condition 1: Decision-making given to users and Activity

Participants' impression of the prototype where decision-making was given to users and an example of an activity was shown differed. Some people gave some negative comments regarding the prototype. Many participants found it difficult and they thought that there could be people who would not be able to use such a program because of low technology literacy. Additionally, some people thought that this way of processing grief would not be adequate: they would prefer to have personal contact if they were grieving. Moreover, a few people wrote that they found the way 'Sun' approached them a bit childish and naive due to the way they see the topic of grief. Finally, some people wrote that they found it mediocre and distant.

Nonetheless, participants also had positive comments. To name some adjectives which were given by participants about the prototype: nice, good, intriguing, curious, and really accessible. Moreover, a few participants thought that 'Sun' had a friendly tone and the explanations were clear. Lastly, some people said that they would like or they would have liked to use LEAVES to help them process grief.

A few participants commented that it would be better if this program could be personalised according to users' personalities. Moreover, it was written that this prototype could not give enough information to answer the questions asked. Finally, some participants thought that LEAVES could really help at the beginning: as a guideline to support people.

Condition 2: Decision-making given to users and Escalation

The comments given in this section relate to the prototype where decision-making is given to users and a moment of escalation is presented. According to some participants, this is not the right way to approach a person. A participant wrote that (s)he got even angry when reading it and another wrote that it was weird. Moreover, a few participants mentioned that there was too much text and that the interaction felt distant. Finally, some participants said that they found it difficult or mediocre.

Notwithstanding the aforementioned negative comments, some participants also gave some really positive comments. Some people found it easy to do, positive, and good. Additionally, a few people reported that the tone was really pleasant and the explanations were clear. A participant said that it seemed professional and that it was good to have a digital system for such a problem. Lastly, another participant said that good questions were asked.

When they were asked if they had something to add, a participant advised that it would be good to make this service accessible also for people with low technological literacy. Another participant wrote that what (s)he had seen was not enough to be able to answer the questions.

Condition 3: Decision-making given to the system and Activity

For this condition where decision-making is given to the system and an activity is shown, the comments are mostly positive. Nonetheless, some negative comments were also given. A few participants thought that 'Sun' was distant and that the words and task selection were not really appropriate (like the word 'must'). Moreover, a participant said that (s)he would never use this and another found it useless.

The positive comments were, in general, that the program is nice, good, easy to use, and useful. Additionally, a few participants said that the tone of voice was friendly and empathic. Furthermore, some participants thought that the idea behind the prototype was good and it could be a valuable initiative to help people. Finally, a participant wrote that naming famous people, like the researchers behind LEAVES, makes it feel like a 'safety net'.

Some participants had some comments to add. One participant said that it would be good to use this program with someone involved. Additionally, another participant wrote that (s)he missed a

button to push in an emergency situation. Finally, a participant wondered if mourners would have enough motivation to use a program like this.

Condition 4: Decision-making given to the system and Escalation

Positive and negative comments, regarding the prototype where decision-making is given to the system and a moment of escalation is shown, were given. Nonetheless, most of the comments were negative. Some participants wondered if the way the moment of escalation was presented could work. A participant doubted if such a virtual approach could work, another participant wrote that seeing this prototype raised more questions, and a few participants said that a person who is really sad would not be able to use this program or type about his or her feelings. Related to the latter, a few participants said that they would still rather talk to a real person. Moreover, a few participants said that it was difficult, bureaucratic, not that deep, and that 'Sun' was too cheerful as approaching Heleen (the character of the scenario). Finally, a few participants said that they missed some information, like permission to call others or more background information about the program.

However, some participants said that it was a good initiative, interesting to see, and good.

Table 18

Overview of Participants' comments

	Positive comments	**Negative comments**	**Neutral comments**
Condition 1: Decision-making to users, Activity	- Accessible - Good, nice - Intriguing - 'Sun' has a friendly tone - Explanations were clear - They would like to use it	- Difficult, in particular for people with low technological literacy. - 'Sun' approach was childish and naïve - Mediocre - Distant	- Personalised according to users' personalities - Not enough information to answer the survey - LEAVES as a guideline to support people
Condition 2: Decision-making to users, Escalation	- Easy to do - Good - Pleasant - Explanations were clear	- Difficult - Mediocre - It is not the right approach - Too much text - Distant	- Make it accessible for everyone - Not enough information to answer the survey
Condition 3: Decision-making to the system, Activity	- Good, nice - Easy to use - 'Sun' voice is friendly and empathic - Valuable initiative to help people - Good to mention famous people (researcher) because more trustworthy	- Distant - Words are not appropriate (like 'must') - Would never use this	- Good to use LEAVES with someone involved - Need of an emergency button to push - Mourners may not be motivated enough
Condition 4: Decision-making to the system, Escalation	- Good - Interesting to see	- Seeing the escalation raised more questions -> Missing information about ethical approval and about the program - Not the right approach - Difficult - Bureaucratic - Not that deep - 'Sun' too cheerful for the situation in which the user is in	- Mourners may not be motivated enough

3.2 Study 2: Interviews with clinical experts

3.2.1 Method

A qualitative method for this study was chosen in order to get deeper insights on what (clinical) experts think about decision-making for an eHealth technology to help elderly people to process the loss of their spouse. With interviews, it is possible to better gather and explore participants' opinions and experiences (Boeije, 2009).

This study was approved by the ethics committee of the Faculty of Behavioural, Management, and Sciences at the University of Twente.

Design

To understand the degree of decision-making that users should have when using eHealth technologies for therapeutic purposes, semi-structured interviews with clinical experts were conducted. These interviews focused on eHealth technologies, decision-making and on the characteristics of the target group of the eHealth technologies.

Participants

For this study, ten experts with different backgrounds were recruited. In Table 19, it is possible to see the characteristics per participant. The two Portuguese participants were part of the LEAVES consortium and they were selected because they were more knowledgeable of the service, of what it could offer, and of the different features of the prototype.

There were no exclusion criteria regarding the provenience of the participant due to the fact that this is a European project.

Table 19

Participants' Overview

	Provenience	**Expertise**	**eHealth technology experience**
Participant 1	Portugal	Clinical psychology, social psychology, decision-making	App to help elderly people quit smoking. Technology to promote health in the working environment.
Participant 2	Germany	Human-Factor Psychology, Usability	Medical devices, Robot faces, Car driving
Participant 3	The Netherlands	Clinical psychology, 'Schema Therapy'	No, but she knows Minddistrict due to work
Participant 4	Portugal	(Geriatric) psychiatrist	Informatic systems
Participant 5	Italy	Clinical and Health psychology	No
Participant 6	The Netherlands	Occupational Therapist with elderly people	No
Participant 7	Switzerland	Clinical psychology	Not in practice, she will work in a e-Mental Health project
Participant 8	Switzerland	Psychotherapist (a big range of psychiatric disorders)	No, but she showed interest in it
Participant 9	The Netherlands	eHealth in mental health care, forensic psychiatry	VR, web-based modules, apps, wearables
Participant 10	The Netherlands	Psychology: Design for behavioural change	Serious games and apps for interactive experience

Interviews' topics

The questions that were asked to participants can be found in Appendix I. These questions were chosen to get their opinions on eHealth technologies for therapeutic purposes, specifically to help elderly people with their mourning process, and to ask advice on how to maximise perceived physical safety in a really vulnerable moment for the user. Additionally, as the article of Mol et al. (2020) shows, different therapists can have a different view regarding therapy with eHealth technologies and therefore, it was investigated how their culture and/or background influenced their opinions. This is also due to the fact that participants came from different European countries and they had different expertise.

Procedure

Experts were contacted via email giving them a short explanation of the study (Appendix F). Once they decided to participate, an online meeting with them was planned. One participant did the interview by writing the question on her own time due to her busy schedule. Moreover, the researcher sent participants the study information and an informed consent form where they also needed to give permission to be recorded (Appendix G).

At the beginning of the meeting, the researcher read the study protocol to the participants to make sure that the goal of the study and the detailed procedure was clear to them (Appendix H). Once everything was in order, the semi-structured interview started. Participants were told in more detail what the LEAVES project is, and about the first study conducted. Afterwards, they looked at prototypes 2 and 4 to get a better idea of the LEAVES project. Finally, some questions were asked.

Most interviews lasted an average of one hour. Nine of them were conducted in English and one in Italian.

Analysis of data

To analyse the data retrieved, thematic analysis was used. This method entails the coding of the text by themes (Clarke & Braun, 2014). To ensure the reliability of data, two researchers worked together in creating the final coding scheme. Firstly, they read individually the transcripts, underlined the most relevant concepts, created themes, and attributed to parts of the text a code through open coding (Boeije, 2009). Afterwards, they each created a draft version of the coding scheme and discussed it. With this agreed scheme, axial coding was applied which requires checking again the transcripts, the codes and subcodes assigned and looking at connections among codes (Boeije, 2009).

Eventually, the main themes which were created reflected the interview questions and the most common topics which emerged during the interviews, namely decision-making, trust, and cultural influence. Under these themes, 13 codes were created (Table 21). Firstly, decision-making refers to the degree of decision-making that users should have when using eHealth technology and the capability of people to decide in high-stakes situations. Additionally, decision-making includes suggestions on how to tailor or include decision-making within an eHealth technology. Secondly, trust refers to the trust that people can have in eHealth technologies, particularly LEAVES. This includes the feeling of trust in general, being physically safe, features of eHealth technology which can enhance and reduce perceived safety, and the feeling that users' privacy is respected. Lastly, intention to use refers to the exploitation of LEAVES in different countries. This includes intention to use LEAVES by users according to experts and intention to use LEAVES by experts.

Additionally, participants also gave information which did not directly answer the interviews' questions, but that was relevant for the LEAVES project and the implications of this research, namely general remarks about the LEAVES prototypes, extra design recommendations (motivational features, personalisation features, and processes), and insights on grief and elderly people. Therefore, this information was divided according to the topic, but it was not included in the coding scheme (Appendix J, Table 22).

Finally, the researchers applied the final coding scheme to 20% of the transcripts by using Atlas.ti (Atlas.ti, n.d.) and the Cohen's Kappa for interrater reliability was calculated (Table 20). Because

the Cohen's Kappas were between 0.75 and 1, interrater reliability was high. Consequently, the first researcher finished coding and analysed all the data with the agreed coding scheme.

Table 20

Interrater Reliability

Theme	**Cohen's Kappa**
Decision-making	**.94**
Trust	**.96**
Intention to Use	**.78**

Table 21

Coding scheme

Theme	Code	Definition
Decision-making		Answers related to decision-making in eHealth technologies and decision-making for people who have grief symptoms. Decision-making is the degree of freedom people should have when using LEAVES. Example: when they are given suggestions, they are the ones to decide what to do.
	Degree of decision-making	Opinions about the degree of decision-making people should have when using eHealth technologies.
	High-stakes	Opinions regarding the degree of decision-making people should/can have when they are in a critical situation.
	Mediating decision-making	Opinions regarding the fact that the web-application should be used by users with someone else involved (a therapist, a family member, and so on)
	User-centred decision-making	How decision-making is centred on the user and the control that (s)he should have
	Tailoring decision-making	How decision-making should be tailored according to the person
	Stepwise decision-making	Approaches which could be taken to foster decision-making
Trust		Safety and privacy that LEAVES can guarantee
	General	Comments about trusting the program
	Actual safety	Can/Does LEAVES guarantee actual (physical) safety?
	Factors enhancing perceived safety	Factors which can make users feel that they are safe using LEAVES, including design features

	Factors reducing perceived safety	Factors which can make users feel that they are not safe using LEAVES, including design features
	Privacy	Factors which can make users feel that their privacy is not respected
Intention to Use		The intention of stakeholders to use LEAVES influenced by culture/background
	Exploitation for users	The intention of users (in different countries) to use LEAVES according to experts
	Exploitation for experts	The intention of experts to advise for LEAVES

3.2.2 Results

Context: grief and elderly people

During the interviews, many participants gave insights on how grief works, on the relationship between elderly people and technology, and how elderly people usually process grief. Accordingly, this information has been used to contextualise the results.

A few participants talked about grief as a normal process: *'Grief is there for a reason* (Participant 2) and people who are grieving are usually in *'their stable systems'* (Participant 10) and they only need some time. Some participants said that what a person really needs in grief is to be with others and talking to others, thus *'social contact'* (Participant 2).

In general, elderly people *'want to be in control'* (Participant 6) and even little things, like having the choice to call someone, can make them feel autonomous. Additionally, most elderly people are seen as responsible and, because of this, according to some participants, they usually do not have the intention to hurt themselves, even if they say so.

However, if elderly people are suffering from PG disorder, they may stop taking care of themselves *'by not taking pills or eating less'* (Participant 6). Because of this, they may need some support on the little tasks. Additionally, in this situation, elderly people may be afraid to *'bother other people'* (Participant 8) or do not ask for help because they think *'they do not need therapy'* (Participant 9). Additionally, the loss of a partner can cause elderly people to feel that they lost even more control over their lives, and *'control is central when you are grieving'* (Participant 2).

Most participants mentioned the fact that the present generation of elderly people can be resistant to technology, especially women because they are considered less skilled (Participant 2) and motivated to use technology (Participant 8). Moreover, depending on the culture, elderly people may not have a computer or even an internet connection. Nonetheless, Participant 3 said that there are also *'a lot of elderly people who are quite handy with computers'.*

General remarks about LEAVES

The opinions regarding the prototypes differ among participants. Most participants liked the prototype where decision-making was given to users because they thought that it was *'more familiar'* (Participant 4), they liked that the user could decide what to do and that it explained *'what it was right for you'* (Participant 6). Nonetheless, Participant 3 said that she liked both of them because of the friendly voice and Participant 8 said that she liked the second one more because *'more directive'*. Additionally, some participants said that the second one could motivate people more.

According to some participants, the tone of voice used was too personal which did not match with the technology. Because of this, it seemed *'insincere'* (Participant 9) and *'deceiving'* (Participant 1). Nonetheless, Participant 3 said that she liked 'Sun' because *'it is a bit optimistic, friendly, and nice'.* Furthermore, some participants would have wanted to have less text because they felt that it was too much to read and that the text should have been more comforting.

Decision-making

Decision-making in eHealth technology

From the word cloud of Atlas.ti, the most frequent word in the code of decision-making was 'freedom' (Appendix K, Figure 13). Accordingly, overall, most of the participants said that the best is to always give people the freedom to decide and that they should always be included *'in the decision-making process'* (Participant 1). Additionally, some participants said that it is really hard for technology to make the right decisions. Because of this, all the suggestions which are given need to be *'solid'* (Participant 2) in order to avoid a counterproductive effect. Some participants said that if people are given too many options, they can find it *'overwhelming'* (Participant 7).

A few participants said that it is important that people are also guided to make the right decisions by, for instance, explaining to them why something needs to be done: *'when people understand why something is important [...], people can make the decisions for themselves'* (Participant 1).

High stakes

This code refers to the capability of people to decide when the stakes are high and how the system should help them. Many participants found this question important because, as Participant 1 said, *'the literature is not really conclusive'*.

Opinions on this topic were controversial and participants' background did not really influence their position. Some participants thought that also in serious situations, people should still be given the chance to decide. Three participants were also a bit sceptical about the help that LEAVES could give in serious situations. For instance, Participant 5 said that *'a web application is not right'* and Participant 2 said that *'the emergency part is exactly the part where a human needs to come in'*.

Nonetheless, some participants said that when the stakes are high, the system should take action. Participant 8 said that '*if you feel very very bad then you are not good at decision-making'*. Moreover, when the researcher asked the reason, she said that *'it is a symptom of depression that you are not good at decision-making'* (Participant 8). Additionally, two participants mentioned that when other people, like a child, could be harmed there should be something or someone to act immediately. However, Participant 1 said that *'when the arousal level is high, no one can make an intuitive rational decision'*.

Control was again the centre of most interviews. In serious situations, some participants said that people already feel hopeless and taking control away from them could just worsen their situation. Finally, as it was mentioned about elderly people, they often do not want to ask for help. If it is mentioned that the system is calling a therapist, they could even get more *'agitated'* (Participant 10). Because of this, a few participants said that it is important to give guidance and support in these situations, but not take away the opportunity to decide.

Mediating decision-making

One of the interviews' questions was about the presence of a virtual agent to help people make decisions. The answers differed according to the experience people had with a virtual agent. Experts with almost no experience with technology focused on mediating decision-making with a therapist or people outside LEAVES because they thought that a virtual agent cannot help on its own. For instance, participant 1 said that this guidance *'can be done by a person with specific training, so it does not have to be a therapist*'. Something similar was also mentioned by Participant 6 and Participant 9 who mentioned family, friends, and doctors. Participant 7 said that having this system as support and a therapist could be *'a very good way'* of treating people.

On the contrary, experts with some experience with virtual agents said, for example, that a virtual agent *'is way better than providing information just like that'* (Participant 9). However, three participants specified that a virtual agent could work only if it takes the role of a companion, if people can relate to it, and if it is well developed.

User-centred decision-making

This code was created because, as the word cloud in Atlas.ti showed, many answers given by participants centred on the importance for the user of control and autonomy (Appendix K, Figure 14). According to all participants, decision-making is associated with the level of control that a person has. To quote a few participants: *'the user should have the freedom for everything.'* (Participant 2) and *'I think that if a system would do something for them, then it could be forceful. I think, from my own perspective, like you need to go to the theatre, I would feel, a person would lose control.*' (Participant 9). Additionally, as the target group is elderly people, they need to feel that they have control over their life, in particular after having lost someone.

Some participants explained how this control can be increased. For instance, by stating that the suggestions given are meant to help the users and that they can still decide what to do. Or by tailoring decision-making (look next section).

Finally, an expert who tries to implement autonomy in technology explained how, according to self-determination theory, '*If you take away autonomy then resistance is increased […]. It feels really bad if some program wants to take away your autonomy.'* (Participant 10).

Tailoring decision-making

Many participants mentioned that decision-making needs to be tailored depending on the users' characteristics, situation, and grief symptoms. To quote some participants: *'It could be amazing to ask at the beginning what each person would prefer'* (Participant 7); *'The kind of people and grieving style can be so different'* (Participant 9).

Some participants said that the reason to need tailored decision-making is that the system should be able to work for everyone. Nonetheless, Participant 9, an expert in personalisation, also explained that '*if there are people with lower literacy or health literacy or low technology skills, then personalisation can become overwhelming and unnecessary. Research showed that if people are in high need of autonomy, then they need personalisation, if they are low, then it is not necessary.'.*

However, some participants explained how decision-making could be tailored. For example, Participant 2 said that going to the cinema could make some people uncomfortable because they could see other people laughing, which could make him or her even more depressed. Because of this, he suggested that the user should be asked *'do you experience loneliness when you are in a crowd'* (Participant 2). If the answer is positive, the system should suggest activities which do not make the user feel uncomfortable. Participant 9 also suggested having a system which can readapt according to the feedback received, so that it is always up to date.

Stepwise decision-making

Some participants gave suggestions on how to have users wisely decide. The most common suggestion was a two steps approach. Users should first be given the chance to choose and, afterwards, the system should ask if they did the action. If they did not, then the system should take action for them. This is how Participant 3 explained this approach: *'To combine both: to first make the suggestions: why don't you call someone, who are you going to call. And then, after a while, the program asks ideally if the person called and if not, the system is going to call'* (Participant 3). Moreover, the system could call someone, but beforehand the user needs to agree: *'Maybe it would be better to ask if LEAVES should call someone for you or if it is not necessary.'* (Participant 6).

However, a few participants said that if the user starts using LEAVES from a really difficult situation, the system should be the one to take decisions to activate him or her. Afterwards, the user should be given the chance to decide. Nonetheless, according to Participant 9, another way to help the user is to suggest him or her to set goals and to *'have the system reminding the user to do it until they do it'*. Moreover, Participant 6 mentioned that elderly people need most of the help with little tasks.

Trust

Trust in LEAVES

When talking about trust in LEAVES, some participants mentioned some general aspects which could make users lose trust in it. A few participants mentioned that the virtual agent, in the way it refers to the user, seems like a real person and if they discover that it is not, they could lose trust in the ability of the program to help them.

Two participants mentioned that having a program calling someone for you after having said how you feel, could reduce trust: *'if you have the program calling, then they will not trust it'* (Participant 6). Participant 7 said that people could feel betrayed if they talk about their feelings and '*they are punished for it by having someone calling them.'*. Moreover, Participant 6 believes that the people who could have problems trusting LEAVES are not users, but family members and friends, because elderly people *'are in the middle of it and they do not feel it as a safety issue'*.

Actual Safety

From the word cloud of Atlas.ti for this code, the following words were prominent: program, really, and safe, which as a sentence can be read as 'is the program really safe?'. Accordingly, many participants wondered if LEAVES can really guarantee the safety of users. Most participants said that it is difficult and that a program cannot ensure physical safety. Participant 1 said that *'LEAVES has the potential for unsafety in both scenarios'* referring to both prototypes.

A few participants reflected on the fact that if something really happens and the user is suicidal, the system is not capable of adequately helping. Additionally, *'If someone is really suicidal, they can decide to not call someone else, or to just close the program. So no, it is not really 100% safe.'* (Participant 3). Some participants mentioned that the user should immediately seek external help: *'should go out of the LEAVES program'* (Participant 3).

Factors Reducing Perceived Safety

Perceived safety is about the feeling of safety the user has when using LEAVES. Most participants said that the major factor influencing the decrease of perceived safety is loss of control. Additionally, some participants mentioned some specific features which could reduce perceived safety. Firstly, when the system notifies users that they should call for someone, they could feel that they do not need it and this could *'be a source of unsafety and anxiety'* (Participant 1) and *'overwhelming'* (Participant 9). Participant 8 said that elderly people may not feel safe when using the program because they may feel *'insecure'* using a technology.

Secondly, a few participants said that careful consideration should be given to the words used, e.g. 'troubling thoughts', which was used in the prototypes, could be a too big word for the user and maybe *'they only need to talk about it [...] you do not want to make people feel worried about that and that it is normal to have these feelings.'* (Participant 9).

Finally, Participant 10 explained how making people aware of their feelings could reduce the feeling of safety because it can *'just increase bad moods anxiety'*. However, she also said that awareness is also good because users need it in their process of recovery, so she thought the feeling of unsafety is unavoidable.

Factors Enhancing Perceived Safety

Help was a keyword in the analysis of this code. In general, for most participants, people need to feel that they are heard and helped. For instance, Participant 9 said that LEAVES should have *'something to make people feel they are being heard'*. Additionally, many participants mentioned that feeling in control is also really important to feel safe.

About content, some participants said that it is important to provide careful, clear, and solid explanations: these could help people understand the reasons behind the suggestions. Moreover, a few participants thought that users could feel safer if they are asked how they feel and *'if they talk about their problems'* (Participant 7). Related to this, a few participants mentioned that the virtual agent should carefully try to convince the user to talk to a specialist.

In moments of escalation, a few participants said that LEAVES could suggest things which could be relaxing. For instance, Participant 3 said that *'when someone comes to me with suicidal thoughts, I suggest them to take a walk or something soothing'*. Participant 5 advised: *'during the reflective exercises, it could be asked to the user what there is still for them of value. In moments of escalation, the things the user wrote down could come back so that the system shifts the attention to something that for him or her is valuable.'* About function, participant 10 liked the monitoring aspect of LEAVES, *'I like that based on their answers, you say that they are getting worse and that they need help'*.

Finally, many participants mentioned adding a red button for people to push when they need help. This button can make people feel that they are safe in case of emergency situations. Participant 1 even advised to have a picture of a reliable person on the button, *'like buttons with your sister, GP, with your therapist or something that is always on the screen […] to create a more familiar environment around'.* Regarding pictures, Participant 9 also said that LEAVES should have more pictures and explanations of people who could help, like the GP, *'to make it more personal'*.

Privacy concerns

Many participants said that a problem that could arise with using LEAVES is privacy breach: having a system deciding for the user and calling someone for him or her could seem '*invasive'* (Participant 1; Participant 7) or '*intrusive'* (Participant 3). Nonetheless, participant 2 said that from a debate about privacy *'people put safety before privacy'*.

When participant 10 advised tracking participants' behaviours and movements with external apps, the researcher asked her about privacy in this situation. She explained that there should always be transparency *'on the kind of data collected and why. […] And people should always have the opportunity to say […] I do not want this data to be collected.'* (Participant 10).

Intention to Use LEAVES

Participants were asked if they thought that elderly people in their country and in Europe would use LEAVES. In general, many participants thought that elderly people of the future generations would use this program because they will have a higher level of technology literacy and, according to participant 4, *'they will be the best profile to prove the benefits of this system'*. Moreover, some participants thought that LEAVES had the added value of being used at home, all the time, when you do not want contact with others, and with low effort. Additionally, participant 7 said that it is *'a good way to think about yourself and to take time and to think about your problems'*.

In the Netherlands, all participants thought that Dutch elderly people would use LEAVES because of a lack of therapists, or because it can help people who do not want to go to a therapist to get better. Additionally, Participant 9 thought that it could be a good way to *'start small'*. Nonetheless, three participants said that LEAVES should be introduced by someone reliable or someone close to them. Additionally, they said that someone from the 'Praktijkondersteuning' (which is the practice support of the general practitioner) should help them to understand the program. This is because it might help to decrease the fear of technology which is common among elderly people.

The Swiss participants thought that it could be hard for some elderly people of this generation to use LEAVES, *'because they are not so used to interacting with a virtual agent'* (Participant 8). Moreover, a participant mentioned that it could be too difficult for people in a depressive state to learn new things and the service needs to be really clear and easy. Nonetheless, participant 8 is also optimistic regarding the possibility of using LEAVES in ten years.

In Portugal, participants said that it would be difficult to implement LEAVES due to the low technology literacy among elderly people and the lack of resources to use the service. However, Participant 1 was optimistic and she said that '*in five years, the exposure to technologies and health programs would be different and people would use it then'.* Additionally, the Portuguese participants said that this service could be used with someone who can help users to understand the program.

The Italian participant thought that, in Italy, LEAVES will not be used due to the fact that some elderly people do not even have the internet. He said that *'they could use it maybe if it is mediated by someone'* (Participant 5).

The German participant did not think that there was a big difference between elderly people in Germany and elderly people in the Netherlands. However, he mentioned that, in Germany, the privacy regulations are stricter and it could be hard to let it pass if it is not considered a safe system.

Some participants found it hard to imagine the use of LEAVES in all of Europe. Most of the participants who were already in doubt of the usage of LEAVES in their country said that they thought that the problem of elderly people and technology is everywhere. Nonetheless, a few participants saw it possible to introduce LEAVES in most developed countries. However, Participant 10 advised adapting the functions and suggestions of the LEAVES program according to the country where it is implemented because, if not, it *'diminishes the effect and the impact that you can have*.'.

All participants who practiced or were in contact with elderly people said that they would advise LEAVES to their patients. The general reason was that it seemed nice and helpful. In the Netherlands, they saw it as a useful technology due to *'the long waiting list'* (Participant 3) or because of the lack of people who can help elderly people during grief. However, Participant 9 thought that this service could better help users in the first year after having lost the partner. In this year, a specialist is usually not needed, and therefore, she advised to not ask for experts to implement this service, but someone else,

like a general doctor. In Switzerland, Participant 8 thought about LEAVES as a nice technology which could help her for therapy.

Extra Design Recommendations

Motivational Factors

In general, from the word cloud of Atlas.ti, motivational factors are associated with autonomy (Appendix K, Figure 16). Most participants thought that a lot of text could demotivate people. Additionally, four participants mentioned how the virtual agent should be to make it more attractive and make people more motivated to interact with it. They said that it should have *'friendliness and a nice tone of voice'* (Participant 3); it should give *'the feeling of a presence'* (Participant 5); it should really feel like a *'companion'* (Participant 10); and *'more alive'* (Participant 2).

Two experts in motivational aspects in eHealth technologies gave some specific advice. Participant 2 said that he would add a gamification aspect, so as to make people more motivated. Participant 10 mentioned self-determination theory and how if people are taken away their autonomy, they are less motivated to do things. By adding a link between the web application and apps on the phone, it was advised to track people's behaviours and movements and, afterwards, with the data collected, the system should create messages which could stimulate people to do something, like taking a walk.

Processes and Personalisation

Some participants advised a few design processes that could be used to improve LEAVES in terms of usage and personalisation. Participant 2 said that in usability, he usually advises to explore all the situations where things can go wrong. This in order to create a *'safety critical system'* (Participant 2) because bad things can always happen and a system like this needs to be ready.

Participant 10 explained that to make the virtual agent more like a companion, *'different users interactions'* need to take place. Moreover, to ensure a more tailored service, participant 9 advised creating *'like a really emotional one or a person who is really depressed, so that you write your text according to each of them'*. Finally, a few participants mentioned that LEAVES should be able to have feedback from participants, so to create personalised options.

4. Discussion

In this chapter, the research questions posed at the beginning of this paper are answered according to the results and, if applicable, literature.

Fostering patient-technology alliance and intention to use

For the first research question, it was asked how decision-making affects perceived-patient technology alliance and intention to use. From there, the other hypotheses of the first study were created. To give a short summary of the results of the first study, most of them were not significant. However, a significant positive correlation among most variables was found. Moreover, when users felt that they could relate to the virtual agent, their perceived alliance with the technology was influenced by it and they were more willing to use the technology. Finally, the feeling of an alliance with the technology meant that users were also more willing to use it.

The insignificant results can be explained by the small number of participants and the inequality of participants among groups. Additionally, because the assumptions were not met, it could mean that it would have been better to use another way to analyse the data. Moreover, by comparing the means of the variables of each condition, there was not a big difference among the groups. Another reason for insignificant results is that participants may have not been able to empathize enough with the situation presented. To illustrate, regarding safety, they needed to feel that LEAVES could not jeopardise the safety of the user in a moment of escalation; to be able to sincerely answer the questions.

Considering that the assumptions were not met and the sample was too small, the significance of the results could have been a coincidence. Nonetheless, significant correlation among variables does not explain causation, but it indicates a positive relationship. This link was expected and it was the reason for choosing these variables for this study.

In addition to this, regarding the effects of relatedness, literature shows that telling users the reasons behind the suggestions given can make people feel relatedness (Cook & Doyle, 2002) and can enhance the creation of an alliance. Moreover, empathic features were part of the framework developed by Barazzone et al. (2012) on how to influence the creation of an alliance between a self-help computerised cognitive behavioural program and a person.

Finding the influence of patient-technology alliance on intention to use could have also been a coincidence, but it can also be considered a strong result since it was observed with such a small sample. Nonetheless, from the prototypes, participants may only have had an idea about the LEAVES program and what entailed. Because of this, their intention to use such a technology cannot be fully reliable. However, a similar result was also found in a study conducted by Bickmore and Picard (2005) with chatbots. The authors had two groups of participants doing an exercise a day for a month, with a different chatbot per group. One chatbot had relationship building skills and the other one did not have any features which could directly create a bond with the participant. At the end of this period, participants wanted to go on using the first chatbot due to the feeling of a creation of a relationship with it (Bickmore & Picard, 2005). However, the chatbot in this study by Bickmore and Picard (2005) was not created for therapeutic purposes.

Nonetheless, from literature, therapeutic alliance in eHealth technologies is one of the factors which motivates people to use the service and adherence (Goldberg, Davis, & Hoyt, 2013; Cohen Rodrigues et al., 2021), and the success of the intervention (Baumel et al., 2017). In turn, literature showed that therapeutic alliance and, consequently, adherence make people get better (Bickmore et al. and Clark et al. as cited in Cohen Rodrigues et al., 2021; Cook & Doyle, 2002). Consequently, finding that the creation of a patient-technology alliance has an influence on intention to use could be important in order to make the technology meet its purpose and for future research.

Experts' points of view on decision-making, safety, and intention to use

The second research question was about experts' opinions regarding the degree of decision-making elderly adults should have when using an eHealth technology with therapeutic purposes, such as LEAVES. From interviews, it came out that the user should always be able to choose, as it happens in a traditional therapeutic setting. This is also because, from literature, it was found that a paternalistic approach in the doctor-patient relationship, as it is enhanced in the prototype where decision-making is given to the system, is not beneficial (Grünloh, Myreteg, Cajander, & Rexhepi, 2018). Moreover, the feeling of control was found a fundamental factor in shared decision-making and in self-determination

theory in order to reinforce the relationship with the other entity (Elwyn et al, 2012; Quin & Dutton, 2005). Control is particularly relevant for mourners who feel that they have less control of their life due to the loss of a loved one, as also Harris (2010) explains.

However, it is still unclear if people who are grieving and have PG disorder or PCB disorder can make rational or good decisions. From interviews, an argument to give decision-making to users was that no one is capable of deciding when the level of arousal is high, not only people with PG disorder symptoms. Nonetheless, the research by Mazzocco, Masiero, Carriero, and Pravettoni (2019) on how emotions influence decision-making, highlighted that the capacity of people to make decisions also depends on other factors, like situation, or the person's mental state. Therefore, people in a vulnerable situation with PG disorder symptoms may still have more difficulty making decisions than people with an average level of arousal.

Nonetheless, experts also said that, in an eHealth technology, it can still be possible to support people who have more serious symptoms. This is also proved in shared decision-making which implies the involvement of the patient in making decisions by giving the right information and guidance (Elwyn et al., 2012). Moreover, in the interviews, more elaborated suggestions were also given:

- *A two steps approach to decision-making.* Elwyn et al. (2012) similarly to the interviews, describe a three stepwise process of decision-making to effectively involve people in shared decision-making. Firstly, people need to be made aware of the choices they have. Secondly, they need to be given specific information and explanations about the choices. Lastly, people need to be supported in their choices by highlighting the possible benefits. Therefore, a combination of both stepwise approaches might be optimal to involve users in the decision-making process.
- *Having users setting goals for themselves*. Setting goals is also an intervention which is used in positive psychology. This is proved to enhance wellbeing and reduce depressive symptoms levels in people (Bolier et al., 2013).
- *Tailoring*. In literature, personalisation means developing the technology to meet the needs of a single user in order to enhance a positive experience (Ameen, Tarhini, Reppel, & Anand, 2021). Nonetheless, as some experts said and according to the literature, the downside of this strategy could be that too much personalisation is overwhelming due to the many options and information that the user needs to choose from (Mugge, Schoormans, & Schifferstein, 2009). Nevertheless, if the technology is not developed according to different users' characteristics and situations, it could be counterproductive. Moreover, from the comments of the first study, it came out that there are many other factors which could influence the likelihood of a participant to prefer one or another. For instance, their level of technology literacy or participants' experience with grief. Because of this, personalisation should meet users' needs.

According to some experts, a virtual agent can mediate decision-making and it can still be better than having people read some information. In accordance with this, from different studies, interacting with virtual agents resulted in higher therapeutic alliance and treatment success (Kowatsch et al, 2021). Nonetheless, it is not possible to make people feel and be hundred per cent safe when their treatment is given by an eHealth technology, such as LEAVES. A system which can endanger human life is called a safety-critical system. This was also defined in literature by Kasauli, Knauss, Kanagwa, Nilsson, & Calikli (2018) and Knight (2002). From the interview, it was suggested that a way to tackle the risk of having a system which does not guarantee the physical safety of the user is to imagine all the possible scenarios in which the life of a person can be in danger when using LEAVES. This is one of the solutions which were also found by Kasauli et al. (2018).

According to experts, the feeling of safety can also be reduced or enhanced by different factors. The factor of loss of control was also described in the literature as inducing a negative experience with the technology (Ameen et al., 2021). For instance, by hearing that LEAVES is calling a therapist, users could get even more worried because they might think that they do not need help and that they are losing control over their feelings. Additionally, experts mentioned that elderly people do not like to ask

for help from others because they are afraid to bother them. By calling someone for them, they may feel incapable of taking care of themselves. As it is explained in self-determination theory, this can be unfavourable because feeling competent is important to facilitate wellbeing and intrinsic motivation (Jessen, Mirkovic, & Ruland, 2017; Seligman & Csikszentmihalyi, 2014).

Another factor that can make people feel unsafe is the way in which the virtual agent talks to people, in particular if the conversations are similar to the ones among humans. According to Miro's uncanny valley theory, when people interact with human-like chatbots, they can get a feeling of discomfort (Moore, 2012). This theory is usually applied to interaction with robots. However, when the language used is similar, but not the same, to the one used among humans, people can still get a feeling of discomfort (Betriana, Osaka, Matsumoto, Tanioka, & Locsin, 2020). Nonetheless, from the interviews, different ways to enhance the feeling of safety were suggested:

- *Feeling heard helped and in control*. Moreover, people should always be explained why certain choices are better than others, as it is also explained in the literature on patient empowerment and shared decision-making (Elwyn et al., 2012). The explanations should be clear and users should be given the possibility to talk about their problems.
- *Do relaxing and soothing activities.* Furthermore, users should focus on positive meaningful things which is also explained in positive psychology as a way to reduce negative factors and improve wellbeing (Waters, 2011).

According to experts, elderly people of future generations would probably use LEAVES in all European countries. This result is mostly relevant for countries like Italy, Portugal, and Switzerland, which are a bit behind with technological development. Additionally, in research, low adherence was found a problem with elderly people in a depressive state (Aerts & van Dam, 2018; Cohen Rodrigues et al., 2021). Nonetheless, using self-help eHealth technology could solve the shortage of therapists (Abd-Alrazaq et al., 2019) and overcome barriers which, in literature, are usually associated with mental health care services (Reins et al., 2021), e.g. stigma.

In those countries where the implementation of LEAVES is seen as difficult, experts thought that blended therapy would be the best. Accordingly, research showed that blended therapy is considered as the best possible treatment because patients may benefit from the establishment of a therapeutic alliance with the therapist, using the technology whenever they need and want, being motivated to make rational decisions and, because of this, adhere more to the treatment (Kip et al., 2020).

5. Limitations and Strengths

The studies of this paper had some limitations. For the quantitative study, one of the problems was the small sample size and the assumptions not being met. For one condition, only 11 participants completed the study. In addition to this, in the statistical analyses, most assumptions were not met. A bigger sample could have led to more trustworthy results and better conclusions could have been obtained.

Moreover, the qualitative answers given in the survey showed that some participants thought that they did not have enough information in order to properly answer the questions. A short interaction with the prototypes and the content of the prototypes were probably not enough to answer the questions in the survey. Additionally, it was probably hard for some people to imagine doing the action or being in the moment of escalation presented in the prototypes. Regarding participants' comments, it could not be said which prototype was the best. This could also be due to the fact that participants did not know which kind of versions could be the other one. Because of this, a within-subjects design would have been more appropriate to understand which level of decision-making would have been the best and for which situations. Another possibility could have been to do a qualitative study. Nonetheless, in the first case, participants' responses could have been biased by the order of the prototypes they were presented with. In the second case, it would not have been possible to measure the statistical influence of the dependent variables on the independent variables and how this effect differed according to the covariates.

The last limitation was that the translation of the prototypes from English to Dutch was not perfect. Some participants noticed that. Although some participants did not care about it, some were a bit concerned and annoyed.

Nevertheless, these studies also had some strengths. The first strength was that these studies were conducted with an eHealth technology which is being developed. This gave the possibility to the researcher to test the influence of decision-making and level of stakes on the other variables by using an already existing design of the prototype. Moreover, due to this, participants in the second study could get a better idea of the context of the research, and of an eHealth technology with therapeutic purposes. This may have helped them to better answer the questions asked. Additionally, from the results of these studies, tangible recommendations for LEAVES can be made.

Another strength regards the variety of participants' backgrounds and experiences of the second study. Due to this, different points of view regarding decision-making, safety, and intention to use were given. Additionally, many answers were the same for more than one participant, no matter the background. This can make the results of this study more valid and more generalisable.

Lastly, the reliability of the construct was quite high, which means that the items for each variable of the questionnaire could be reused for other studies.

6. Implications and Future work

For further research

A general implication for eHealth technology is that users should always be given the opportunity to decide and be in control of how to manage their health. Another implication of the findings is that the virtual agent needs to become a companion for users. However, this can be really hard to create because it requires many design interactions with users. Moreover, the virtual agent needs to be programmed with the aim to address all possible situations and possible conversations. A virtual agent which is capable of interacting like a human may be really hard to create and it would require the expertise of people from different disciplines, like human-computer interaction, sociolinguistics, computational linguistics and so on (Kowatsch et al., 2018). However, with research on improving the interaction between humans and virtual agents and on improving conversations, it may be possible, in the future, to devise a virtual agent which can create a bond with the user and become a companion for him or her.

For future work and as a follow-up of this paper, it is advised to investigate which features can create a patient-technology alliance in a self-help eHealth technology with therapeutic purposes. Also, because, as this paper shows, creating this alliance may also favour the intention to use the eHealth technology. In this study, it was discovered that control and the feeling of relatedness are really important factors. However, a similar study with a bigger sample should be conducted in order to validate these results and discover more factors which can boost this alliance.

Afterwards, to confirm that patient-technology alliance influences intention to use, a longitudinal study should be conducted to give time to participants to establish an alliance with a self-help eHealth technology with therapeutic purposes or/and to give them enough information to be able to say if they would want to use the technology.

For the LEAVES project

These studies also have some implications for the LEAVES project. During the interviews, some practical suggestions were made on how to introduce the right degree of decision-making in LEAVES. A two steps approach could be taken. Firstly, people should be given the chance to decide and control their decisions. Moreover, they should be helped and supported to set goals for themselves. By giving control, autonomy, and support, people's motivation to use LEAVES could increase. Secondly, via notifications, the system could ask or remind them if they performed the action. If the user did not, then the system needs to be the one to take action for them, asking for permission to contact other people if necessary.

Additionally, decision-making needs to be tailored according to individual users or groups of users. Personalising LEAVES was a general recommendation. This is also due to the fact that there was not a concrete answer on which prototype was the best for users due to the different user characteristics which can influence participants' experience with it. Moreover, personalisation can be a motivator factor for people to use LEAVES. Additionally, the topic of personalisation came back in the pilot study, in the qualitative study and in the quantitative study. Zanker, Rook, and Jannach, (2019) categorise personalisation in three dimensions: the user interface, the content, and the interaction processes. Firstly, the personalisation of the user interface refers to the layout and design of the technology. Secondly, content personalisation is the information which is shown according to users' preferences. Lastly, personalising the interaction processes means creating an algorithm which is capable of making decisions and approach users according to their feedback or needs (Chen, Chiang, & Storey as cited in Ameen et al., 2021).

Personalisation in virtual agents is challenging, but a way to personalise LEAVES could be done by looking at which of these three dimensions are more important to personalise and at which level. For instance, regarding the user interface, users could decide themselves the kind of avatar they would like to see. Regarding the content and tailoring decision-making, users could decide which activity they would like to do or the information that they would like to see. Or personalisation could also be automatic: after getting feedback or inputs from the user (interaction processes personalisation),

LEAVES could create personalised messages (content), or to tailor decision-making, LEAVES could only present options which are more appropriate for the user. To personalise LEAVES, it was suggested to create different digital personas and to tailor the program according to each persona.

LEAVES could be considered a safety-critical system which means that users might be physically or emotionally harmed by it. The possibility of something happening to users whilst using LEAVES is small, but it could still happen. Because of this, it is advised to think about all possible situations which could endanger users whilst using LEAVES. Furthermore, for each situation, a risk assessment and possible solutions could be created. In addition to this, a design feature which could foster the feeling of safety is to add a 'red button' which should be always visible. This button could make people feel that, if they need help, they know where to look for and this could reduce possible fears and anxiety about using LEAVES. Additionally, by adding images of people the user knows, and images and explanations of people who can help, a more familiar environment can be created. In a moment of escalation, users need to see familiar faces in order to feel more at ease if they need to ask for help.

7. Conclusion

This paper investigated the degree of decision-making users should have when using an eHealth technology with therapeutic purposes and with a virtual agent in it, such as LEAVES.

In general, it was confirmed that most concepts usually applied to traditional therapeutic settings can be used in the same way when the therapist is replaced by an eHealth technology with a virtual agent in it.

As it would happen in traditional therapeutic settings, it was found that the creation of patient-technology alliance is fundamental to foster usage. Nonetheless, it is still unknown which are the factors, together with relatedness and control, that can influence the creation of an alliance between a patient and a virtual agent. Moreover, it is confirmed that people should be given the chance to decide and have control over their health when using a self-help eHealth technology. However, it was found that if people have difficulty deciding because of PG disorder symptoms or because they are in a critical situation, there are ways in which they can still be given the chance to decide.

Nonetheless, in situations where the user needs help, it was supported that a virtual agent cannot react as a therapist would, and this could make users feel less safe. What is important is that users experience that they are in control of their choices.

From both the qualitative and the quantitative study, it was clear that not every elderly person would be able to use an eHealth technology like LEAVES, due to low technological literacy that often affects this generation. Moreover, LEAVES was mostly seen as a tool to use as support for the therapist.

The findings of this paper can be generally applied to eHealth technology and virtual agents which have a therapeutic purpose. A general finding was that personalisation is needed to meet users' needs, situations, and characteristics.

As for future research, it is suggested to investigate how to improve the interaction between a virtual agent and a person with the purpose of creating a feeling of reciprocity. Moreover, more research should be conducted on which features can be used to create an alliance between a person and a technology.

8. References

Aerts, J. E. M., & van Dam, A. (2018). Blended e-Health in Cognitive Behavioural Therapy: Usage Intensity, Attitude and Therapeutic Alliance in Clinical Practice. *Psychology, 9*, 2422-2435. Doi: 10.4236/psych.2018.910139

Abd-Alrazaq, A. A., Alajlani, M., Alalwan, A. A., Bewick, B. M., Gardner, P., & Househ, M. (2019). An overview of the features of chatbots in mental health: A scoping review. *International Journal of Medical Informatics*, *132*. Doi: 10.1016/j.ijmedinf.2019.103978

Akeel, A. U., & Mundy, D. (2019). Re-thinking technology and its growing role in enabling patient empowerment. *Health Informatics Journal*, *25*(4), 1278-1289. Doi: 10.1177/1460458217751013

Ameen, N., Tarhini, A., Reppel, A., & Anand, A. (2021). Customer experiences in the age of artificial intelligence. *Computers in Human Behavior*, *114*. Doi**:** 10.1016/j.chb.2020.106548

Araujo, T. (2018). Living up to the chatbot hype: The influence of anthropomorphic design cues and communicative agency framing on conversational agent and company perceptions. *Computers in Human Behavior, 85*, 183-189. Doi: 10.1016/j.chb.2018.03.051

Arning, K., & Ziefle, M. (2009, November). Different perspectives on technology acceptance: The role of technology type and age. In *Symposium of the Austrian HCI and Usability Engineering Group* (pp. 20-41). Springer, Berlin, Heidelberg.

Atlas.ti (n.d). Retrieved on 2021, June 16 from ATLAS.ti: The Qualitative Data Analysis & Research Software (atlasti.com)

Barazzone, N., Cavanagh, K., & Richards, D. A. (2012). Computerized cognitive behavioural therapy and the therapeutic alliance: a qualitative enquiry. *British Journal of Clinical Psychology*, *51*(4), 396-417. Doi: 10.1111/j.2044-8260.2012.02035.x

Barello, S., Triberti, S., Graffigna, G., Libreri, C., Serino, S., Hibbard, J., & Riva, G. (2016). eHealth for patient engagement: a systematic review. *Frontiers in Psychology*, *6*, 2013. Doi: 10.3389/fpsyg.2015.02013

Bart, Y., Shankar, V., Sultan, F., & Urban, G. L. (2005). Are the drivers and role of online trust the same for all web sites and consumers? A large-scale exploratory empirical study. *Journal of Marketing*, *69*(4), 133-152. Doi: 10.1509/jmkg.2005.69.4.133

Baumel, A., Birnbaum, M. L., & Sucala, M. (2017). A systematic review and taxonomy of published quality criteria related to the evaluation of user-facing eHealth programs. *Journal of Medical Systems*, *41*(8), 1-7. Doi: 10.1007/s10916-017-0776-6

Boeckxstaens, P., Meskens, A., Van der Poorten, A., Verpoort, A. C., & Sturgiss, E. A. (2020). Exploring the therapeutic alliance in Belgian family medicine and its association with doctor–patient characteristics: a cross-sectional survey study. *BMJ Open*, *10*(2). Doi: 10.1136/bmjopen-2019-033710

Belanger, F., Hiller, J. S., & Smith, W. J. (2002). Trustworthiness in electronic commerce: the role of privacy, security, and site attributes. *The Journal of Strategic Information Systems*, *11*(3-4), 245-270. Doi: 10.1016/S0963-8687(02)00018-5

Beldad, A., van der Geest, T., de Jong, M., & Steehouder, M. (2012). A cue or two and I'll trust you: Determinants of trust in government organizations in terms of their processing and usage of citizens' personal information disclosed online. *Government Information Quarterly*, *29*(1), 41-49. Doi: 10.1016/j.giq.2011.05.003

Beldad, A., Hegner, S., & Hoppen, J. (2016). The effect of virtual sales agent (VSA) gender–product gender congruence on product advice credibility, trust in VSA and online vendor, and purchase intention. *Computers in Human Behavior*, *60*, 62-72. Doi: 10.1016/j.chb.2016.02.046

Beldad, A., De Jong, M., & Steehouder, M. (2010). How shall I trust the faceless and the intangible? A literature review on the antecedents of online trust. *Computers in Human Behavior*, *26*(5), 857-869. Doi: 10.1016/j.chb.2010.03.013

Betriana, F., Osaka, K., Matsumoto, K., Tanioka, T., & Locsin, R. C. (2020). Relating Mori's Uncanny Valley in generating conversations with artificial affective communication and natural language processing. *Nursing Philosophy, 22*(2). Doi: 10.1111/nup.12322

Bickmore, T. W., & Picard, R. W. (2005). Establishing and maintaining long-term human-computer relationships. *ACM Transactions on Computer-Human Interaction (TOCHI)*, *12*(2), 293-327. Doi: 10.1145/1067860.1067867

Boeije, H. (2009). *Analysis in Qualitative Research*. Sage publications.

Bolier, L., Haverman, M., Westerhof, G.J., Riper, H., Smit, F., & Bohlmeijer, E. (2013). Positive psychology interventions: a meta-analysis of randomized controlled studies. *BMC Public Health 13*, 119. Doi: 10.1186/1471-2458-13-119

Brodbeck, J., Berger, T., Biesold, N., Rockstroh, F., & Znoj, H. J. (2019). Evaluation of a guided internet-based self-help intervention for older adults after spousal bereavement or separation/divorce: A randomised controlled trial. *Journal of Affective Disorders, 252,* 440-449. Doi: 10.1016/j.jad.2019.04.008

Chen, J., & Dibb, S. (2010). Consumer trust in the online retail context: Exploring the antecedents and consequences. *Psychology & Marketing*, *27*(4), 323-346. Doi: 10.1002/mar.20334

Clarke, V., & Braun, V. (2014). Thematic analysis. In *Encyclopedia of Critical Psychology* (pp. 1947-1952). Springer, New York, NY.

Cohen Rodrigues, T., Reijnders, T., de Buisonjé, D., Santhanam, P., Kowatsch, T., Janssen, V., ... & Evers, A. (2021). Human Cues in Self-help Lifestyle Interventions: an Experimental Field Study. *Journal of Medical Internet Research (JMIR) Preprints*. Doi: 10.2196/preprints.30057

Cook, J. E., & Doyle, C. (2002). Working alliance in online therapy as compared to face-to-face therapy: Preliminary results. *Cyber Psychology & Behavior*, *5*(2), 95-105. Doi: 10.1089/109493102753770480

Dean, D. H., & Biswas, A. (2001). Third-party organization endorsement of products: An advertising cue affecting consumer prepurchase evaluation of goods and services. *Journal of Advertising*, *30*(4), 41-57. Doi: 10.1080/00913367.2001.10673650

Del Vecchio, D., & Smith, D. C. (2005). Brand-extension price premiums: the effects of perceived fit and extension product category risk. *Journal of the Academy of Marketing Science*, *33*(2), 184-196. Doi: 10.1177/0092070304269753

Elwyn, G., Frosch, D., Thomson, R., Joseph-Williams, N., Lloyd, A., Kinnersley, P., Cording, E., Tomson, D., Dodd, C., Rollnick, S., Edwards, A., & Barry, M. (2012). Shared decision making: a model for clinical practice. *Journal of General Internal Medicine, 10*.1361-1367. Doi: 10.1007/s11606-012-2077-6.

Featherman, M. S., & Pavlou, P. A. (2003). Predicting e-services adoption: a perceived risk facets perspective. *International Journal of Human-Computer Studies*, *59*(4), 451-474. Doi:10.1016/S1071-5819(03)00111-3

Fei-Yin Ng, F., Kenney-Benson, G. A., & Pomerantz, E. M. (2004). Children's achievement moderates the effects of mothers' use of control and autonomy support. *Child Development*, *75*(3), 764-780. Doi: 10.1111/j.1467-8624.2004.00705.x

Feine, J., Gnewuch, U., Morana, S., & Maedche, A. (2019). A taxonomy of social cues for conversational agents. *International Journal of Human-Computer Studies, 132*, 138-161. Doi: 10.1016/j.ijhcs.2019.07.009

Fishbein, M. and Ajzen, I. (1975). *Belief, Attitude, Intention, Behavior: An Introduction to Theory and Research*. Addison-Wesley, Reading, MA.

Goldberg, S. B., Davis, J. M., & Hoyt WT. (2013). The role of therapeutic alliance in mindfulness interventions: therapeutic alliance in mindfulness training for smokers. *Journal of Clinical Psychology, 69*(9):936-950. Doi: 10.1002/jclp.21973

Grewal, D., Gotlieb, J., & Marmorstein, H. (1994). The moderating effects of message framing and source credibility on the price-perceived risk relationship. *Journal of Consumer Research*, *21*(1), 145-153. Doi: 10.1086/209388

Grünloh, C., Myreteg, G., Cajander, Å., & Rexhepi, H. (2018). “Why do they need to check me?” patient participation through eHealth and the doctor-patient relationship: qualitative study. *Journal of Medical Internet Research*, *20*(1), 11. Doi: 10.2196/jmir.8444

Harris, D. (2010). Oppression of the bereaved: A critical analysis of grief in western society. *OMEGA-Journal of Death and Dying*, *60*(3), 241-253. Doi: 10.2190/OM.60.3.c

Hindmarch, T., Hotopf, M., & Owen, G. S. (2013). Depression and decision-making capacity for treatment or research: a systematic review. *BMC Medical Ethics*, *14*(1), 1-10. Doi: 10.1186/1472-6939-14-54

Horvath, A. O., & Greenberg, L. (1989). Development and validation of the working alliance inventory. *Journal of Counseling Psychology, 36*(2), 223–233. Doi: 1037/0022-0167.36.2.223

Horvath, A. O., & Luborsky, L. (1993). The role of the therapeutic alliance in psychotherapy. *Journal of Consulting and Clinical Psychology*, *61*(4), 561. Doi: 10.1037/0022-006X.61.4.561

IBM SPSS Software (n.d.). Retrieved on 2021, June 16 from https://www.nsc.utwente.nl/software/option/category/8/

Infurna, F. J., Wiest, M., Gerstorf, D., Ram, N., Schupp, J., Wagner, G. G., & Heckhausen, J. (2017). Changes in life satisfaction when losing one's spouse: Individual differences in anticipation, reaction, adaptation and longevity in the German Socio-economic Panel Study (SOEP). *Ageing & Society*, *37*(5), 899-934. Doi: 10.1017/S0144686X15001543

Jessen, S., Mirkovic, J., & Ruland, C. (2017, June). User and stakeholder requirements of eHealth support tool viewed in a self-determination theory lens. In *2017 IEEE 30th International Symposium on Computer-Based Medical Systems (CBMS)* (pp. 682-683). IEEE. Doi: 10.1109/CBMS.2017.152

Jovanovic, M., Baez, M., & Casati, F. (2020). Chatbots as conversational healthcare services. *IEEE Internet Computing*. Doi: 10.1109/MIC.2020.3037151

Karahasanovic, A., Brandtzæg, P. B., Vanattenhoven, J., Lievens, B., Nielsen, K. T., & Pierson, J. (2009). Ensuring trust, privacy, and etiquette in web 2.0 applications. *Computer*, *42*(6), 42-49. Doi: 10.1109/MC.2009.186

Kasauli, R., Knauss, E., Kanagwa, B., Nilsson, A., & Calikli, G. (2018, August). Safety-critical systems and agile development: a mapping study. In *2018 44th Euromicro Conference on Software Engineering and Advanced Applications (SEAA)* (pp. 470-477). IEEE. Doi: 10.1109/SEAA.2018.00082

Kip, H., Wentzel, J., & Kelders, S. M. (2020). Shaping Blended Care: Adapting an Instrument to Support Therapists in Using eMental Health. *JMIR Mental Health*, *7*(11). Doi: 10.2196/24245

Knight, J. C. (2002, May). Safety critical systems: challenges and directions. In *Proceedings of the 24th International Conference on Software Engineering* (pp. 547-550). Doi: 10.1145/581339.581406

Kowatsch, T., Nißen, M., Rüegger, D., Stieger, M., Flückiger, C., Allemand, M., & von Wangenheim, F. (2018). The impact of interpersonal closeness cues in text-based healthcare chatbots on attachment bond and the desire to continue interacting: an experimental design. In *Twenty-Sixth European Conference on Information Systems (ECIS2018)*, Portsmouth, UK. https://www.alexandria.unisg.ch/254284/

Kowatsch, T., Schachner, T., Harperink, S., Barata, F., Dittler, U., Xiao, G., ... & Möller, A. (2021). Conversational agents as mediating social actors in chronic disease management involving health care professionals, patients, and family members: multisite single-arm feasibility study. *Journal of Medical Internet Research*, *23*(2). Doi: 10.2196/25060

Laroche, M., Yang, Z., McDougall, G. H., & Bergeron, J. (2005). Internet versus bricks-and-mortar retailers: An investigation into intangibility and its consequences. *Journal of Retailing*, *81*(4), 251-267. Doi: 10.1016/j.jretai.2004.11.002

Laumer, S., & Eckhardt, A. (2010). Why do People Reject Technologies?-Towards an Understanding of Resistance to IT-induced Organizational Change. In *ICIS* (p. 151). http://aisel.aisnet.org/icis2010_submissions/151

Lee, S., & Choi, J. (2017). Enhancing user experience with conversational agent for movie recommendation: Effects of self-disclosure and reciprocity. *International Journal of Human Computer Studies, 103*, 95–105. Doi: 10.1016/j.ijhcs.2017.02.005

Liebrecht, C., & van Hooijdonk, C. (2019). Creating Humanlike Chatbots: What Chatbot Developers Could Learn From Webcare Employees In Adopting A Conversational Human Voice. In *International Workshop on Chatbot Research and Design* (pp. 51-64). Springer, Cham. Doi: 10.1007/978-3-030-39540-7_4

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *Academy of Management Review*, *20*(3), 709-734. Doi: 10.5465/amr.1995.9508080335

Mazzocco, K., Masiero, M., Carriero, M. C., & Pravettoni, G. (2019). The role of emotions in cancer patients' decision-making. *eCancer Medical Science*, *13*. Doi: 10.3332/ecancer.2019.914

McCaffrey, R., Liehr, P., Gregersen, T., & Nishioka, R. (2011). Garden walking and art therapy for depression in older adults: a pilot study. *Research in Gerontological Nursing*, *4*(4), 237-242. Doi: 10.3928/19404921-20110201-01

Meadows, R., Hine, C., & Suddaby, E. (2020). Conversational agents and the making of mental health recovery. *Digital Health*, *6*. Doi: 10.1177/2055207620966170

Milne, G., Pettinico, G., Hajjat, F., & Markos, E. (2017). Information sensitivity typology: Mapping the degree and type of risk consumers perceive in personal data sharing. *Journal of Consumer Affairs, 51*(1), 133-161. Doi: 10.1111/joca.12111

Mol, M., van Genugten, C., Dozeman, E., van Schaik, D. J. F., Draisma, S., Riper, H., Smit, J. H. (2020). Why Uptake of Blended Internet-Based Interventions for Depression Is Challenging: A Qualitative Study on Therapists' Perspectives. *Journal of Clinical Medicine*, *9*(1), 91. Doi: 10.3390/jcm9010091

Moore, R. K. (2012). A Bayesian explanation of the 'Uncanny Valley'effect and related psychological phenomena. *Scientific Reports, 2*(1), 1-5. Doi: 10.1038/srep00864

Mugge, R., Schoormans, J. P., & Schifferstein, H. N. (2009). Incorporating consumers in the design of their own products. The dimensions of product personalisation. *CoDesign*, *5*(2), 79-97. Doi: 10.1080/15710880802666416

Newson, R. S., Boelen, P. A., Hek, K., Hofman, A., & Tiemeier, H. (2011). The prevalence and characteristics of complicated grief in older adults. *Journal of Affective Disorders*, *132*(1-2), 231-238. Doi: 10.1016/j.jad.2011.02.021

Nguyen, Q., & Sidorova, A. (2018). Understanding user interactions with a chatbot: a self-determination theory approach. *AMCIS*. https://www.semanticscholar.org/paper/Understanding-user-interactions-with-a-chatbot%3A-a-Nguyen-Sidorova/cd1193c8c1a3feb4bad42aee91d50690217cc01b#citing-papers

Ossebaard, H. C., & van Gemert-Pijnen, L. (2016). eHealth and quality in health care: implementation time. *International Journal for Quality in Health Care*, *28*(3), 415-419. Doi: 10.1093/intqhc/mzw032

Paap, D., Schrier, E., & Dijkstra, P. U. (2019). Development and validation of the working

alliance inventory Dutch version for use in rehabilitation setting. *Physiotherapy Theory and Practice*, *35*(12), 1292-1303. Doi: 10.1080/09593985.2018.1471112

Palanica, A., Flaschner, P., Thommandram, A., Li, M., & Fossat. Y. (2019). Physicians' Perceptions of Chatbots in Health Care: Cross-Sectional Web-Based Survey. *Journal Medical Internet Research, 21*(4). Doi: 10.2196/12887

Prentice, J. L., & Dobson, K. S. (2014). A review of the risks and benefits associated with mobile phone applications for psychological interventions. *Canadian Psychology*, *55*(4), 282. Doi: 10.1037/a0038113

Proudfoot, J. G., Parker, G. B., Pavlovic, D. H., Manicavasagar, V., Adler, E., & Whitton, A. E. (2010). Community attitudes to the appropriation of mobile phones for monitoring and managing depression, anxiety, and stress. *Journal of Medical Internet Research, 12*(5), 64. Doi: 10.2196/jmir.1475

Philip, P., Dupuy, L., Auriacombe, M., Serre, F., de Sevin, E., Sauteraud, A., & Micoulaud-Franchi, J. A. (2020). Trust and acceptance of a virtual psychiatric interview between embodied conversational agents and outpatients. *NPJ Digital Medicine*, *3*(1), 1-7. Doi: 10.1038/s41746-019-0213-y

Qualtrics (n.d.). Retrieved on 2021, June 16 from https://www.qualtrics.com/uk/?rid=ip&prevsite=en&newsite=uk&geo=NL&geomatch=uk

Quinn, R. W., & Dutton, J. E. (2005). Coordination as energy-in-conversation. Academy of *Management Review, 30*(1), 36-57. Doi: 10.5465/amr.2005.15281422

van Randenborgh, A., de Jong-Meyer, R., & Hüffmeier, J. (2010). Decision making in depression: differences in decisional conflict between healthy and depressed individuals. *Clinical Psychology & Psychotherapy*, *17*(4), 285-298. Doi: 10.1002/cpp.651

Reins, J. A., Buntrock, C., Zimmermann, J., Grund, S., Harrer, M., Lehr, D., ... & Ebert, D. D. (2021). Efficacy and moderators of internet-based interventions in adults with subthreshold depression: an individual participant data meta-analysis of randomized controlled trials. *Psychotherapy and Psychosomatics*, *90*(2), 94-106. Doi: 10.1159/000507819

Risling, T., Martinez, J., Young, J., & Thorp-Froslie, N. (2017). Evaluating patient empowerment in association with eHealth technology: scoping review. *Journal of Medical Internet Research*, *19*(9), 329. Doi: 10.2196/jmir.7809

Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and Emotion*, *30*(4), 344-360. Doi: 10.1007/s11031-006-9051-8

Seligman, M. E., & Csikszentmihalyi, M. (2014). Positive psychology: An introduction. In *Flow and the Foundations of Positive Psychology* (pp. 279-298). Springer, Dordrecht. Doi: 10.1037//0003-066X.55.1.5

Stone, R. N., & Grønhaug, K. (1993). Perceived risk: Further considerations for the marketing discipline. *European Journal of Marketing*, *27*(3), 39-50. Doi: 10.1108/03090569310026637

Thies, I. M., Menon, N., Magapu, S., Subramony, M., & O'neill, J. (2017). How do you want your chatbot? An exploratory wizard-of-oz study with young, urban indians. In B. R., D. G., J. A., K. B. D., O. J., & W. M. (Eds.), *Human-Computer Interaction–Interact* (Vol. 10513, pp. 441–459). Cham, Switzerland: Springer.

Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*, *19*(6), 349-357. Doi: 10.1093/intqhc/mzm042

van Velsen, L., Cabrita, M., Op den Akker, H., Brandl, L., Isaac, J., Suárez, M., ... & Canhão, H. (2020). LEAVES (optimizing the mentaL health and resiliencE of older Adults that haVe lost thEir spouSe via blended, online therapy): Proposal for an Online Service Development and Evaluation. *JMIR Research Protocols, 9*(9). Doi: 10.2196/19344

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly, 36*, pp. 157-178. Doi: 10.2307/41410412

Wang, S., Blazer, D., & Hoenig, H. (2016). Can eHealth technology enhance the patient-provider relationship in rehabilitation?. *Archives of Physical Medicine and Rehabilitation*, *97*(9), 1403-1406. Doi: 10.1016/j.apmr.2016.04.002

Waters, L. (2011). A review of school-based positive psychology interventions. *The Educational and Developmental Psychologist, 28*(2), 75-90. Doi: 10.1375/aedp.28.2.75

Wirtz, J. & Lwin, M. (2009). Regulatory Focus Theory, trust, and privacy concern. *Journal of Service Research, 12*(2), 190-207. Doi: 10.1177/1094670509335772

World Health Organisation (WHO) (2013, January 6th). Mental health action plan 2013 - 2020. Retrieved from https://www.who.int/publications/i/item/9789241506021

Xie, B. (2011). Effects of an eHealth literacy intervention for older adults. *Journal of Medical Internet Research*, *13*(4), 90. Doi: 10.2196/jmir.1880

Yusif, S., Soar, J., & Hafeez-Baig, A. (2016). Older people, assistive technologies, and the barriers to adoption: A systematic review. *International Journal of Medical Informatics*, *94*, 112-116. Doi: 10.1016/j.ijmedinf.2016.07.004

Zanker, M., Rook, L., & Jannach, D. (2019). Measuring the impact of online personalisation: Past, present and future. *International Journal of Human-Computer Studies*, *131*, 160-168. Doi: 10.1016/j.ijhcs.2019.06.006

9. Appendix

Appendix A

Message with link for participants

Beste …,

Mijn naam is Valentina Bartali en ik ben student bij de University of Twente en stagiaire bij Roessingh Research and Development (RRD) in Enschede (NL).

RRD, DELA Natura- en Levensverzekeringen N.V. en de National Foundation for Elderly (Ouderenfonds) werken, naast zes internationale partners in Switzerland en Portugal, samen binnen het LEAVES project. Binnen LEAVES wordt een technologie ontwikkeld die ouderen kan helpen bij het verwerken van rouw en verdriet in het kader van het verlies van hun partner.

Als onderdeel van dit project, ben ik bezig met een onderzoek om meer inzichten te krijgen in de functies die deze technologie zou moeten hebben om aan de behoeften van oudere volwassenen te voldoen.

Voor dit onderzoek heb ik een programma ontworpen en ik zou het waarderen als u de tijd zou willen nemen om naar het programma te kijken en een paar vragen beantwoorden. Ik kan me voorstellen dat mijn vragen over rouwverwerking een gevoelig onderwerp voor u zouden kunnen zijn, maar ik vraag u fit om deze technologie beter af te stemmen om de behoeften van de gebruikers. Zoals u zich kunt voorstellen, is dit een belangrijk onderwerp om te onderzoeken omdat het mogelijk hulp biedt aan mensen die het moeilijk hebben door het verlies van hun partner.

Het onderzoek duurt max. 25 minuten. U heeft het onderzoek afgerond zodra u het volledige programma heeft bekeken en de vragenlijst heeft ingevuld. U krijgt meer uitleg over dit onderzoek en een formulier voor geïnformeerde toestemming zodra u op de link klikt.
Bent u oudere dan 55 jaar oud? Als het antwoord op deze vraag ja is, zou u aan dit onderzoek deel willen nemen?
Heel erg bedankt voor uw tijd.
Als u problemen ervaart tijdens het voltooien van dit onderzoek, met de links, of als u vragen hebt, kunt u altijd contact opnemen met ... (bellen, Whatsapp, of SMS).

Dit is de link:
https://utwentebs.eu.qualtrics.com/jfe/form/SV_6AwBMf93PKsiVD0

Appendix B

Online consensus form in Qualtrics

Beste deelnemer,

Bedankt voor de tijd die u wilt nemen om mee te doen aan dit onderzoek. Ik ben Valentina Bartali, de onderzoeker van deze studie. Momenteel schrijf ik mijn masterscriptie bij Roessingh Research and Development in Enschede (NL). Het project, wat Roessingh aan het ontwikkelen is en waaraan ik meewerk, heet LEAVES. Het heeft als doel een webapplicatie (programma) te ontwikkelen, om ouderen die hun partner verloren hebben te helpen bij het verwerken van verdriet. Uiteindelijk ligt de focus van mijn studie op de ontwikkeling van het programma LEAVES en om de beste mogelijke webapplicatie voor ouderen te creëren. De verzamelde gegevens worden alleen gebruikt voor onderzoeksdoeleinden.

Dit onderzoek vereist, dat u één scenario kiest om u meer in te leven in mensen die dit programma zullen gebruiken. Daarna krijgt u twee delen van het programma van LEAVES te zien. Ten slotte wordt u gevraagd een vragenlijst in te vullen. Uw bijdrage kost u maximaal 10 minuten om naar het programma te kijken en ongeveer 15 minuten om de vragenlijst in te vullen.

Voor alle duidelijkheid: dit is geen kennistest en er zijn geen goede of foute antwoorden. Dit onderzoek zal mij helpen om meer inzicht te krijgen in wat gebruikers denken en voelen bij het gebruik van dit programma. Bovendien wil ik u verzekeren dat dit onderzoek u geen schade zal berokkenen. Als u zich toch oncomfortabel voelt en om welke reden dan ook, dit onderzoek niet wilt afmaken, bent u vrij om de studie te beëindigen zonder uitleg.

Dit onderzoek is goedgekeurd door de ethische commissie van de Faculteit Gedrags-, Management- en Maatschappijwetenschappen van de Universiteit Twente, Enschede (NL). Voor vragen over het ethische deel van dit onderzoek kun u contact opnemen met ethicscommittee-bms@utwente.nl

Aan het einde van de vragenlijst, krijgt u de mogelijkheid om uw ervaringen met mij te delen en om meer details te weten te komen over mijn onderzoeksvraag.

Mocht u stuiten op een probleem omtrent deze studie of vragen hebben, neem dan gerust contact met mij op via e-mail.

Contactgegevens:
Valentina Bartali
E-mail: …

Dank u voor uw bereidwilligheid. Door op de pijlknop hieronder te drukken:
- Gaat u akkoord met deelname aan dit onderzoek.
- Verklaart u, dat u de informatie die u zojuist heeft gelezen, begrijpt.
- Geeft u toestemming om de gegevens die in dit onderzoek worden verzameld te gebruiken voor ontwikkeling van het programma LEAVES.

Tweede scherm
De onderstaande link leidt u naar het LEAVES - programma. Houd er aub rekening mee dat u slechts enkele delen van het volledige LEAVES - programma zult zien. Wees dus niet verbaasd, als u informatie mist over hoe u op een bepaalde pagina terecht bent gekomen. Bovendien werken bepaalde verbindingen tussen pagina's niet, omdat het de bedoeling is dat u slechts enkele delen van dit programma bekijkt. Elk onderdeel van het programma wordt aan u voorgesteld met een korte tekst.

U kunt altijd de 'Terug' knop (zoals hieronder getoond) aan het einde van de pagina gebruiken om terug te gaan naar de vorige pagina en de 'Volgende' knop (zoals hieronder getoond) om naar de volgende pagina te gaan. U vindt deze knoppen door naar beneden te scrollen

Appendix C

Scenario

Na 40 jaar huwelijk heeft Heleen, 75 jaar oud, haar man Harm, verloren aan longkanker. Hij was al lange tijd ziek, maar in de weken voor zijn dood leek het erop dat het beter met hem ging. Hij is toch onverwacht dood en Heleenheeft geen kans gekregen om afscheid van hem te nemen. Heleen is altijd een sociaal persoon geweest. Ze hield ervan om eens per week een drankje te drinken met haar vrienden en om naar de bioscoop te gaan. Ze genoot ook van lange wandelingen in het bos met Harm. Daarnaast hebben Heleen en Harm een dochter die helaas ver weg woont, maar af en toe pakten ze de trein en gingen ze bij haar op bezoek. Maar sinds Heleen Harm heeft verloren, kan ze zich er niet meer toe zetten iets te ondernemen. Haar familieleden en vrienden proberen haar te bereiken, maar ze heeft niet veel zin om hen te zien of met hen te praten. Verder kijkt ze als een berg op tegen kleine klusjes, zoals het huis schoonmaken. Alle dingen die Harm altijd deed, blijven nu liggen. Heleen weet niet meer waar ze moet beginnen, maar ze wil geen hulp vragen. Op een dag krijgt ze het advies om een programma te gebruiken: LEAVES. In dit programma helpt een virtuele persoon mensen die rouwen om het verlies van een geliefde om hun gevoelens te verwerken. Heleen besluit het programma uit te proberen.

Escalatie

Heleen voelt zich nu gewoon hopeloos. Ze wisselt momenten van verdriet en nostalgie af met gevoelens van woede jegens haar man die haar zo snel alleen heeft gelaten. De laatste tijd heeft ze zelfs het gevoel dat ze niet meer wil leven.

Appendix D

Links to prototypes

Condition 1, Task, high decision:

https://www.figma.com/proto/hOjRzFlpZzstlCqdpXkIQW/LEAVES-1?node-id=20%3A3&scaling=min-zoom&page-id=0%3A1

Condition 2, Escalation, high decision:

https://www.figma.com/proto/rLYl7Ik7cR7rjTdjIGerWl/LEAVES-2?node-id=20%3A3&scaling=min-zoom&page-id=0%3A1

Condition 3, Task, low decision:

https://www.figma.com/proto/JVMC04pW9E0oNclOCagt0v/LEAVES-3?node-id=20%3A3&scaling=min-zoom&page-id=0%3A1

Condition 4, Escalation, low decision:

https://www.figma.com/proto/lKDUY0CmBibT9DnZjAEPKa/LEAVES-4?node-id=20%3A3&scaling=min-zoom&page-id=0%3A1

Some screenshots of the Prototypes

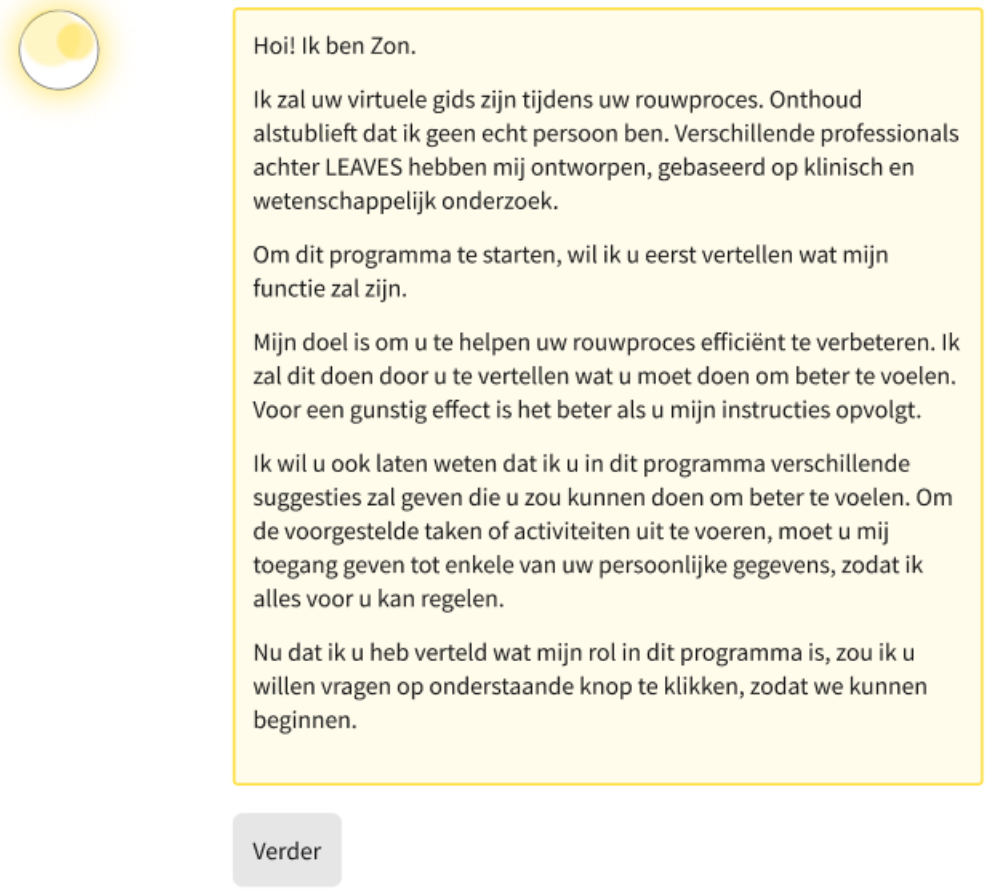

Figure 9. Screenshot Presentation of Sun Prototype 3 and 4

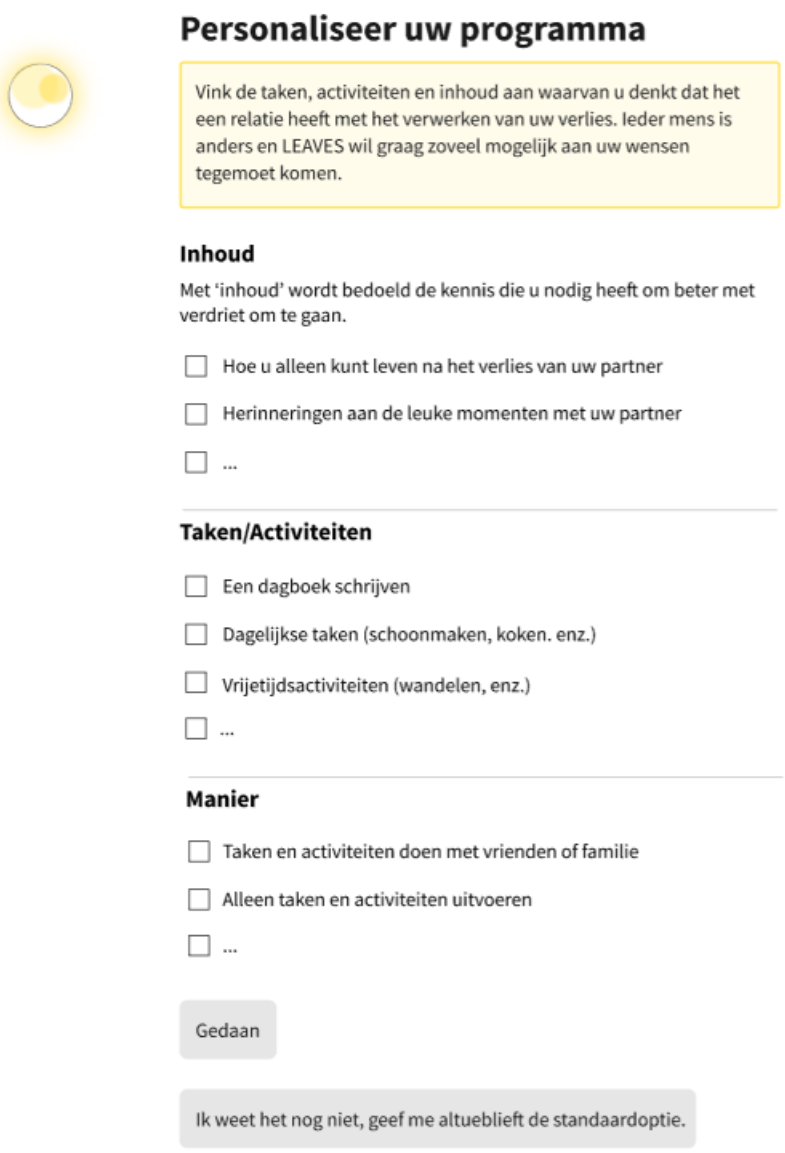

Figure 10. Personalisation options in Prototypes 1 and 2

Figure 11. Questions to monitor feelings Prototypes 2 and 4

Figure 12. Pop-up message to e-mail Prototype 3

Appendix E

Questionnaire
Dit is het laatste deel van het onderzoek, waarin ik u zal vragen een paar vragen te beantwoorden over de ervaringen die u had met het LEAVES - programma. Ik wil u eraan herinneren dat deze vragenlijst niet bedoeld is om u te testen; er zijn geen goede en foute antwoorden.

Als eerste, zou ik u enkele algemene vragen willen stellen.

- Wat was uw eerste indruk van het LEAVES - porgramma? (optioneel)

- Hoe was je algehele ervaring? (optioneel)

Dit is het begin van de vragenlijst. Bij het beantwoorden van deze vragen zou ik u willen vragen zich in te leven in het scenario dat u aan het begin van deze studie werd gepresenteerd, de situatie van Heleen. Als u dit scenario opnieuw wilt lezen, kunt u het hieronder vinden:

(SCENARIO)

Beantwoord de volgende vragen vanuit het oogpunt van Heleen die net het LEAVES programma heeft gebruikt. Als u het moeilijk vindt, probeer dan aan iemand te denken die u heeft verloren (zelfs een huisdier) en dat u net het programma LEAVES hebt gebruikt.

Zeer mee oneens
Enigszins mee oneens
Neutraal
Enigszins mee eens
Zeer mee eens

(Perceived autonomy)

- Ik had het gevoel dat ik zelf kon beslissen of ik de voorgestelde taken wilde uitvoeren.

- Ik had het gevoel dat ik zelf kon beslissen hoe ik mijn rouwproces zou plannen.

- Ik had het gevoel dat k controle had over mijn rouwproces.

(Perceived relatedness)

- Ik had het gevoel dat mijn behoeften werden begrepen door de virtuele agent ‘Zon’ (LEAVES-programma).

- Ik had het gevoel dat de virtuele agent ‘Zon’ (LEAVES-programma) me met respect behandelde.

- Ik vond de interactie met de virtuele agent ‘Zon’ (LEAVES-programma) prettig.

(Perceived competence)

- Ik voelde me capabel/vaardig genoeg om te begrijpen wat de virtuele agent ‘Zon’ (LEAVES-programma) van mij vroeg.

- Ik voelde me overweldigd door de verzoeken van ‘Zon’ (LEAVES-programma). (opposite when analysing)

- Ik voelde me vaardig genoeg om te begrijpen hoe ‘Zon’ (LEAVES-programma) werkt.

(Perceived privacy)

- Ik vertrouw ‘Zon’ (LEAVES-programma) om mijn gegevens vertrouwelijk te behandelen.

- Ik maak me zorgen over de veiligheid van mijn persoonlijke gegevens bij het gebruik van ‘Zon’ (LEAVES-programma). (opposite when analysing)

- Ik vond het ongemakkelijk om mijn persoonlijke gegevens aan ‘Zon’ (LEAVES-programma) te geven. (opposite when analysing)

(Perceived patient-technology alliance)

- Het werd mij duidelijk hoe ik mijn geestelijke gezondheid kan verbeteren met het LEAVES - programma.
- De doelen van het LEAVES - programma waren duidelijk voor mij.

- Uit de voorgestelde taken kwam duidelijk naar voren hoe ik mijn gezondheid kan verbeteren.
- Ik geloof dat de voorgestelde taken mijn gezondheid kunnen verbeteren.

- Ik geloof dat de virtuele agent ‘Zon’ (LEAVES - programma) mijn beste belang voor ogen heeft.
- Ik voelde dat ik, in samenwerking met de virtuele agent ‘Zon’ (LEAVES - programma), zelf kon beslissen hoe ik mijn gezondheid kan verbeteren.

Het kan gebeuren dat de persoonlijke situatie bij een gebruiker verergerd en dat hij of geen concrete beslissen kan nemen. Daarom zou ik u willen vragen of u bij het bekijken van het LEAVES - programma het gevoel had dat u veilig voelde. Met veilig wordt dus fysieke veiligheid bedoeld, zodat de gebruiker zichzelf schade niet berokkenen. Beantwoord deze vragen alstublieft, denkend dat u Heleen bent.

(Perceived safety)

- Ik voelde me veilig bij het gebruik van het LEAVES-programma.

- Het gebruik van het LEAVES-programma zou mijn fysieke veiligheid in gevaar kunnen brengen. (opposite when analysing)

- Ik denk dat het LEAVES-programma mij niet goed kan helpen in moeilijke situaties. (opposite when analysing)

Beantwoord de volgende vragen vanuit uw eigen perspectief. (Intention to use)

- Indien nodig zou ik overwegen om het LEAVES-programma zelf te gebruiken.

- Ik ben van plan om, indien nodig gebruik te maken van het LEAVES-programma.

- Indien nodig zal ik het LEAVES-programma aanbevelen aan een vriend/vriendin.

- Heeft u nog iets toe te voegen met betrekking tot het prototype dat u net zag? (optioneel)

Als laatste zijn er vier vragen over uw persoonlijke situatie.

- In welk jaar bent u geboren?

- Heeft u ooit een dierbare verloren (inclusief huisdieren)?

- Neem een of twee voorbeelden. (optioneel)
- Hoe lang geleden was dit? (optioneel)

Einde van deze studie
Nogmaals bedankt voor uw deelname. Het doel van dit onderzoek was om te zien hoe besluitvorming, de mate van vrijheid die gebruikers krijgen bij het gebruik van LEAVES, hun gevoelens beïnvloedt. Vooral de gevoelens die ze hebben bij het omgaan met de technologie en de intentie om deze te gebruiken.

Nogmaals, ik wil u eraan herinneren dat de in deze studie verzamelde gegevens alleen voor onderzoeksdoeleinden in het kader van het project LEAVES worden gebruikt.

Heeft u nog vragen of wilt u meer weten over deze studie, dan kun u contact met mij opnemen via e-mail: ...

Appendix F

Message interview

Dear …,

I am Valentina Bartali, a master student at the UT and intern at Roessingh Research and Development.

I am contacting you to ask for your help with my master thesis.

I am writing my master thesis at Roessingh Research and Development in Enschede where different researchers are working on a European project, called LEAVES. This project aims to develop a web application, called LEAVES, with included a virtual agent to help elderly people to process the loss of their spouse. In my study, I am looking at the effect of decision-making within the web application on the creation of therapeutic alliance and intention to use. With decision-making, it is meant the degree of freedom users have when using the web application. For instance, in case of high decision-making for the user, LEAVES could suggest him or her to do an activity and it is up to the user to do the activity.

However, it could also happen that the user is getting worse and/or having suicidal thoughts. In that case, the user needs (immediate) help. Therefore, it is relevant to know if, in that situation, the user would like to have the possibility to decide, like to call a doctor or to have the system decide for him or her, like calling someone for the user.

Accordingly, I would like to ask you if I can interview you to ask you, as a possible expert in the subject, some questions on decision-making and eHealth technologies and how, in your opinion, perceived safety in such technologies can be maximised.

The interview will last a maximum of one hour. In the first twenty minutes, I will ask you to look at some parts of the prototypes I created for the study. Afterwards, I will ask you some questions. Before the interview, you will receive a document with the links to the prototypes and a consensus form to fill in for the study.

Let me know if you are available in the next few weeks.

Thank you in advance.
Kind regards,
Valentina

Appendix G

Informed Consent Form

Consent Form for: How decision-making given to users influence the creation of patient-technology alliance and intention to use.
YOU WILL BE GIVEN A COPY OF THIS INFORMED CONSENT FORM

Please tick the appropriate boxes	**Yes**	**No**
Taking part in the study		
I have read and understood the study information which has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	□	□
I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	□	□
I understand that taking part in the study involves a video – recorded interview which will be used to effectively transcribe the interviews as text. The recording will be deleted as soon as it is considered not necessary to keep it for research purposes.	□	□
Use of the information in the study		
I understand that information I provide will be used to give insights on development of a service to help elderly people to process grief. Accordingly, a report will be written.	□	□
I understand that personal information collected about me that can identify me, such as [e.g. my name or where I live], will not be shared beyond the study team.	□	□
I agree that my information can be quoted in research outputs: a fictious name will be used	□	□
I agree to be audio/video recorded. Yes/no	□	□
Future use and reuse of the information by others		
I give permission for the answers that I provide to be archived in Roessingh Research and Development (RRD) database, so it can be used for future research and learning. Note: the answers will be in form of anonymised transcripts, audio recording, and in the report. Only the report and probably the transcripts will be shared with RRD. The data will **not** be used for commercial use and they will be stored as safe as possible to avoid privacy breaches.	□	□
I agree that my information may be shared with other researchers for future research studies that may be similar to this study or may be completely different. The information shared with other researchers will not include any information that can directly identify me. Researchers will not contact me for additional permission to use this information.	□	□
I give the researchers permission to keep my contact information and to contact me for future research projects or questions.	□	□

Signatures

_____	_____	_____
Name of participant	Signature	Date

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

_____	_____	_____
Researcher name	Signature	Date

Study contact details for further information:

Valentina Bartali

Emails: ... or ...

Contact Information for Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-bms@utwente.nl

Appendix H

Interview Protocol

Thank you again for participating. I am Valentina Bartali and I am, at the moment, working on the LEAVES project, a European project, at Roessingh Research and Development centre. The aim of this interview is to get insights on what you, as clinical experts, think regarding decision-making in an eHealth technology which has the goal to help elderly adults to process the loss of their spouse, namely LEAVES. Therefore, it will also try to help adults with complicated grief symptoms, diagnosed as Persistent Complex Bereavement disorder (PCB) in DSM-5 and Prolonged Grief disorder (PG) in ICD-11 which is a condition where severe grief symptoms occur longer than six (ICD-11)/ twelve (DSM-5) months after bereavement. Consequently, I would like to ask you to think about that target group during this study. Additionally, I would like to ask you how to maximise the feeling of safety for the users as using the LEAVES service. Note that this technology is meant to be used without the presence of a therapist.

Regarding the procedure of the study, I would like to first ask you if you can fill in and sign in a consensus form in which you agree to participate in this study and to be recorded. You can find the consensus form attached to the last email I sent you. Secondly, I would like you to read a description of my first study which I am conducting with end-users of LEAVES. Once you read the description, I would like you to take a look at two prototypes which I created to conduct the first study. This will take max 10-20 minutes. When you do this, I will be online present in case you have any questions. Finally, I will be asking you some questions.

Therefore, to start, in your email, you can find the consensus form. It is a fillable PDF file; you only need to copy and paste your digital signature. Afterwards, go back to this document to read a short description of the first study and to click on the links to look at the prototypes.

First study, scenario, and prototypes

The idea behind the first study was to see what people felt when using different versions of the prototype. The differences among the four prototypes were the degree of decision-making the user had when using them and the task they had to do when using LEAVES. For instance, in one, the virtual agent could suggest the user to go to the cinema and the user could refuse the suggestion and/or choose to do something else. In this case, it was up to the user to contact the person to go to the cinema with and to make an appointment. In the other one, if the user wanted to do the activity told by the system, he or she had to allow LEAVES to access to the email of the user and to the calendar to set a time and date for the appointment.

What I measured was the control felt, the feeling of relatedness, and to what extent participants felt competence whilst using it. Moreover, I looked at the perceived privacy of participants and at their perceived safety. My hypotheses were related to how these variables influenced the creation of therapeutic alliance and intention to use the service.

You will see two prototypes where the task will be the same (Filling in a regularly check questionnaire and see how LEAVES will react to it), but the degree of decision-making will be different (decision-making given to users vs. decision-making given to the system).

Do you have any questions at this point?

These are the links to the two prototypes:

Appendix I

Interview Questions

- What do you think about each prototype?
- Do you have any questions, until now?

General information

- (Where are you from?)
- What is your specialisation?

Experience with eHealth technology

- Do you have experience with eHealth technologies?
    - If yes, which ones? Could you give me some examples?
    - If no, would you like to use one to help you cure your patients?

Decision-making

As you may remember from my explanation, decision-making refers to the degree of freedom people have when using LEAVES. For instance, the virtual agent could suggest the user to go to the theatre and the user could refuse the suggestion and choose to do something else.

- What is your opinion regarding the degree of decision-making users should have when using eHealth technologies with therapeutic purposes?

- To what extent do you think that people with Persistent Complex Bereavement disorder (PCB) and Prolonged Grief disorder (PG) symptoms or who are in severe conditions have the capability of making decisions which could improve their health?

    - Do you think they would be able to do it when there is no therapist helping them, but a virtual agent?

Perceived safety

As you may remember from my explanation, one of the variables I measured was perceived safety. You can imagine that when people have really serious symptoms and, in extreme cases, they think about committing suicide, they, family members, and doctors may not feel safe putting their life on the hand of a virtual agent. Therefore, their perceived safety may be low. Accordingly, I wanted to ask you:

- What do you think about the safety of the users when using LEAVES in extreme situations?

- How do you think, as a clinician, perceived safety of users could be maximised (within the system)?

Cultural/Background influence (optional: it depends on the answers given)

As you may remember, this is a European project and as such, I would like to ask you your opinion on the user of this technology in your country or other countries.

- Do you think elderly people in … (country of participant) would use this service?
    - Why?

- Do you think elderly people in other countries would use this service?
    - Why?

In general:

- Would you advise the LEAVES service to a patient?
    - Why?

Appendix J

Table 22
External codes

Theme	Code	Definition
General Remarks about the LEAVES prototypes	General Remarks about the LEAVES prototypes	General comments about the prototypes
Extra Design Recommendations		Specific design features which were advised by participants
	Motivational features	Features which can motivate users to do as the LEAVES program suggests or to use it
	Personalisation features	Design features which can allow personalisation
	Processes	Design processes which were advised by experts to use. (Like how to make sure that the LEAVES program meets usability requirements)
Grief and elderly people		Information about elderly people, people in grief, and elderly people in grief to contextualise the information gathered
Participants' information		

Appendix K

Word clouds Atlas.ti

Figure 13. Word cloud for the code ‘decision-making in eHealth technology’

Figure 14. Word cloud for the code ‘user-centred decision-making’

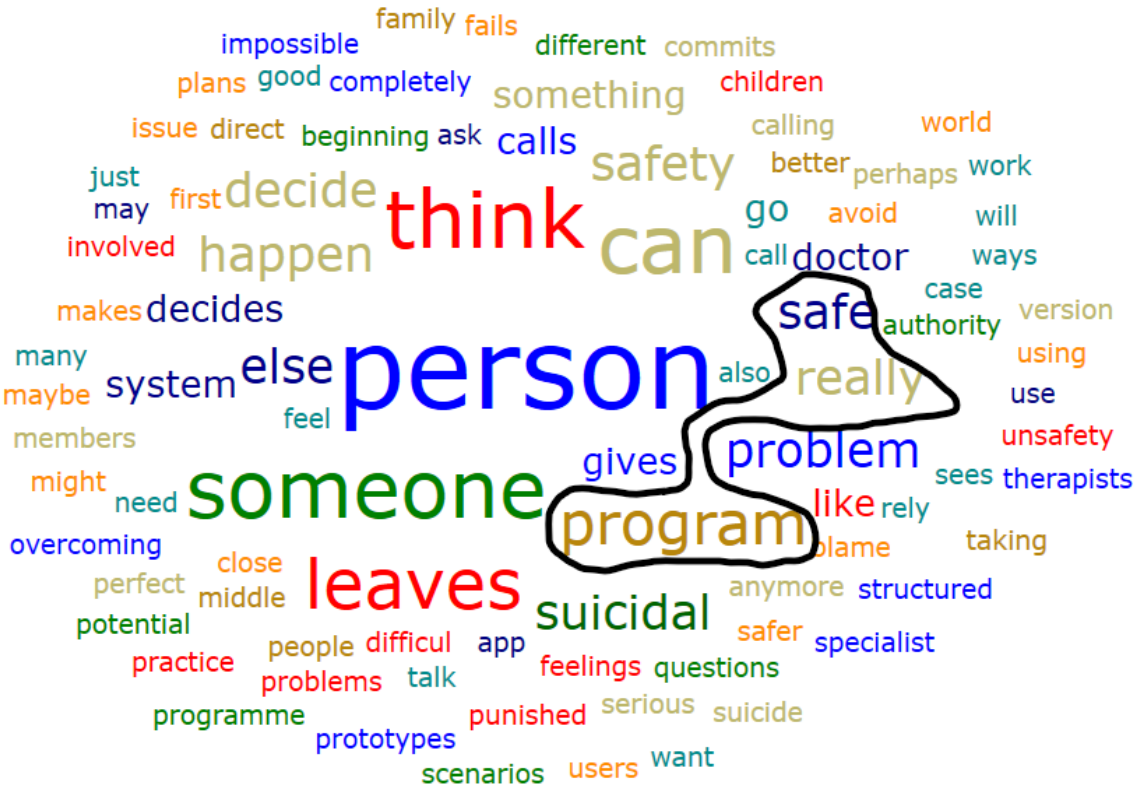

Figure 15. Word cloud for the code ‘Actual Safety’

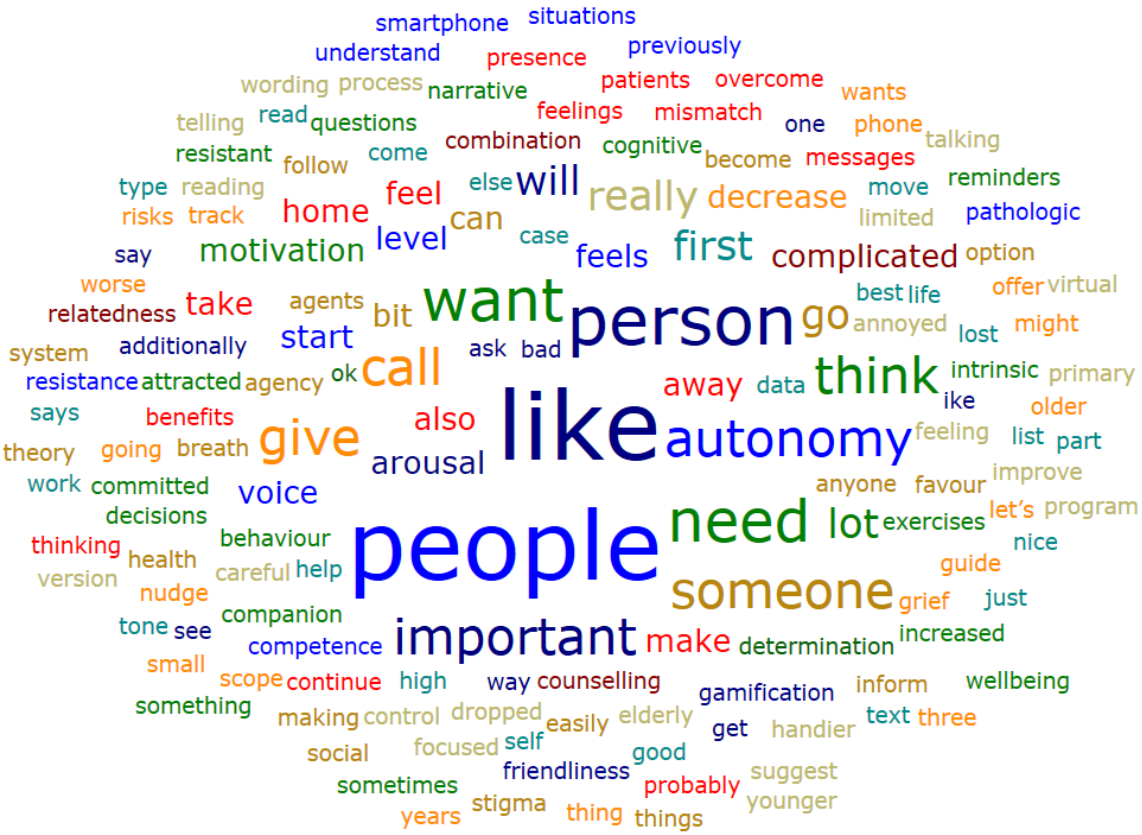

Figure 16. Word cloud for code ‘Motivational factors’