The theme eHealth among visually impaired elderly

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Abstract English

Visually impaired (VI) elderly are a growing population, resulting in an increasing demand in eye-care services. A rehabilitation center for VI people, Bartiméus, wants to offer eHealth services. Little is known about how VI elderly relate to eHealth services. This study gained more insights into the perceptions of VI elderly regarding eHealth services of Bartiméus. A qualitative study from a client perspective was conducted. Semi-structured interviews were telephonically held with 15 Dutch VI elderly aged over 65. The results show that VI elderly have little knowledge regarding eHealth. VI elderly consider helping aids for the visually impaired as a part of eHealth. VI elderly have the intention to exchange knowledge and experiences online with other VI people, and to contact a healthcare professional online to ask a question or to make an appointment. VI elderly showed no interest in video-communication or receiving mainly online treatment. Follow-up research should focus on how blended care can be designed by means of an client portal that partially offers services online. Values and user-requirements are explored to some extent in light of the potential services but more context of technology use should be given in future research regarding all stakeholders with the use of the CeHRes roadmap.

Abstract Nederlands

Visueel beperkte (VI) ouderen zijn een groeiende populatie wat resulteert in een stijgende vraag naar oog zorg. Een revalidatiecentrum voor visueel beperkten, Bartiméus, wil eHealth diensten aanbieden. Er is echter weinig bekend over hoe VI ouderen zich verhouden tot eHealth diensten. Dit onderzoek richt zich op het verkrijgen van meer inzicht in de percepties die VI ouderen hebben over potentiele eHealth diensten van Bartiméus. Er is een kwalitatief onderzoek gedaan vanuit het cliënt perspectief. Er zijn telefonische semi-gestructureerde interviews gehouden met 15 Nederlandse VI ouderen van 65 jaar en ouder. De resultaten laten zien dat VI ouderen weinig kennis hebben over eHealth. De VI ouderen beschouwen hulpmiddelen voor visueel beperkten als onderdeel van eHealth. De VI ouderen zijn bereid om online kennis en ervaringen uit te wisselen met andere visueel beperkten, en om online contact te leggen met gezondheidsprofessionals om een vraag te stellen of een afspraak te maken. De VI ouderen toonden geen interesse in video-communicatie of om voornamelijk online behandeling te krijgen. Vervolgonderzoek moet zich richten op hoe blended care ontwikkeld kan worden zoals een cliënt portaal dat gedeeltelijk online diensten aanbied. Waarden en gebruikersvoorwaarden zijn onderzocht gericht op eHealth diensten maar meer context van technologiegebruik moet onderzocht worden middels de CeHRes roadmap.

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1 Introduction

1.1 General introduction

The visually impaired (VI) population is growing which is most seen in the aging population due to age as a major risk factor for visual impairment. This growth is mostly due to the development of age-related eye diseases such as macular degeneration, glaucoma, cataract and diabetic retinopathy. The number of people aged over 65 is growing and therefore the demand of eye-care services in the Netherlands is increasing in 2010-2020 (Keunen et al., 2011). This increase in eye-care is mainly explained by the ageing population in the Netherlands since the life expectancy of both men and women has increased over the years (CBS Statline, 2016). In the Netherlands there is a growing number of VI people. It is estimated that in 2008 there were 311.000 VI people in the Netherlands, 77.000 people are blind and 234.000 people have low vision. This number may increase by 18% to an estimated 367.000 VI people in 2020. Thirty-one percent of all VI people is male and 69% is female. Visual impairment is most prevalent among intellectually disabled persons, independently living people aged over 50 and among elderly in nursing homes and care institutions (Limburg & Keunen, 2009). Moreover, 3% of the people aged over 50 is visually impaired and this number will increase to 4% in 2020 (ZonMw, 2011).

Several definitions regarding vision are given. The term blindness refers to when the person has a vision of less than 0.05 in the better eye with available correction or if the person has a vision of 10 degrees or less around the central axis. Low vision or sightedness is defined by a having a vision of less than 0.3 in the better eye with available correction or if the person has a vision between 30 or 10 degrees around the central axis. The term visual impairment is used to include both blindness and low vision. Visual impairment is defined by a person having a vision of less than 0.3 in the better eye with available correction or if a person has a vision of less than 30 degrees around the central axis (Limburg, 2007). Shown in Table 1 is a widely used classification model to classify visual impairment, the ‘International Classification Model of Disease 10th revision’ (ICD-10) (WHO, 2016). As a guidance for classification the ICD-10 and definition of visual impairment are used in this study.

Table 1. WHO International Classification of Diseases, 10th revision (ICD-10)

	Category	WHO vision with best correction	Sight
Normal	0	≥0.3	
Low vision	1	<0.3 and ≥0.1	≤0.30 - >0.20
	2	< 0.1 and ≥0.05	≤0.20 - >0.10
Blind	3	< 0.05 and ≥0.02	≤0.10 - >0.05
	4	< 0.02 and light perception	≤0.05
	5	No light perception	

Note: (source: (WHO, 2016)

The setting of this study aims at a practical question from Bartiméus, a Dutch rehabilitation center for the visually impaired. Bartiméus delivers tertiary prevention care which involves the prevention of further invalidation due to the visual impairment. Bartiméus helps their clients to live and maintain a healthy life with respect to their visual impairment and all that is affected by it (e.g., mental health, daily activities, work and education). Bartiméus aims to create eHealth for their visually impaired clients to improve Bartiméus' healthcare services. The starting point of this study is not to explore what and how eHealth technologies can improve the health and healthcare of VI elderly but rather how Bartiméus can offer their services via eHealth and how they relate to their clients.

1.2 Vulnerable population

The VI elderly with age-related eye-conditions are a vulnerable group. Among VI elderly aged 65 years or older it was found that there is an association between an age-related eye-condition and having physical impairments (i.e., poor/fair general health, physical unhealthy, activity limitation). Elderly with an age-related eye-condition have a lower quality of life (Li et al., 2011; Lotery, Xu, Zlatava, & Loftus, 2007). Visual impairment among older adults negatively affect their mobility, activities of daily living and communication which can lead to less feelings of life-satisfaction and independence (Brouwer, Sadlo, Winding, & Hanneman, 2005). It appeared that VI elderly who newly register at a rehabilitation center for the visually impaired are lonelier than normal sighted elderly with 50% of the VI elderly compared to 29% of the normal sighted elderly who experience loneliness (Alma et al., 2011). Furthermore, depression and anxiety are common among VI elderly with an age-related eye-condition (Brody et al., 2001). VI elderly seem more susceptible to mental health problems compared to normal sighted elderly. It is therefore important to improve or maintain the health, healthcare and quality of life of VI elderly.

1.3 Use of internet and technology potentially for care at home

The internet is a big source of information for people of all ages and the use of the internet is increasing among older adults (Seybert, 2012a). The use of devices to access the internet is increasing among elderly aged over 65. That is, in 2016 77.6% had access to the internet, 46% owned a PC or desktop, 51.6% owned a laptop or notebook, 47.4% owned a tablet and 50,9% owned a mobile phone or smartphone (CBS Statline, 2016).

Elderly in general also use other everyday technologies. The elderly's most common interests were in the media with the TV, radio and newspapers being most often used (Eek & Wressle, 2011). However, when using assistive technology (e.g., video monitoring, pressure mats, door alerts or fall detectors (Miskelly, 2001), VI elderly had a higher need of using these technologies (Dahlin-Ivanoff & Sonn, 2004). Moreover, Miskelly (2001) states that elderly who have visual, auditory, speech impairments or other physical or cognitive impairments might not be able to use some of the technology due to difficulties with some of the equipment.

It is expected that with good, affordable and appropriate care elderly can live longer independently at home (Hilten, 2010). Six out of seven 80-year old's live longer at home, with or without support (CBS, 2011). However, this depends on having a good health. One of the challenges with living independently is the efficient delivery of health and care services (Al-Shaqi, Mourshed, & Rezgui, 2016). The internet is a potential medium to support or improve health and healthcare due to the increasing use of devices to access the internet.

1.4 eHealth, eHealth applications, benefits and barriers

The use of information and communication technologies for health is defined as eHealth (WHO, 2017). Defining eHealth is difficult and several definitions have been formulated over the years. A basic form of eHealth offers information about diseases, symptoms and treatment options via the internet (Rozenkranz, Kühne, Ecknardt, & Rozenkraz, 2013). A more commonly used definition of eHealth derives from Eysenbach (2001):

eHealth is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology. (p.1)

Various technologies can be considered eHealth. Table 2 shows various eHealth technologies and applications. These applications can be used for eHealth in particular because they support or improve eHealth and healthcare (Van Gemert-Pijnen, Peters, & Ossebaard, 2013). Furthermore, eHealth can be used between professionals, between patients or between patients and professionals (Eysenbach, 2001).

Table 2. Variants of eHealth technologies

Variant	Explanation
Web-based applications	Common denominator of these eHealth applications is their presentation to the end-user via a web-browser. End-users (mostly patient, provider) make use of it independent of time and place. A web portal is a special variation of web-applications; here information from different sources and different user-functionalities are presented uniformly. Patients-portals are one example, offering a range of functionalities; educational portals (e.g., about medical protocols) for professionals are another.
Mobile apps	These applications (‘apps’’) have in common their availability on smartphones and/or tablet-PC. Thousands of of health or medical apps are made for patients and consumers.
Electronic health records (EHR) or persona health records (PHR)	Not its medium but its functionality is what characterizes this variant. EHR are primarily medical-administrative systems designed for healthcare professionals to record, document, consult or share medical information about patients within their healthcare organisation. Many more functions may be added such as planning, decision support or research. Sometimes patients can access their ‘own’ data via a web-application. When patients manage, change or share their data we speak of PHR. Depending on its definitions the patient is the primary user or sometimes the only user.
Health sensors, gateways and wearable devices	These pervasive devices are used in patient’s ‘home environments to automatically measure and record vital physical functions and transmit these data via gateways to a medical professional. Such measurements (e.g., weight, glucose, blood pressure) are used for remote monitoring or tele-observation of the health status of chronic patients. Ambient sensors are used in long-term care, for example, to detect falling of elderly people. This borders with domotics. Wearable, medical devices are specific applications of health sensors. These are worn or implemented in the body surface, processed in special clothing or in accessories to continuously measure physical parameters.
Domotics	Domotics or home automation refers to the use of electronics for automating domestic processes. Usually it concerns the combination of sensors and (robot) actuators to regulate the ambience in the house. (temperature, light, humidity) or to automatically operate utilities (doors, windows, machines). These assistive technologies may be used for health services such as emergency alarming or self-management support.

Video communication	Realtime video communication, videoconferencing or telepresence add a visual dimension to telecommunication as usual. This obviously enhances the relationship between patients and care provider and can easily be integrated into other technologies such as mobile apps or web-based applications it is also used for inter-professional consultation.
Robotics	Robotics are electronics, mechanical machines driven by specialized software that perform certain tasks. In medicine they are operated by surgeons for minimal invasive surgery. Personal robotics assist older or disable people to relive daily tasks (vacuum cleaning) or provide emotional support.
Health information exchange	Integrated electronic networks that enable exchange of medical information (e.g., medication data, prescriptions, radiological images) for specific professional roles, locations (regions) or functions (one specific data set e.g., results of national screenings).
Business to business gateways	General integration networks to exchange data between collaborating (commercial) partners e.g., concerning (e-)procurement or (e-)logistics.
Business intelligence and 'big data' solutions	Business intelligence systems analyse (un)structured data to create information for decision support. Within healthcare this s called ''medical intelligence' for instance with regard to compose quality indicators from system data. If very large data sets (in terms of tera bytes) are analysed we speak of 'big data' for instance with regard to genome-analysis.

Note: (source: (Krijgsman & Klein Wolterink, 2012; Van Gemert-Pijnen et al., 2013, p16-17)

Various benefits of eHealth are that it should be evidence based, educational and encouraging. eHealth has no geographical boundaries. Meaning that consumers can easily obtain health services online from global providers (Eysenbach, 2001). eHealth also has the potential to increase the effectiveness of disease management by improving the continuity, accessibility and promptness of care services (Chen & Chang, 2016). Lastly, eHealth should be accessible for more people. However, this aspect can be difficult due to money, skills and access to computers and networks. If people do not have these facilities, they cannot use computers effectively (Eysenbach, 2001).

eHealth also concerns several barriers. eHealth technologies are often not yet user-friendly or tailored enough to meet the needs of the user (Krijgsman et al., 2016). eHealth can be more utilized but often people lack the motivation or the ability to use technology (van Gemert-Pijnen et al., 2013). Due to a lack of skills or poor computer skills people engage less in eHealth (O'Connor et al., 2016). However, a lower impact of eHealth does not only lie with the user. Often when developing (eHealth) technologies a more technology-driven approach is used while it should be the user that stands central during the development process. The approach that places the user in the center of the design process is called User-Centered Design (UCD) (van Gemert-Pijnen et al., 2013). A lack of user centeredness can explain

usability problems (Nijland, van Gemert-Pijnen, Boer, Steehouder, & Seydel, 2008; Van Gemert-Pijnen et al., 2011). When eHealth is not optimally designed, implemented or productive, it can have a lower impact. (van Gemert-Pijnen et al., 2013).

1.5 User-Centered Design

If you gather data about what the prospective user wants and needs and include this in the design of the eHealth technology, the gap between the ideas of the technology developers and the users becomes smaller, which has the potential to increase the uptake and impact of eHealth technologies (Kim, Han, Park, & Park, 2016; Van Gemert-Pijnen et al., 2011) . In UCD 'the needs, expectations, interests and motivations of the prospective users are taken as the focal point of the design and are evaluated throughout the development process (Gould & Lewis, 1985; Van Gemert-Pijnen et al., 2013, p49). Key principles of UCD are using co-design by working together with different stakeholders, end users, to collect feedback which can be included in the design of the technology. Knowing the users, their tasks and environments is important by involving the users as early as possible in the process to explore what their characteristics, needs and (health related) activities are. During the development of the technology, every important change needs to be tested by the user and the results need to be included in the improved version. These evaluations are iterative during the whole development process. In addition, executing these evaluations can be done in several ways because the users might not always be able to express their preferences and abilities (Van Gemert-Pijnen et al., 2013). Applying UCD has the potential of enhancing the quality of care for patients and healthcare professionals (Maguire, 2001; Rinkus et al., 2005).

To ensure that eHealth technologies are used efficiently and effectively, Van Gemert-Pijnen et al. (2011) believe that a comprehensive view is needed to improve healthcare with technology. Activities belonging to the key principles of UCD are included in the CeHRes roadmap, which is an evidence based holistic framework for the development of eHealth technologies. The CeRHes roadmap helps to plan, coordinate and execute the participatory development of eHealth. It consists of five main phases which are the contextual inquiry, value specification, design, operationalization and summative evaluation. The CeHRes roadmap is iterative which means that throughout this approach at any phase formative evaluation is needed to gather information to improve the eHealth technology (Van Gemert-Pijnen et al., 2011).

1.6 eHealth for the visually impaired

eHealth technologies designed for VI people are often part of assistive technology or helping aids (e.g., electronic magnifiers or speech enabling software). Whereas (eHealth) technologies, such as mobile devices, are not yet designed to be fully beneficial for people with special needs (e.g., elderly or people with a visual impairment) (Kang, Liao, Wester, Leeder, & Pearce, 2010).

VI people still have accessibility difficulties because assistive technologies are often developed from a technology-driven perspective (Kim et al., 2016). In order to design new technologies that are more suitable for VI users it is important to identify the needs of VI people regarding technology and to identify which problems they face while using technologies (Kim et al., 2016).

The use of tablets and smartphones is rapidly increasing and with this increase in popularity these devices are becoming more user-friendly for all consumers (Irvine et al., 2014). However, some built in features of these devices (e.g., contrast, zoom, voice command and several audio feedback options) can be difficult to use for VI people. Publicly advertised features are often not related to low vision accessibility features. People are often unaware of the existence of the accessibility features which leads to the features not being utilized as frequently (Irvine et al., 2014). Companies and organizations more often take into account the guidelines of designing web or mobile applications that are easily accessible for VI people (Harper & Chen, 2012). (eHealth) technologies are becoming more suitable for VI people but the prospective user can more often be placed central during the development process.

1.7 eHealth for elderly

Little is known about how VI elderly perceive and use eHealth. Therefore it is important to explore how eHealth is perceived and used by elderly in general. Considering both the ease of use and usefulness of a technology, the elderly's anxiety towards technology tools is a concern (Mostaghel & Oghazi, 2017).

Moreover, Liu et al. (2016) indicate that the acceptance and usability of domotics were rather high among elderly. Factors for this acceptance and usability were based on whether these technologies allowed the elderly to remain in their own home, whether the technology improved their quality of life and whether the technology had a high perception of usefulness by the elderly. However, in the adoption and use of domotics the privacy was considered a big concern due to the use of cameras in these technologies (Liu et al., 2016).

Elderly are openminded towards using eHealth. With regard to web-based applications, Freund et al. (2017) show that elderly appear to be willing to consider technology to search for medical information online. This study also shows that elderly have the ability to improve their health-related knowledge by using customized online medical databases (Freund et al., 2017). De Veer et al., (2015) found that when offered an eHealth application, 63% of the elderly indicated they would definitely or probably intend to use it. A higher age, female gender or a lower educational level were indicators of less intention to use eHealth. Elderly who strongly believed that the eHealth applications were easy to use and that the applications would help them were more inclined to use internet applications in the future. However, the elderly who did not believe in the advantages and thought eHealth would be difficult to use, were less inclined to use eHealth (de Veer et al., 2015; Venkatesh, Morris, Davis, & Davis, 2003).

1.8 UTAUT

The current study aims at VI elderly and how they relate to eHealth by means of services that Bartiméus can offer in the future. From a UCD perspective it is needed to gain an understanding of VI elderly's (health related) needs and wishes so it can be included in a suitable eHealth design for the user. What is also of importance is how the users interact with the technology and how it can change attitudes or behaviour. Interactive information technology that is designed to change attitudes or behaviours of the user is called persuasive technology (Fogg, 2003). In order to change attitudes or behaviour, it is important to describe, explain and predict which factors play a role in changing attitudes and behaviour (Ajzen, 2001). Various models exist that give insights into several aspects of human behaviour, such as the Theory of Planned Behaviour, Social Cognitive Theory, the Technology Acceptance Model and the Model of PC Utilization. Therefore, the current study uses the 'Unified Theory of Acceptance and Use of Technology' (UTAUT) because it integrates competing models, including the above mentioned theories, of human behaviour into one strong empirical model, the UTAUT (Venkatesh et al., 2003).

The UTAUT seeks to give more insight into the individual acceptance and usage behaviour of technology by focussing on core constructs that include organizational context, user experience and demographic characteristics (Venkatesh et al., 2003). The UTAUT is a useful model that 'helps understand the drivers of acceptance in order to proactively design interventions targeted at populations of users that may be less inclined to adopt and use new systems' (Venkatesh et al., 2003, p.426).

1.9 Research questions

The following research questions (RQ) are formulated for this explorative study to gain insights into eHealth among VI elderly. A UCD approach with the UTAUT were chosen to explore the VI elderly's perceptions regarding eHealth as well as their intention to use eHealth, resulting in RQ 1, 2 and 3. RQ 4 and 5 were formulated from a more practical perspective to gain more insight into how eHealth ca be facilitated by Bartiméus. Based on the found literature, there are no hypothetical expectations for RQ 1, 3, 4 and 5 because of eHealth's novelty among the population of VI elderly and due to a lack of literature regarding this topic. However, regarding RQ 2 it is expected that VI elderly are intended to use eHealth in comparison with normal sighted elderly who are intended to use eHealth.

RQ 1. What do visually impaired elderly know/think about eHealth?
RQ 2. Do visually impaired elderly intend to use eHealth?
RQ 3. What do visually impaired elderly perceive to be the characteristics of eHealth?
RQ 4. What media is used by visually impaired elderly?
RQ 5. How can visually impaired elderly be coached to work with eHealth?

2 Methods

2.1 Design

An exploratory, qualitative study with the use of a semi-structured interview is conducted. The perceptions of VI elderly regarding eHealth are of interest for this study. Semi-structured interviews are an appropriate tool to explore perceptions and opinions regarding complex and sometimes sensitive matters and it enables probing which in turn can lead to more information and clarified answers (Barriball & While, 1994).

2.2 Participants and recruitment

Selection criteria for the study were (1) a minimum age of 65 years, (2) having a visual impairment according to the clusters of the ICD-10 from the WHO as shown in Table 1. With cluster 0 (i.e., normal vision) being excluded from this study. The elderly (3) had to have at least a minimal level of computer skills or interest in learning computer skills[1]. Participants were excluded from the study if they (4) were suffering from dementia or hearing loss. VI

[1] VI elderly with technology interest were recruited after discovering that interviewing VI elderly with no computer skills or access to a computer, laptop, tablet or smartphone quickly led to saturated answers.

elderly registered at Bartiméus were recruited via their social worker, computer accessibility instructor, occupational therapist, home counselor or other counselors. The sample in this study consists of fifteen Dutch participants, their characteristics are shown in Table 3 and 4.

Table 3. Demographics paricipants VI elderly

Characteristics		n	
Gender	Female	7	47%
	Male	8	53%
Age		M= 74,8 (65-99)	
Level of education	Low (i.e., none, primary school or prevocational education)	0	0%
	Medium (i.e., secondary or vocational education)	7	47%
	High (i.e., higher education or university)	8	53%
Living situation/marital status	Live together/married	7	47%
	Live alone/single or widow	8	53%
Living area	City	9	60%
	Smaller village	5	33%
	Countryside	1	7%

Table 4. Characteristics of VI elderly and visual impairment

Participant	Visual impairment	VI at age[2]	Years being VI	Description of eyesight	Devices being used
Short <3 years being VI					
P3	Infarction of the optic nerve	62	3	No central vision, trouble with contrast	Computer with speech/magnifying software, electronical magnifier, memo recorder
P4	Macular degeneration	87	3	No central vision, 5% eyesight	Daisy player, memo recorder, webbox
P6	Maculopathy	71	9 months	1 blind eye, 40% eyesight in other eye	Smartphone, computer with speech/magnifying software
P14	Macular degeneration	71	3	No central vision, 5% eyesight	Computer with speech and magnifying software, smartphone, tablet

[2] This age is an indication of when the visual impairment became noticeable or when the participant was diagnosed.

Medium 4-12 years being VI					
P5	Macular degeneration	90	9	No central vision, 15% eyesight	Daisy player, normal magnifier, screen monitor magnifier
P10	Macular degeneration	74	10	No central vision	Electronical magnifier, tablet, screen monitor magnifier, webbox. daisy player
P11	Acute glaucoma	55	11	Tunnel vision, eyesight less than 5%, trouble with light and contrast	Screen monitor magnifier, webbox, daisy player, gps, laptop with speech software,
P13	Macular degeneration	63	10	No central vision, 40% eyesight	Computer with speech and magnifying software, memo recorder, handsfree home phone
P15	Macular degeneration, faded optic nerve	61	4	No central vision, 3-4% eyesight	Smartphone, computer with speech and magnifying software, TV, webbox, screen monitor magnifier
Long >12 years being VI					
P1	Retinitis pigmentosa	38	42	Tunnel vision, night blindness, hardly no sight	Computer with speech/magnifying software, webbox, daisy player, mobile phone
P2	Macular degeneration	65	18	No central vision, hardly no eyesight	Radio, TV, webbox, daisy player, screen monitor magnifier, electronical magnifier, memo recorder, mobile phone.
P7	Glaucoma, eye prostheses	0	68	Severe visually impaired at birth, complete blindness at age 27	Braille reading line, computer with speech software, smartphone, webbox, daisy player, light detector
P8	Retinal blastoma, eye prostheses	0	70	Complete blindness at 9 months old	Smartphone, daisy player, computer and laptop with speech software
P9	No clear cause	52	18	1 blind eye, other eye has 20% sight with tunnel vision of 5 degrees	Smartphone, laptop with speech and magnifying software
P12	Retinal blastoma, eye prostheses	3	65	Complete blindness at age 3	Smartphone, computer and laptop with speech software, braille reading line

2.3 Materials

Determinants for the interview schedule were chosen based on the UTAUT. The UTAUT is a unified model that compared eight specific models regarding determinants of intention and usage behaviour of information technology. The UTAUT identifies four core determinants: Performance expectancy, effort expectancy and social influence as determinants for the

intention to use information technology. Facilitating conditions as a determinant of usage behaviour of information technology. Moreover, four moderators were identified as integral features of the UTAUT: Age, gender, experience and voluntariness of use. Table 5 shows the definitions of the core determinants. These determinants were used in a qualitative way to elicit information from the VI elderly rather than to measure to what degree these determinants relate to VI elderly. For example, with questions about if the elderly find eHealth easy to use and easy to learn, followed by asking the elderly why they would think this, what stimulates them or what holds the elderly back to use eHealth.

Table 5. Definitions core determinants UTAUT

Performance expectancy	The degree to which an individual believes that using the system will help him or her.
Effort expectancy	The degree of ease associated with the use of the system.
Social influence	The degree to which an individual perceives that important others believe he or she should use the new system.
Facilitating conditions	The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system.

Note: source: (Venkatesh et al., (2003)

The current study used six examples of eHealth (see Table 6.) that stem from de Veer's et al. (2015) quantitative study among Dutch community-dwelling older adults and their intention to use eHealth. The examples were transformed to fit the potential (eHealth) services of Bartiméus in the present and future.

Table 6. Six examples of eHealth

1. Making an appointment with a healthcare professional through the use of the internet, for example, by sending an email.
2. Asking a question to a healthcare professional through the internet.
3. Following a rehabilitation course from Bartiméus through the internet by using video calls.
4. Using a tablet or smartphone to read about your visual impairment in an app from Bartiméus.
5. Following a course through the internet to learn how to deal with, for example, loneliness or depression.
6. Exchanging experiences and knowledge with other visual impaired people through the internet.

The semi-structured interview schedule (see Appendix A) consists of open and closed questions to cover the different sections that structure the interview schedule. Each of these sections were introduced during the interview, see Appendix A for the section introusctions.

The demographic section explored gender, age, level of education, type of visual impairment and duration of being visual impaired. The technology section contained questions about what the participant owns and actually uses regarding electronical devices, how often these devices are being used and if the use of these devices contributes to their health or healthcare services. Then the elderly were asked to indicate to what extent they feel capable of working with electronical devices. To help facilitate this question the elderly were allowed to think of a number between 0 and 10 followed by an explanation to further explore this topic. The knowledge section explored what knowledge[3] the participant has about eHealth and what the participant would like to know more about eHealth. Followed by the attitude section in which perceptions and attitudes regarding eHealth were explored. Using questions as to what the participant's opinion was regarding eHealth while reminding them of the given examples of eHealth. Ending the attitude section with a question about what reasons there might be that prevent or encourage the participant to use eHealth, followed with an explanation. The intention section explored if the participant intents to use eHealth by asking which of the given eHealth examples the participant would or would not use provided with an explanation. The three individual sections of performance expectancy, effort expectancy and social influence were all explored using several statements. The participant was allowed to answer to what extent he or she agreed with the statement to elicit an explanation belonging with that statement. The section of self-efficacy explored the level of difficulty using the internet by enabling the participant to choose from five answers ranging from very difficult to very easy to elicit an explanation. The last section, skills, explored how the participant learned about eHealth and how to work with it. What elements were (un)useful in learning to work with eHealth, how the participant would prefer to learn to work with eHealth and who/what is needed or preferred to become better in working with eHealth. The interview ended with a question to explore how the participant believes he or she is capable to work independently with eHealth in the future. To help facilitate this question the elderly were allowed to think of a number between 0 and 10 followed by an explanation to further explore this topic.

Other material used in this study are an oral and written informed consent (see Appendix B) to obtain the elderly's permission to participate in this study. One telephone was

[3] Note that the elderly were informed about eHealth's definition and several eHealth examples at the start of the interview.

used to telephonically conduct the interview and a second telephone and laptop were used to record the interview with. The data was transcribed using F4 Transcript software and coded with Atlas.TI 8.0 software. On behalf of Bartiméus all participants received a voucher worth 10 euros as a token of appreciation for their participation.

2.4 Procedure

Two pilot tests were conducted prior to the main data collection to not only assess the utility of the interview schedule but also to provide the interviewer of valuable experience (Barriball & While, 1994). Small changes were made after pilot testing.

Recruited participants were called to inform them about the study and interview procedure. When agreeing to participate in the study, an appointment was made to carry out the interview. The interviews were telephonically conducted to not be restricted by geographical boundaries. In addition, VI older adults can experience difficulties with their mobility and independence (Brouwer et al., 2005). During the interview a brief introduction about the interviewer was given followed by general information regarding this study (see Appendix C). Then the informed consent was explained, read out loud by the interviewer and an oral agreement was given by the elderly. After the interview the informed consent was mailed on paper to also obtain an written agreement. When starting the actual interview schedule, a thorough explanation of eHealth was given in lay terms that stem from Eysenbach's (2001) definition of eHealth followed by six examples of eHealth (see Appendix C). During the interview and at the end of it, the elderly had the opportunity to ask questions. On average, every interview lasted one hour.

2.5 Analysis

All interviews were recorded using a recording feature on a smartphone and laptop. The audio was transcribed with F4 Transcript software and it was made anonymous by removing any names or information that can directly be linked to the participant. The coding process started with a top-down approach to sort out different data fragments. However, these fragments were often aligned with the topics in the semi-structured interview schedule. The topics stem from the determinants of the UTAUT and any additional topics to gain more insights in the VI elderly. Data fragments were sorted out and ascribed to certain codes through open coding. After that, through axial coding, the codes were placed into categories which were then described and placed into possible subcategories (Boeije, 2010). The relevance of these categories was determined, however, this time they were often aligned and in accordance with

the formulated research questions. Table 7 shows the final codes and odes groups. The codes were then translated into systematically written results in which second-level codes were described throughout each paragraph of the result section.

Table 7. Code groups and codes

Code groups	Codes
Sample group	Age, gender, level of education, living situation, marital status, living area, type of visual impairment, description of eyesight and duration of being visually impaired.
Attitude	Negative and positive attitude.
Knowledge	Existing knowledge and knowledge that is requested regarding eHealth.
Effort expectancy	Negative and positive effort expectancy.
Performance expectancy	Negative and positive performance expectancy.
Electronical devices/technology	What electronical devices or technology are available and what is actually being used.
Social influence	Statement one and two regarding social influence.
Individual codes	Contribution of electronics to health, intention to use eHealth, learned about eHealth, self-efficacy regarding difficulty using the internet, skills eHealth, skills eHealth learned by, necessities and ideas for skills training, usage frequencies of electronics, 'other' for all that could not be placed in one of the above codes.

3 Results

During the result section each research question will be answered with the found results. Starting with a summary of each research question, followed by the results of the codes that were categorized in accordance with the interview schedule and the research questions.

3.1 RQ 1: What do visually impaired elderly know/think about eHealth?

3.1.1 RQ 1: Summary

The VI elderly in this study had little or no knowledge regarding eHealth despite being informed about eHealth at the beginning of the interview. However, after reminders of the given eHealth examples and follow-up questions more information came to mind regarding eHealth. The elderly were interested in where to find general information, how to 'learn' eHealth, what its feasibility is and what the possibilities are. According to the interviewed VI elderly, their eHealth perception also included helping aids for the visually impaired. The elderly expressed both positive and negative opinions regarding eHealth. The elderly found it difficult to express an opinion about eHealth due to eHealth's novelty in their perception.

eHealth had the following values according to the VI elderly: It was considered to have no added value, a lack of personal contact, time-consuming, energy-consuming, sedentary and overwhelming. But also as energy-saving, handy, convenient and a way to keep up with society. The latter one and online information were associated with affecting their feelings of independence and therefore their health.

3.1.2 Knowledge

The majority of interviewed elderly (twelve elderly) reported not knowing anything about eHealth. Despite being informed about eHealth at the beginning of the interview. The elderly reported that they had never heard of eHealth prior to the interview. When given the chance, most elderly do not know what to ask for regarding more knowledge about eHealth.

No knoeide - *P9. "Tsjah, dat weet ik helemaal niet. Ik vind het hele moeilijke vragen. Want het is compleet nieuw voor mij en ik moet antwoord geven op iets waar ik nog nooit bij stil heb gestaan. Ik vind dat heel erg moeilijk. U praat eigenlijk over een wereld waar ik totaal geen weet van heb, laat ik het maar zo zeggen. Over dat eHealth."*

Other elderly did not show an interest in eHealth by not wanting, needing or asking for more information when given the opportunity. The given reasons were: Not being interested in eHealth, not wanting anything to do with eHealth, not wanting to be confronted with the handicap too often and being content with the information that was already given and therefore not needing more knowledge.

No interest, no confrontation with handicap - *P12." Nee. Heb ik niet zo'n behoefte aan eigenlijk. Ik wil niet te vaak bezig zijn met mijn handicap eigenlijk."*
No interest, being content with given information - *P13. "Nee, wat ik me kan herinneren van wat u noemde. Ik denk dat dat voldoende is voor mij hoor."*

After reminders of the given examples of eHealth it became clear to some elderly that they had heard of eHealth, in particular its applications, or that they had used eHealth themselves to some extent. Three elderly were immediately familiar with eHealth in its different applications, such as health monitoring or making online contact with healthcare professionals. Despite the majority of elderly indicating knowing little about eHealth, follow-up questions brought up that eHealth could also help you make appointments with healthcare

professionals, that eHealth can be a digital platform that gathers healthcare professionals to monitor patients and that eHealth can be used to monitor and measure blood pressure, blood sugar and heartbeat.

eHealth as self-management - *P8. "Ik weet dat ze er heel erg mee bezig zijn. Ook met het aansluiten van patiënten op apparatuur zodat je per dag aan artsen kan doorgeven hoe je situatie is, je hartslag, je bloeddruk, je suikermeting voor diabetes patiënten. Ja, dat soort dingen."*
eHealth for online messaging - *P10. "Je kan er dingen mee opzoeken, je kan er mee corresponderen, berichtjes heen en weer."*

The perception of eHealth appeared to be not always clear after a thorough explanation of eHealth. eHealth got confused with general helping aids or apps that, in essence, were not eHealth, such as a digital newspaper or a helping aid like a magnifier.

eHealth as helping aid for VI - *P4. "Het is toch alleen maar voor de elektronica eigenlijk? Als hulpmiddel?"*
eHealth as helping aid for VI - *P14. "Ik neem aan dat u met eHealth bedoelt dat de krant voorgelezen kan worden? Met dat vergrootglas?"*

The elderly that did want to know more about eHealth, requested more general information about eHealth. They asked what eHealth all contained, where to find information about eHealth, if eHealth was still feasible for them, how eHealth can help them see better or how eHealth can be used with regard to helping aids for better sight, what the possibilities are with eHealth and how eHealth can be taught. The elderly did not came up easily with their answers. Eventually the researcher gave examples on which the elderly confirmed what they wanted to know.

Feasibility of eHealth - *P2. "*Oudere*: Wat het allemaal inhoud en of dat zin heeft voor mij.*
Interviewer*: Dus meer over de mogelijkheden van eHealth?*
Oudere*: Ja, als dat voor mij nog haalbaar is."*
eHealth for better sight - *P5. "*Oudere: *Ja ik zou dus graag weten wat voor mogelijkheden zijn er toch om meer te kunnen zien? Want dat is voor mij de allerbelangrijkste vraag natuurlijk. En ook om zelfstandig te blijven.*

3.1.3 eHealth attitudes and their associations to health

The attitude regarding eHealth differs greatly among the elderly. For most elderly the subject eHealth is new and had not long been considered before expressing an opinion.

eHealth is new for VI elderly - *P4. "*Interviewer*: Wat vindt u van eHealth?*
Oudere*: Hoe kan ik dat nou zeggen? ik hoor het voor het eerst?*
Interviewer*: En gaat er dan iets door u heen als u erover hoort? Een bepaalde gedachte?*
Oudere*: Nou tot nog toe niet."*

eHealth had both negative and positives sides since the given eHealth examples varied in required knowledge and skills. Three elderly perceived no added value of eHealth because they believe they do not specially need eHealth or technology to monitor their health or contact healthcare professionals. A few elderly believe that the 'non-eHealth' way is as faster or easier than using eHealth.

No added value, eHealth is no better replacement for the non-technological way - *P6. "Dus net zoals hoeveel stappen je maakt op een dag enzo. En op een gegeven moment denk je van, wat win ik er eigenlijk mee. Daar ben ik mee gestopt. Dan denk ik toch dat dat soort gegevens een beetje loze gegevens zijn. Tot het moment dat ik bij de arts kom en dat hij vraagt van, goh en hoeveel bloedneuzen heeft u deze maand gehad? En dan kan ik dat ook gewoon in mijn agenda noteren, snap je. Dan heb ik daar niet een app voor nodig speciaal."*

Moreover, eHealth was perceived to be time-consuming, explaining that a phone call would be easier and faster than using eHealth. The elderly considered eHealth to be energy-consuming due to the effort to use a computer or other device while being visually impaired. As a result of vision loss and a lack of overview, operating a device often requires more steps and can be more intensive. eHealth was also seen as sedentary and not interactive since some elderly feel like eHealth consists of equipment that you can only sit and listen to. Due to magnifying and speech enabled software, often the overview on a screen is lost. As participant 7 illustrates, it might make it more time and energy-consuming to use eHealth.

eHealth is sedentary and not interactive - *P1. "Maar het zijn allemaal wel apparaten. Alleen maar zitten en luisteren vaak he."*

A phone call is faster than eHealth as a website with speech for a blind person - *P7. "Dat sommige dingen een beetje te ingewikkeld zijn om te doen en teveel energie kosten. Telefonisch een afspraak maken gaat vlugger dan dat ik het via de website ofzo doe. Want dan moet je eerst inloggen, dan moet je kijken van waar kan je dat. Dan krijg je zoveel informatie. En dan krijg je eerst al die lijsten met al die linken enzovoort. Dan heb je op een gegeven moment iets en dan moet je weer daar op klikken. En dan ga je eigenlijk weer opnieuw beginnen, dan krijg je weer al die lijsten, in braille. En een ziende die ziet dat veel vlugger. Ja en dat weerhoudt me dan wel een beetje."*

Missing personal contact was mentioned due to the fear of losing humanity and not wanting to rely on eHealth only. Personal contact was lacking when talking about having a conversation with a healthcare professional (e.g., psychologist, doctor or physiotherapist). The elderly do not prefer to participate in a (complex) dialogue with a healthcare professional if it is not face-to-face contact. They want to experience the presence of a human, the atmosphere and hear a human voice, someone who reacts to them in a personal way. The VI elderly want the opportunity to have a dialogue, being able to ask questions and get answers directly. Rather than mailing several times back and forth and needing to wait for an answer.

A lack of personal contact - *P6. "Het enige wat ik natuurlijk altijd zou missen bij eHealth, hoe dan ook, het persoonlijk contact. Dat zal natuurlijk altijd missen. En dat heb je wel, als patiënt , hoe dan ook nodig. Je kunt het systeem nooit helemaal loslaten van... als je mensen van vlees en bloed tegenover je hebt zitten eens in de zoveel tijd, en een gesprek zo kunt hebben he, dan is dat toch anders dan wanneer je dat achter de knoppen moet doen."*
A lack of personal contact - *P8. Alleen moet je wel uitkijken dat het niet de menselijke maat verliest. Dat er ook persoonlijk contact moet zijn. Anders krijg je 's morgens zo'n videostemmetje: Goedemorgen, bent u al wakker? haha. Dat lijkt me nou niks."*

Searching online for information regarding health or healthcare was perceived to be positive because you can do it with ease, it is within reach, you do not have to look in health books or dictionaries anymore and via devices you can use voice-enabled software. This was also positively associated with their health by means of facilitating the opportunity to make online contact or search online for information. Therefore, relating to feeling more independent. However, the amount and diversity of online information was perceived as overwhelming. A few elderly described that it was difficult to choose which information to pursuit, especially

without the help of an expert. Therefore, indicating that they do not know when to trust an online source.

Web-based eHealth is quick - *P9. "Het is even opzoeken en je hebt wat. Je googled het maar en het komt wel tevoorschijn."*
Web-based eHealth is within reach - *P10. "Ja, dan kan je alleen maar zeggen... dat het geweldig is. Dat je binnen handbereik dingen kan opzoeken die je niet in woordenboeken of weet ik wat hoeft op te zoeken. In die gezondheidsboeken."*
eHealth through a technology is accessible through speech/magnifying software - *P13. "Maar op de computer kan je dingen oproepen, dan wordt het voorgepraat voor je (voorgelezen).*
Trouble trusting a online source - *P11. Maar moet ik naar de fysiotherapie, ooh er zijn weet ik veel hoeveel sites met allerlei oefeningen voor bijvoorbeeld een hernia. Maar ik wil echt duidelijk advies via een... Wie zegt dat ik de goede antwoorden krijg via een eHealth?"*
Web-based eHealth can be overwelming with information - *P3. "Je kunt op internet heel veel vinden en af en toe kun je daar te veel op vinden want je hoort allerlei positieve en negatieve dingen. Dat is altijd lastig om daar een juiste keuze in te maken."*

Several other advantages regarding eHealth were given: eHealth helps you keep up with society, it would make it easier to handle all appointments with a hospital online, you can take control over your own business, it is convenient in your own time and eHealth can be a (small) addition to the knowledge provided by a healthcare professional because you can search online for extra information when needed. Especially keeping up with society was positively associated with their health by means of having the opportunity to know what is happening in the world (e.g., through a webbox, a radiolike device that is connected to the internet in order to offer spoken newsletters, magazines, subtitle and more). Therefore, feeling more independent which in turn affects their health. Fewer elderly even indicated feeling less lonely by being able to listen to (foreign spoken) news and reading newspapers, books or magazines. Without these devices some elderly miss their connection to society.

eHealth conncts you to society - *P1. "Ik kan niet meer alleen zelfstandig naar buiten. Daar zie ik te weinig voor. Kijk, dan vind ik het wel. Met al die apparaten heb je een stukje buitenwereld.. haal je naar binnen."*

eHealth enables positive feelings of independence - *P3. "Ja, ik denk hier wel positief over. Kijk, als je dat zelf kunt opzoeken en regelen en je kunt er zelf iets aan sturen. Dat euh, doordat je er zelf iets mee kunt doen dan helpt je dat vooruit. Nou om me beter te voelen. Om positiever in het leven te staan. Kijk, als je lichamelijk niet in orde bent en je kunt dat soort middelen gebruiken, dat helpt je om je weer beter te gaan voelen en ook beter te zijn."*
eHealth makes it easier to plan appointments in the hospital - *P6." Het maakt het een stuk makkelijker voor je." (Om afspraken in het ziekenhuis online te regelen)*
eHealth is convenient in your own time - *P7. "Ik denk wel gewoon makkelijker want je gaat het behandelen op een moment dat het mij uitkomt."*
Online health information is a convenient addition to the information provided by a healthcare professional - *P11. "Eigenlijk als kleine aanvulling op de kennis die je kan opdoen bij een hulpverlener. (…). De laptop, de computer dat vind ik ideaal voor het nazoeken van bepaalde gegevens, van hé, wat bedoelen ze hier mee. En kom ik er dan niet uit dan kan ik altijd even de arts bellen.*

Because helping aids were also perceived as eHealth, they were positively associated with their health by means of feeling independent. However, rather the absence of devices were considered to negatively affect their health. Explaining that without a computer or other devices, feelings of loneliness, dependence, crankiness or limitations could occur. However, the devices have to be working and accessible otherwise its usage can be exhausting or can lead to feelings of crankiness.

A lack of eHealth enables negative feelings of dependence - *P14. "Maar als ik niet meer de krant zou kunnen lezen of zo de telefoon kan bedienen. Dan denk ik dat ik me eenzaam begin te voelen en dan zal ik waarschijnlijk chagrijnig gaan worden omdat ik dan niet kan wat ik eigenlijk wil of eigenlijk vind dat ik moet doen. Dan voel ik me echt beperkt. En dan moet ik veel aan mijn omgeving vragen. En dat ik iedere keer moet vragen of ik met de auto... En dat willen ze wel maar als je om de 10 minuten wat vraagt is dat weer irritant."*
A lack of technology negatively affects leisure time - *P15. "Als ik mijn computer niet meer heb, dan heb ik geen hobby meer. En dan kom ik geestelijk in een verschrikkelijk dal terecht. Waar ik niet meer uit zal komen, denk ik."*

3.2 RQ 2: Do visually impaired elderly intend to use eHealth?

3.2.1 RQ 2: Summary

Overall, the majority of interviewed elderly has the intention to use eHealth. In particular to exchange knowledge and experiences with other VI people online or to contact a healthcare professional online to ask a question or make an appointment. However, the elderly do not want to follow an online course or receive online treatment. At least not entirely without human contact such as face-to-face dialogues. Various barriers were mentioned concerning eHealth that overlap and supplement the negative attitude described in RQ 1. Two thirds of the interviewed elderly believed that their friends and family would use eHealth for themselves whereas half of the interviewed elderly believed that their friends and family think the elderly person should use it. Life spam was mentioned several times by the elderly. They explained that eHealth is easier for younger people to use and more done by younger people and that less older people use eHealth because of their age.

3.2.2 Intention to use eHealth/devices

The elderly were asked, when given the chance, if they would use one or more of the given eHealth examples shown in Table 8.

Table 8. Given examples of eHealth

1. Making an appointment with a healthcare professional through the use of the internet, for example, by sending an email.
2. Asking a question to a healthcare professional through the internet.
3. Following a rehabilitation course from Bartiméus through the internet by using video calls.
4. Using a tablet or smartphone to read about your visual impairment in an app from Bartiméus.
5. Following a course through the internet to learn how to deal with, for example, loneliness or depression.
6. Exchanging experiences and knowledge with other visual impaired people through the internet.

Two thirds of the interviewed elderly (eleven elderly) had the intention to use at least one of the given eHealth examples. However, several barriers were mentioned that overlap with the negative attitude described in paragraph 3.1.2. The visual impairment itself plays a role in the elderly's intention to use eHealth because being visually impaired in general costs energy too. Being visually impaired affects daily living and might therefore cost more energy. In addition, using devices might require more steps and its use can be more intensive. If an elderly intents to use eHealth, it should not add to their fatigue. Furthermore, the elderly cannot use the given examples when there is no internet connection or when the internet or available devices are not being used. In addition, some elderly did not have the money or were not willing to spend it on internet or other devices because there was no motivation or willingness to try it at all.

Due to vision loss eHealth is more energy-consuming - *P6. "Euhm ja, in principe wel. Maar sinds blijkt dat ik slechtziend ben is dat wel lastig hoor. Ik zoek steeds minder op omdat het mij zoveel moeite kost."*
Lack of internet as a barrier for eHealth - *P5. "U noemt het allemaal via het internet, en als je dat nou niet hebt, niet gebruikt. Dan wordt het lastig ja."*
Other priorities for money than eHealth - *P5. "Want kijk, voor die Webbox moet je ook internet hebben he. En dat heb ik dus niet, dat kan ik zo weer krijgen hoor maar dat kost ook weer geld natuurlijk. En ik kan er toch niet mee omgaan dus waarom zou ik dat dan doen he. Dat kan ik het geld beter voor andere dingen gebruiken."*

Missing personal contact was considered a negative attitude as well as a barrier when relating to the intension to use eHealth. Missing personal contact was most mentioned when following online treatment or an online course. Face-to-face contact was preferred in these examples.

Choosing personal contact over eHealth - *P15. "Interviewer: Een cursus krijgen via het internet voor bijvoorbeeld eenzaamheid of depressieve klachten.*
Oudere: (...). Maar om dat via een PC te doen.. Nee, dat doe ik liever persoonlijk, zulke dingen."

When there is the intention to use eHealth, the following three examples were most chosen: The elderly would contact a healthcare professional online to make an appointment or ask a question. The elderly would also exchange knowledge and experiences online with other VI people.

Making online appointments and searching for information - *P3. "Jazeker, die eerste twee zou ik sowieso gebruiken. En ook bij Bartiméus zou ik gaan zoeken en ik zou dan ook afspraken maken."*

Online contact with other VI people - *P12. "Vooral die laatste, dingen uitwisselen met andere visueel gehandicapten, dat wel. Via internet ja."*

3.2.3 Social influence

Regarding the intention to use eHealth, social influence was explored by investigation if and how an individual perceives that important others believe he or she should use the new system. The elderly in this study were asked to indicate how they feel about statement one and two as shown in Table 9.

Table 9. Statements for social influence

1. Contacting a healthcare professional via the internet is something that my friends and family would like to do for themselves.
2. Contacting a healthcare professional via the internet is something that my friends and family would like me to do for myself.

Almost two thirds of the elderly (nine elderly) agreed and believed that their family and friends would use eHealth for themselves in the context of contacting healthcare professionals online. The elderly believe that you can ask questions online and probably get answers more quickly than when going to the doctor. It is considered as easy and if one has computer skills, one would use it. The elderly also believe that the youth would use eHealth because they are young and eHealth should come easy to them.

Others would use eHealth because its ease and speed - *P6. "Ja, daar ben ik het wel mee eens, ik denk dat ze dat wel graag zouden willen ja. Omdat je als snel kunt duidelijk maken dat dat makkelijk is. Dat je niet meer hebt dat je wat nodig hebt maar dat er een heleboel vragen zijn die je ook makkelijk zo kunt stellen en daar krijg je ook vrij snel antwoord op."*

eHealth is easier for younger people than older people - *P9. "Oh jazeker, voor zichzelf, ja, zeker, die doen alles via internet. (…). De jeugd die doet het allemaal. De jeugd die legt je dan wel eens wat uit en dan snap je het allemaal en dan draaien ze zich om, ze gaan weg. En dan zeg je van hé, hoe zit dat ook alweer. En dat is iets waar ik met heel veel mensen van mijn leeftijd over hoor. Zij denken dat wij het allemaal even gauw in de gaten hebben als zijzelf. Dat ze jong zijn, dat hebben ze (...) in de gaten. Totdat je ouder bent, dan lukt dat niet."*

Four elderly disagreed with statement one because some elderly believe it is age-related and their friends and family are of similar age and would therefore not use it. Two elderly did not know whether their friends and family would use eHealth for themselves.

eHealth is age-related - *P15. "Daar ben ik het mee oneens. Ik denk namelijk dat dat leeftijdsgebonden is. En aangezien mijn vrienden allemaal van mijn leeftijd zijn. En de meeste van mijn vrienden niet met Pc's werken."*

Six elderly disagreed with statement two but were not clear in their reasoning. Two elderly did not know whether their friends and family believe the elderly person should use online contact with healthcare professionals. At last, half of the elderly (seven elderly) agreed with statement two. Despite unclear reasoning, one reason was given: It can be a comforting idea for friends and family if they know that the elderly person can take care of himself, therefore, friends and family would stimulate the behaviour of contacting healthcare professionals online.

eHealth enables independence and is therefore stimulated by family - *P3. "Ook mee eens. Want dat geeft voor hun het idee van euh, hij kan zichzelf wel redden en die probeert het zelf te doen. En daarom stimuleren ze dat wel."*

3.3 RQ 3: What do visually impaired elderly perceive to be the characteristics of eHealth?

3.3.1 RQ 3: Summary

Effort expectancy, performance expectancy and the level of difficulty using the internet were used to explore the perceived characteristics of eHealth by the VI elderly. The effort expectancy (i.e., the degree of ease) was perceived as positive by half of the elderly. Indicating that these elderly consider eHealth to be easy to use by thinking it is easy to learn, easy to do and that it fits into their daily routine. The other half of the elderly did not know or disagreed with eHealth being easy to use.

The performance expectancy (i.e., believing eHealth is helpful) was also considered to be positive by half of the elderly. Indicating that the elderly believe eHealth will help them by thinking that it will make it easier to contact healthcare professionals when they want, that eHealth helps them to longer live independently, that it works well and that eHealth is a

pleasant way to interact with healthcare professionals. The other half of the elderly disagreed or did not know if eHealth was helpful.

The elderly perceived eHealth, or in particular the internet usage, to be difficult because they are not fully comfortable using devices/internet. This is also due to new required skills when becoming visually impaired in order to work with devices/internet. The other third believes that using the internet is easy because they have managed to work with computers (or other devices) over the years.

3.3.2 Effort expectancy

eHealth's effort expectancy was divided among the VI elderly. Effort expectancy is the degree of ease associated with the use of the system. It was explored with three statements regarding contacting healthcare professionals online as shown in Table 10.

Table 10. Statements for effort expectancy

Statement	Number of elderly		
Contacting a healthcare professional via the internet…	Agree	Disagree	d.n.k./neutral
1. …is easy to lean.	7	6	2
2. …fits into my daily routine.	8	3	4
3. …is easy to do.	7	4	4

3.3.2.1 Effort expectancy: Statement 1. …is easy to learn.

Half of the interviewed elderly (seven elderly) agreed with statement one because: You need the right skills. If you are interested in eHealth then it should be easy to learn. If eHealth was not easy then people would not be working on it. And some elderly find it easy because they could already work with computers or other devices.

eHealth is easier when technically skilled - *P8. "ik kan goed de apparatuur gebruiken dus dan is het makkelijk om contact op te nemen."*
eHealth should be easy - *P15. "Ik denk dat omdat ik er vanuit ga dat het gewoon gemakkelijk is. Anders was men er niet mee bezig."*

A third of the interviewed elderly (six elderly) disagreed with statement two because it is age-related, you need (computer) skills and if you feel reluctant towards the idea of eHealth, it would not even be worth the effort to learn how to work with it. Two elderly did not know if

it was easy to learn because they felt uncomfortable expressing an opinion about something they do not have experience with.

Not easy with older age - *P5. "Nee, nee, op mijn leeftijd is dat niet makkelijk."*
Not easy when reluctant towards eHealth - *P11. "Ik denk het niet. Ik ben al heel terughoudend daarin, dus is het voor mij sowieso al heel erg moeilijk. Als ik het er niet mee eens ben dan zal ik er de moeite niet voor doen."*

3.3.2.2 Effort expectancy: Statement 2. …fits into my daily routine.

Eight elderly agreed that contacting healthcare professionals via the internet fits into their daily routines because they have the time to use it and they already use a computer daily or other device. Three elderly disagreed with statement two because they do not use devices (anymore) or they have other priorities than using the internet. Four elderly were neutral or did not know if contacting a healthcare professional fits into their daily routine.

Enough time for eHealth - *P15. "Omdat ik daar tijd genoeg voor heb."*
No time because of other priorities - *P10. "Nee, ik ben er niet altijd mee bezig. (…) Ook al zou ik wel iets willen weten. Dan gaan andere dingen voor."*

3.3.2.3 Effort expectancy: Statement 3. …is easy to do.

Half of the interviewed elderly (seven elderly) agreed that contacting healthcare professionals via the internet is easy to do because once you know how it works, it is also easy to do.

eHealth is easy when it works - *P3. "Wanneer je dus contact kan krijgen. Ja, dan gaat het prima."*
eHealth is easy once you know how it works - *P10. "Als je het eenmaal kent dan is het ook makkelijk om te doen."*

Four elderly disagreed with statement three because: you need enough skills to make online contact. Otherwise, eHealth would not be relevant due to a lack of skills. In addition, it can be privacy sensitive and there is a higher threshold when you need to create another code or password in order to use eHealth safely. Four elderly were neutral or did not know if it was easy to contact healthcare professional via the internet.

Guaranteeing privacy requires more steps which make it difficult - *P11. "Ik denk dat het enigszins moeilijk is. Want je zult ook codes moeten gebruiken. (…). Je moet weer een wachtwoord bedenken, je moet weer.. ik denk dat het wel even een drempel is. Als ik naar mijn huisarts iets via de skype moet. Ik denk dat er toch wel een beveiliger op moet zitten? Dat niet iedereen zomaar kan meekijken of luisteren."*

Difficult when not technically skilled enough - *P13. "Maar als je het aan mij vraagt is het nog niet makkelijk. Want ik kan er nog niet voldoende mee. Ik kan het niet makkelijk doen. In dit stadium is het niet relevant voor mij want ik kan het niet makkelijk doen."*

3.3.3 Performance expectancy

The performance expectancy is the degree to which an individual believes that the system will help him or her. Four statements were given regarding contacting a healthcare professional via the internet as shown in Table 11.

Table 11. Statements for performance expectancy

Statement	Number of elderly		
Contacting a healthcare professional via the internet…	Agree	Disagree	D.n.k./neutral
1. …makes it easier to contact a healthcare professional when I want.	9	3	3
2. …enables me to live independently for longer.	8	1	6
3. …works well.	7	1	7
4. …is a pleasant way to interact.	6	4	5

3.3.3.1 Performance expectancy: Statement 1. …makes it easier to contact healthcare professionals when I want.

The performance expectancy among the elderly was divided. Two thirds of the interviewed elderly (nine elderly) agreed with statement one. According to the elderly you have a clear entrance and it is convenient in your own time. Asking a (simple) question online can be faster rather than going to the doctor because not everyone is always directly available when calling for an appointment. By sending an email, the receiver will eventually see it in the mailbox and according to the elderly it is okay to have to wait, knowing that the process has started. Three elderly were neutral or did not know how to rate statement one. Three elderly disagreed with statement one although only one explanation was given: Healthcare services always allow for a consultation hour or the secretary indicates when it is convenient to call

back. Therefore, providing more non-online opportunities to contact or visit a healthcare professional.

Convenient in own time - *P8. "Helemaal mee eens. Dan heb je een duidelijke ingang. Je kunt het doen wanneer je wil. Iemand ziet het wel een keer. En als je belt bijvoorbeeld, dan is niet iedereen bereikbaar. En als je het via internet doet dan ziet je het een keer vanzelf."*
Online consult can be faster than going in person - *P10. "Omdat het sneller gaat. Anders moet je eerst een afspraak maken, bellen. En dan moet je er nog weer naar toe. En als je het nu zo doet, via internet. Dan moet je misschien wel wachten op het antwoord. Maar dan draait het in ieder geval."*
Enough non-eHealth opportunities that work as good - *P11. "Oneens. Iemand van de gezondheidsdienst heeft altijd wel een telefonisch spreekuur. En die heeft altijd wel een secretaresse of secretaris, dat je even kunt vragen van, wat moet je hiermee aan. En kunnen ze dat op dat moment niet uitleggen dan kunnen ze dan zeggen wanneer ik wel kan bellen."*

3.3.3.2 Performance expectancy: Statement 2. … enables me to live independently for longer.

Half of the interviewed elderly (eight elderly) agreed with statement two. According to the elderly contacting healthcare professionals online is easy and noncommittal which the elderly feel it would enable them to longer live independently. A third of the elderly (six elderly) were neutral or did not know how to answer statement two. One elderly person disagreed with statement two but was not clear in his reasoning.

Easy and non-comitial contact - *P7. "Omdat je op die manier gewoon makkelijker en vrijblijvend contact hebt."*

3.3.3.3 Performance expectancy: Statement 3. …works well.

Half of the interviewed elderly (seven elderly) agreed with statement three. However, it was mentioned that eHealth has to be well implemented at the organisation who offers it. Other elderly just agreed with the statement whereby two elderly said that it just works without further reasoning. Seven elderly were neutral or did not know how to explain their answer on statement three. One elderly person disagreed but this was due to her personal preferences.

eHealth has to be well implemented - *P8. "Nou, als de andere kant het ook goed heeft geïmplementeerd dan werkt het goed ja. Maar dat ligt een beetje aan de organisatie aan de andere kant. Ik ben het er wel mee eens maar dan moet het wel aan de goede voorwaarden voldoen."*

3.3.3.4 Performance expectancy: Statement 4. ..is a pleasant way to interact.

A third of the interviewed elderly (six elderly) agreed with statement four and four elderly disagreed. Despite agreeing or disagreeing, there was some discussion about 'pleasant' not being the right word to describe the online interaction. According to some elderly this way of interacting was unilateral and it could be pleasant until the online interaction becomes too complex. A real voice or face-to-face contact was preferred over online interaction. In addition, online interaction is considered pleasant in such a way that it is easy and you do not have to leave your home to do it. A third of the interviewed elderly (five elderly) were neutral or did not know how to rate statement four.

Onlline mailing is one-sided - *P8. "*Oudere*: Nou het is eenzijdig. (...). Het is niet een kwestie van aangenaam. Het is het sturen van een mail, het is wel aangenaam, je hebt het gedaan. En dan moet je afwachten tot iemand reageert. Dat is niet echt een kwestie van aangenaam het is gemakkelijk en dan ben je er vanaf, dan heb je het gedaan."*
pleasant to use form home - *P12. "Je hoeft er niet voor de deur uit."*
Pleasant until becoming too complex - *P14. "(...) maar zodra het gecompliceerd wordt.. dan moet het mondeling bij mij zodat ik een tussenvraag kan stellen."*
eHealth interaction can feel distant - *P6. "Aangenaam dat doet mij denken aan gezellig, leuk en prettig, daar kies je voor en dat doet me denken aan persoonlijk contact. Via het internet… Het is afstandelijker.*

3.3.4 Difficulty level of internet usage

The elderly were asked to indicate to what extent they found using the internet difficult or easy followed by a possible explanation. Half of the interviewed elderly (seven elderly) reported that using the internet is difficult or that they find it difficult nowadays because they became visually impaired. The elderly explained that they are not comfortable using more than only basic aspects (e.g., simple Google searches or email) on a device. In order use the internet on a computer or other device the elderly indicate that new skills have to be learned (e.g., working with magnifying and speech enabled software). In addition, these skills may

require more effort (i.e., carrying out extra steps) in relation to people with normal sighted skills which can make the internet more difficult for VI elderly. Two elderly were neutral or did not know about the difficulty level of internet because they are doubtful or have no experience with the internet.

Internet use is difficult - *P1. "Ik vind het moeilijk. Omdat ik het internet niet machtig ben. Nee, ik zit niet op het internet, nee. Ook met die mailgroep maar verder doe ik er niet veel mee (met de computer)."*
Difficulties using internet due to vision loss - *P5. "Omdat ik dat kon zien. Ik kon het nog zien. (...). Het is dus zo, als ik iets weten wil op internet dan vraag ik het aan mijn nicht. Zoek jij dat eens even voor mij op op internet. Ik kan het zelf niet."*
Difficulties using internet due to vision loss - *P13. "Nee, ik vond het makkelijk, internet, toen ik nog ziende was.(...). Op dit moment is het best moeilijk voor mij, moeilijk. Door mijn visuele beperking is het best moeilijk ja."*

Six elderly found the internet easy to use. According to them working with computers and the internet was learned over the years. Some elderly say that if you once know how it works its use will go automatically after that.

Practice makes eHealth easier - *P6. "Gewoon makkelijk. Het wijst zich vanzelf op een gegeven moment. Je moet er aan gewend raken, dat wel. Maar het is allemaal een maniertje en als je het maniertje eenmaal weet dan is dat heel makkelijk. (...). Eerst dien je ze te leren. Er moet iemand zijn die je er op wijst, hoe het moet en als je dat weet dan is het makkelijk."*
Experience make eHealth easier - *P15. "Heel erg makkelijk. Omdat ik daar al, zo lang internet bestaat, al mee werk. (...). Ik gebruik al rum 35 jaar computers. Ik ben ermee opgegroeid."*

3.4 RQ 4: Which media is used by visually impaired elderly?

3.4.1 Available and actual used devices.

The devices that the elderly use or have access to are helping aids for the visually impaired (HAVI) or other technological devices (OTD) . Table 12 shows that the majority of interviewed elderly has access to or uses a computer/laptop with speech/magnifying software, a daisy player (i.e. a blindly operable device that reads audiobooks out loud), a smartphone

and a webbox (i.e. a radiolike device that is connected to the internet in order to offer spoken newsletters, magazines, subtitles and more). However, the usage frequency differs greatly per device for each elderly person (e.g., twice a week to once a day). There is a large diversity regarding what device is most or less used by the VI elderly in this study. It is remarkable that the three early onset blind elderly in this study did use their computer or smartphone more often or were more comfortable using it. This might be explained due to frequent use of technology as a helping aid at a younger age than other elderly in this study who became visually impaired later in life.

Table 12. List of available and used devices mentioned by the VI elderly

Available devices	Device mentioned as available by (n) elderly	Device mentioned as used by (n) elderly	Type of device
Computer (with speech/magnifying software)	9	9	OTD
Daisy player	8	8	HAVI
Smartphone	7	7	OTD
Webbox	7	7	HAVI
Laptop (with speech/magnifying software)	5	4	HAVI
Monitor magnifier	5	5	HAVI
Tablet	4	2	OTC
Electronic magnifier	3	3	HAVI
Memo recorder	4	4	HAVI
Regular mobile phone	2	2	OTC
Braille reading line	2	2	HAVI
Home phone	1	1	OTD
Television	2	2	OTD
Home phone	2	0	OTD
eReader	1	0	OTD
Radio	1	1	OTD
Light detector	1	1	HAVI
Regular magnifier	1	1	HAVI
GPS navigator	1	1	HAVI

Note: The upper part of this table might be more accurate since the VI elderly were more thinking of electronical devices in light of their visual impairment rather than electronical devices in general. This might explain why common technologies (e.g., TV and radio) are barely mentioned.

3.5 RQ 5: How can visually impaired elderly be coached to work with eHealth?

3.5.1 RQ 5: Summary

The skilfulness regarding devices differs for each elderly, depending on skills and experience with devices. The channels through which the elderly hear about eHealth are mostly via this

study or the media. Learning how to work with devices occurs in different ways that could take place simultaneously or additionally (e.g., taking lessons from Bartiméus while at the same time being assisted by friends or family). When offering assistance, it is important to take into account the limitations regarding devices as a result of the elderly's visual impairment and other impairments. Furthermore, the instructor needs to have patience and take one step at the time, cannot go too fast and repeat steps when needed. The instructor must be able to listen and advise well.

3.5.2 Channels to hear about eHealth

Two thirds of the interviewed elderly (ten elderly) have learned about eHealth through their participation in this study. Two elderly heard about eHealth via the hospital. The results show that the media (i.e., radio, television, newspapers) are also channels that elderly learn about eHealth.

eHealth channel - hospitaal - *P6. "Alle patiënten van dat ziekenhuis worden daarop gesteld dat dat kan. Dat gebeurt in het ziekenhuis zelf. Als je bij het ziekenhuis bent dan zie je in alle ruimtes bij alle afspraken flyers."*
eHealth channel – media - *P8. "Ik denk euh, dat weet ik niet hoor. Informatie via radio, televisie of via krantenartikelen. Ik heb echt geen idee.(…). Ik hou het gewoon graag bij, laat ik het zo zeggen. Het valt in mijn interesse gebied. Dan kom je daar vanzelf achter."*
eHealth channel – this study/Bartiméus - *P10. "Via jou. ik heb het niet eerder gehoord."*

3.5.3 Ways to learn skills

Several ways were described in which the elderly have learned to work with devices or in most cases the computer. The elderly described the following ways: Learning it over the years during work or hobbies, it was self-taught, computer lessons were taken in an elderly center or they were assisted by friends or family. Bartiméus was mentioned too by means of a computer course that could be taken in group form or individually but Bartiméus also assisted with other devices such as a daisy player, webbox or memo recorder. However, Bartiméus only offers computer accessibility lessons with regard to the visual impairment of the elderly (e.g., working with speech/magnifying software or other electronic helping aids). It appeared to be common that the elderly used more than one of the mentioned ways simultaneously or additionally.

Computer lessons at elderly center - *P1. "Toen heb ik dus bij een ouderencentrum, heb ik die computer geleerd."*
Self-taught and help of family - *P4. "Heb ik mezelf geleerd. Ja, met mijn zoon enzo erbij. Die wist het natuurlijk."*
Computer course of Bartimeus - *P7. "Ik heb een cursus van Bartiméus gehad voor de iPhone en de computer."*
Self-taught/hobby - *P9. "Meer mijn hobby eigenlijk, wat erachter zit. Beetje hobby."*

3.5.4 Points of attention for skills training

The elderly that received ICT training from Bartiméus were all content with how it was taught and by whom. In general, when receiving assistance regarding devices or eHealth, the elderly considered the following aspects to be helpful: The steps need to be clearly explained, one step at the time, not going too fast and repeat steps when needed. The person offering assistance needs to have time, patience and, if possible, an understanding of the vision loss and its limitations regarding devices. Moreover, the instructor is able to listen, guide, advise and show an interest. The elderly perceived training at home as pleasant because of mobility problems due to their visual impairment.

Patience, having and having knowledge of VI elderly's limitations - *P1. "De kinderen ook wel maar die doen het mij veel te vlug. Hij (computertoegankelijkheidsdeskundige CTD) had zoveel geduld ook. Ik moet altijd zeggen: Langzamer want ik kan het niet, ik snap dat niet. En (CTD) die had echt begrip. Die weet de moeilijkheden van ons. Dat hij begrip en geduld even heeft. En CTD had in de gaten wat ik wel zag."*
Showing an interest, listen and advise - *P4. "Prettig, ze hebben belangstelling, ze luisteren goed, ze adviseren goed."*
Getting help at home - *P5. "*Interviewer*: Stel dat u beter wilt worden in het gebruik van eHealth, wie of wat heeft u daar dan bij nodig?*
Oudere: *Iemand die bij mij thuis komt."*

Group lessons versus individual lessons were discussed by some elderly. Individual lessons were perceived as pleasant because you have full attention of the instructor and you do not have to wait on others. Waiting was considered to be unpleasant in group lessons. In addition, the elderly could feel burdened when not keeping up with the group and therefore slowing

down others. The questions other participants ask, where the elderly themselves did not think of but could benefit from, was perceived as positive during group lessons.

Slowing down others in group lessons - *P3. "(…) dat we dus in een groepje zaten. (…). En dat een ander nog bezig is met dingen opzoeken en doen. En dan ben je dus zelf al klaar, of net andersom, dat je zelf nog niet zo ver bent. Dat je dus zelf nog meer hulp nodig hebt. En dat een ander alweer klaar is."*
Learning from others in group lessons - *P10. "En je leert misschien nog van vragen die anderen hebben."*
Having full attention in individual lessons - *P11. "Ik vind dat heel erg lastig. Omdat ik ook met gehoorproblemen zit. En als je één op één hebt dan heb je ook de volle aandacht."*

When offering assistance with devices it is also important to take into account other impairments (e.g., hearing loss or rheumatoid arthritis) and the different perceived skillfulness of the elderly. Depending on the elderly's skills and experience with devices, they might be content working only with relative simple devise (e.g., daisy player or a memo recorder) whereas others might desire making use of more comprehensive devices (e.g., computer, tablet, smartphone or software/features on these devices). However, the desired system needs to fit with the needs and wishes of the user. As participant 5 and 6 illustrates, an app might be easier and more convenient than a website when planning hospital appointments whereas the device needs to have tactile buttons instead of a touchscreen when suffering from a visual impairment and rheumatoid arthritis in the hands (i.e., therefore not being able to see or feel which buttons to press).

Using computer basics - *P4. " Nou, zoveel heb ik daar nooit mee gedaan hoor. (…). Nou ik denk dat ik daarop digibeet ben. Ik kon vroeger wel mailen (…). De dingen op google opzoeken die me interesseerden, dat allemaal wel maar verder niet."*
Using tactile buttons - *P5. "Nou, ik kan het toch niet.. in mijn omstandigheden. Ik kan er toch niet meer mee omgaan. Het is te moeilijk, het is te moeilijk. (…). Nou toch aan dat ik het niet zie en niet kan voelen (reuma in de handen en touchscreens).*
Using a easy app for contact with healthcare professionals - *P6. " Jawel ik doe het wel maar ik snap soms niet wat ik doe hoor. Vandaar dat ik meer voor een app ga dan voor een omgeving waarin ik nu zit. Dan bedoel ik dus mijn (online) patiënt omgeving, zeg maar, in het ziekenhuis. Ik snap wel wat dat er is maar hoe dat nou precies allemaal werkt, dat weet ik*

niet. En daar heb ik ook zoiets van... dat hoeft ik eigenlijk niet te weten. Maar als het allemaal in een appje zou kunnen zou het helemaal mooi zijn. Want ik gebruik wel andere appjes voor contacten met familieleden."

4 Discussion

4.1 Key findings and their implications

The current qualitative study investigated eHealth among VI elderly to explore how potential eHealth services of Bartiméus are related to VI elderly. The VI elderly have little knowledge regarding eHealth and its applications were considered new to the majority of elderly in this study. However, two thirds of the VI elderly were inclined to use at least one of the six given eHealth examples as is similar compared to normal sighted community-dwelling older adults (de Veer et al., 2015). The VI elderly were most inclined to exchange knowledge and experiences online with other VI people. And to contact a healthcare professionals via the internet to ask a question or make an appointment. The VI elderly were not interested in taking an online course or receiving online treatment from Bartiméus. Nor did the elderly show an interest in video communication which was associated with a lack of personal contact. The characteristics of eHealth were considered to be easy to use and helpful by only half of the VI elderly. These findings are slightly lower compared to normal sighted community dwelling older adults (de Veer et al., 2015). And when using eHealth, most elderly might use a computer or laptop to do so since these media were most mentioned as available and used by the VI elderly.

eHealth, as perceived by the VI elderly, also included helping aids for the visually impaired (e.g., magnifiers, audiobooks or other voice-enabled devices). These general helping aids for the visually impaired were considered to be energy-saving compared to how they would otherwise perform the task. These helping aids provided relief and enrichment. As a result, the VI elderly were able to perform tasks that would otherwise not be possible or cost a lot of energy (e.g., not being able to read a book without helping aids versus reading audiobooks with helping aids). The helping aids gave VI elderly the ability to keep up with the media (e.g., voice-enabled devices that read newspapers or subtitles from the news). This shows that VI elderly share a common interest in the media as is similar with normal sighted elderly (Eek & Wressle, 2011). However, meeting this need for VI elderly requires the help of assistive technology. The need for assistive technology is already higher for VI elderly than normal sighted elderly (Dahlin-Ivanoff & Sonn, 2004). eHealth, as perceived by the VI

elderly, contributes to their health by means of being a facilitating factor. Meaning that VI elderly are less limited to perform tasks that they would otherwise have been able to do if they were not visually impaired. This study suggests that eHealth and helping aids for the visually impaired are considered similar according to VI elderly. In addition, eHealth contributes to feeling more independent with the use of devices by taking away limitations. It is rather the absence of eHealth, or in particular its devices and helping aids, that could have a negative contribution to the VI elderly's health. Suggesting that the lack of eHealth could relate to feelings of dependence, loneliness, crankiness and limitations. Thus, according to the VI elderly, eHealth contains a broader aspect of technologies since helping aids are included in their eHealth perception.

There was a noticeable preference for several eHealth examples. This can be partially explained by the variety of the given eHealth examples because they varied in complexity, skills, dialogue and personal contact. The three most chosen eHealth examples have a clear goal and a relative low-threshold. Suggesting that these three examples were possibly considered to be easier and more helpful to use compared to the less chosen eHealth examples. These were perhaps harder to picture and therefore less chosen. Thus, eHealth has several characteristics but due to the variety in eHealth examples it is hard to specify what exactly can be ascribed to these differences in the chosen examples.

A lack of personal contact was negatively associated with the non or less chosen eHealth examples. Mostly because the VI elderly did not want to receive treatment only via the internet. Moreover, the elderly indicated to want to be able to have a dialogue, to have a normal conversation while feeling the presence of a human instead of talking online. Suggesting a need for face-to-face contact, a dialogue in person and a good atmosphere during treatment with the healthcare professional. The combination of these factors might be challenging to include in eHealth only.

eHealth was perceived to be energy and time-consuming. This can possibly be explained due to the fact that a visual impairment can cause great difficulties with the use of information technology (Kim & Han, 2017). For example, having difficulties with typing on a QWERTY virtual keyboard or memorizing the interface layout with smartphone use (Kim et al., 2016). In addition, Schakel et al. (2017) describe that visually impaired people can experience a high cognitive load as a result of their visual impairment. This cognitive load is considered to be a cause for vision-related fatigue. The cognitive load relates to "a variety of cognitive processes that require more energy or resources due to the loss of vision, such as memorizing information, processing (auditory) information, paying attention to the

environment and orientation in the surrounding environment" (Schakel et al., 2017 p.4). However, using voice-enabled devices as a solution to more visual demanding devices is demanding as well with regard to sensory perceptions (Schakel et al., 2017).

The aging process can cause technology interaction disabilities that are separate from the perceived difficulties regarding the visual impairment. The aging process reduces the remaining sensory and physical abilities. This reduction of abilities can cause interaction disabilities with information technology (Kim & Han, 2017) or assistive technology (Miskelly, 2001). In addition, Wobbrock, Kane, Gajos, Harada, and Froehlich (2011) state that it should rather be the user's abilities than disabilities that should be taken into account when designing new technologies. This is in accordance with ability-based design which describes that a technology should be adapted to impaired people rather than impaired people adapting to the technology (Wobbrock et al., 2011). Thus, eHealth technologies can be time and energy-consuming due to difficulties resulting from the visual impairment and aging process or by inadequate technology design.

Internet use can be challenging among VI elderly. The computer, or in particular, the internet, was considered to be difficult to use by half of the VI elderly in this study. In general, older adults show a lower computer self-efficacy (CSE) and internet self-efficacy (ISE) than younger people (Tams, Grover, & Thatcher, 2014). Age is an important factor in the acceptance and use of technology (Venkatesh, et al., 2003) and internet (Seybert, 2012b).The current study suggests that when VI elderly are going to use eHealth, they will most likely use their computer or laptop to do so. Poor computer skills affect the engagement in eHealth (O'Connor et al., 2016). Therefore, computer and internet skills are necessary to effectively implement eHealth among VI elderly. In addition, older adults will encounter difficulties using eHealth when they believe the internet is difficult to use or when there is a lack of internet experience (de Veer et al., 2015). However, the use of UCD is considered to be a prerequisite to influence the usability, acceptance and adoption of eHealth technologies (Van Gemert-Pijnen et al., 2011). Training, experience and encouragement are determinants that can influence the computer self-efficacy (Tams et al., 2014). Letting the elderly practice with the application and informing them about the benefits can increase the acceptance of eHealth (de Veer et al., 2015). Thus, both the user's skills and the design of eHealth technologies need to be taken into consideration when developing eHealth among VI elderly.

4.2 Strengths and limitations of the study

Some limitations of the study are the different operationalisations of the used eHealth examples. eHealth is a big concept and the examples show a variety in required skills, knowledge, complexity and personal contact. Despite the variety in examples, eHealth was often referred to as a whole. Resulting in both negative and positive perceptions of eHealth. Making it challenging to explore which aspects are related to the different characteristics of eHealth. More attention should be given to the different operationalisations of eHealth. Possibly placing similar sub-concepts of eHealth together in order to facilitate a better overview. In addition, this study should have been given more context of use for eHealth. This is in accordance with the first step of the CeHRes roadmap, the contextual inquiry. Context is lacking because this study aimed more on eHealth as potential services of Bartiméus rather than the problems VI elderly face and how technology can improve their health or healthcare. Furthermore, the coding process was done by one researcher. This can affect the reliability of the coding process. However, citations were discussed with the supervisors.

Another limitation is the heterogeneous sample group of this study. The sample group represented a realistic population of VI elderly but it was too heterogeneous for scientific purposes. This led to the results not being fully saturated. There was a great variety in the level of skills, experience with devices, the duration of being visually impaired and the severity and type of visual impairment. This resulted in more generic results because the result were too different to discuss it all in detail.

The VI elderly found it difficult to answer the interview questions. Some elderly answered based on hypothetical situations whereas others only felt comfortable answering based on true experiences. Not every elderly person could form an opinion or found it hard to express an opinion at all. This might be explained due to the lack of context during this study. The elderly were asked to form an opinion based on a concept that was new to them rather than answering questions about what they actually experience such as which problems they face. More attention should be given to experiences instead of expectations.

Several strong aspects of the study are the researcher's great expertise regarding VI people. The researcher is familiar with common experiences and perceptions of VI people. Being able to connect on an equal level and knowing in more depth what the VI elderly meant when expressing themselves where helpful in gaining a better understanding of the VI elderly. Furthermore, the VI elderly in this study were not recruited via interest associations but via

Bartiméus, a rehabilitation center for the visually impaired. Suggesting that the VI elderly had no other gains or interests apart from an honest participation in this study.

Last, the telephonically conducted interviews are a strong aspect because it held no geographical boundaries for VI elderly to participate in the study. Allowing for a better recruitment of the sample group and giving VI elderly a fair chance to participate without mobility limitations.

4.3 Practical/clinical and scientific implications

If Bartiméus wants to provide eHealth services in the future it is recommended to begin with relative low-threshold services that have a good usability. For this usability the system should be informative and help the user guide through the system. It should speak to the user on a understandable level by using concepts that the user is familiar with (Nielsen, 1994a). The VI elderly prefer assistance with existing technology, (e.g., computer, tablet, smartphone) in a way that the instructor or advisor has patience, is able to listen well and has knowledge about the limitations of the VI elderly with technology. The instructor needs to go step by step through the process of learning how to work with technology and needs to repeat steps when needed. This study suggests that the perceived effort and performance expectancy need to increase in order to implement a better uptake and adoption of eHealth. Therefore, the elderly should be informed about or experience the benefits of the potential eHealth services. Their experiences and opinions then need to be taken into consideration when recommending other existing technologies or when designing new ones. This can be done with the use of the CeHRes roadmap which will be discussed later on in this paragraph.

Future research should focus more on blended care to meet VI elderly in their need for face-to-face contact while rehabilitating. Blended care refers to the use of the usual care combined with self-care and technology (Van Gemert-Pijnen et al., 2013). Blended care offers the benefits of the traditional face-to-face care (e.g., with a counselor) and combines it with the benefits of online interventions, this way it can also be more cost-effective since part of the treatment is provided online (Massoudi et al., 2017). Blended care for Bartiméus could be combined with an online client portal that partially offers treatment online in combination with traditional face-to-face contact of Bartiméus.

Contributions of this study focus on the first step of gaining insight into how VI elderly relate to potential eHealth services of Bartiméus. The study's sample group is too heterogeneous and lacks the potential to go into depth regarding eHealth perceptions of different subgroups among VI elderly. Follow-up research should form subgroups. For

example, dividing VI elderly based on their skills and experiences with existing technology, the type and severity of their visual impairment or the age a person became visually impaired. These differences in groups allow for a better understanding of prospective users for eHealth technology because it might be these differences that create different needs and wishes for the user, or perhaps these different groups use different types of technology so that new designed technologies can be adapted to the existing experience and skills of the user. However, the CeHRes roadmap should provide the framework to explore these differences in subgroups.

This study focused partially on the first step of the CeHRes roadmap, the contextual inquiry. However, context is missing because this study focused more on potential eHealth services rather than actual experiences of the VI elderly. When Bartiméus wants to offer eHealth services, they have to be developed since Bartiméus (sector services) has not yet used eHealth services. For designing new technologies the CeHRes roadmap of Van Gemert-Pijnen et al. (2011) will be used. It is now important to define the problem in collaboration with other stakeholders and get an better understanding of the prospective users, their context and strong and weak points of the current healthcare while taking into consideration the different groups of VI elderly. Then the value specification starts in which the different stakeholders determine which values they find most important (e.g., increased, access or increased interaction with healthcare professionals or VI people) and what requirements are needed for the technology to make it fit for the user. These values can be used to set up user-requirements. This process is aimed at exploring the possibilities and limitations of healthcare and to find out which healthcare improvements can be made to realize the values (Van Gemert-Pijnen et al., 2011). In this study it was found that the elderly require a system with a good accessibility, that the system is not energy and time-consuming and that it has a certain level of personal contact with healthcare professionals and other VI people. This, in order to realize the values that the system should make it easier to make appointments with healthcare professionals and to ask questions online. The design of the technology can be made when the requirements are set-up. The design can then be tested with the prospective users to evaluate the process up till now and to put the new feedback into the further development of the technology, or online client portal that can offer the eHealth services of Bartiméus. When the technology is finished, it can be disseminated, adopted and incorporated within Bartiméus. At last, the technology needs to be evaluated to explore how it is used and what the effect of the technology is on the users.

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Appendix A The interview schedule

Het interview schema

Persoonlijke vragen

1. Wat is uw geslacht?
2. In welk jaar bent u geboren?
3. Wat is uw hoogst genoten opleiding?

- Basisschool
- Middelbare school
- MBO
- HBO
- Universitair

4. Hoe woont u?(samenwonend, alleenstaand, verpleeg/verzorgingshuis).
5. Woont u in de stad, een dorp of meer op het platteland?
6. Welke visuele beperking heeft u?
   Bijvoorbeeld:

- Cataract/staar
- Glaucoom
- Macula degeneratie
- Glasvochtloslating
- Diabetische retinopathie
- Ablatio retinae (netvliesloslating)
- Nastaar
- Iets anders, namelijk:

7. Kunt u me iets vertellen over uw visuele beperking? Over hoeveel u ziet en wat uw klachten zijn?
8. Hoe lang bent u visueel beperkt?
9. Heeft u al eens eerder een hulpverleningstraject gehad met betrekking tot uw visuele beperking? (bijvoorbeeld bij Bartiméus of Visio)

- Zo ja, wanneer was dat? Bent u destijds ook bezig geweest met ICT vaardigheden?

Vragen over uw technologie gebruik

De volgende vragen gaan over uw technologie gebruik.

10. Wat bezit u aan elektronische/digitale (hulp)middelen? (elektronische loep, computer, tablet, smartphone etc).
11. Welk van deze elektronica gebruikt u ook daadwerkelijk?
12. Hoe vaak gebruikt u deze middelen? (meerdere keren per dag, enkele keren per week, één keer per week, wekelijks, maandelijks of minder).
13. Draagt het gebruik van deze elektronica bij aan uw gezondheid?

- Kunt u uw antwoord toelichten?

14. Als u uzelf een rapportcijfer mocht geven, hoe behendig vindt u zichzelf met elektronica op een schaal van 1 tot en met 10 waarbij 1 niet behendig is en 10 volledig behendig. Kunt u uw antwoord toelichten?

Kennis

De volgende ragen gaan over uw kennis over eHealth.

15. Weet u iets over eHealth? Wat weet u over eHealth?
16. Wat zou u verder graag willen weten over eHealth?

Attitude

De volgende vragen gaan over uw mening over eHealth.

17. Wat vindt u van eHealth?
18. Wat zijn voor u redenen om elektronische middelen voor uw gezondheid te gebruiken?
19. Wat houdt u tegen om elektronische middelen voor uw gezondheid te gebruiken?

Intentie

Lees opnieuw de voorbeelden op:

- Een afspraak maken met een gezondheidsprofessional via het internet door bijvoorbeeld een email te sturen.
- Een vraag stellen aan een gezondheidsprofessional via het internet.

- Een hulpverleningstraject krijgen van Bartiméus via het internet door videogesprekken te voeren (met Skype).
- Een tablet of smartphone gebruiken waar u in een app van Bartiméus informatie kan vinden over uw visuele beperking.
- Via het internet een cursus krijgen over hoe je om leert gaan met eenzaamheid of depressieve klachten.
- Met andere visueel beperkten ervaringen en kennis uitwisselen via het internet.

20. Als u de kans kreeg, zou u dan één of meerdere van de opgenoemde voorbeelden van eHealth gebruiken in de toekomst? Zo ja, welke dan? Kunt u uw antwoord toelichten?

Technologie gebruik na voorbeelden van eHealth

Ik heb u net een aantal voorbeelden gegeven over eHealth. Eerder tijdens ons gesprek gaf u aan de volgende elektronische middelen te gebruiken…….

21. Welke vormen van eHealth/elektronische middelen vindt u het meest prettig om te gebruiken? Waarom?
- En welk van deze middelen vindt u het meest prettig om daadwerkelijk te gebruiken voor uw gezondheid/eHealth?

22. Welke vormen van eHealth/elektronische middelen vindt u het meest onprettig om te gebruiken? Waarom?

Prestatie verwachting/performance expectancy

Ik leg u nu een paar stellingen voor. Kunt u aangeven in hoeverre u het hiermee eens of oneens bent? U kunt kiezen uit de volgende vijf opties, namelijk: helemaal mee eens, mee eens, weet ik niet, mee oneens of helemaal mee oneens.

23. A. Contact opnemen met een gezondheidsprofessional via het internet maakt het makkelijker om contact op te nemen wanneer ik wil. In hoeverre bent u het hiermee eens of oneens?

    B. Contact opnemen met een gezondheidsprofessional via het internet stelt mij in staat om langer zelfstandig te leven. In hoeverre bent u het hiermee eens of oneens?

C. Contact opnemen met een gezondheidsprofessional via het internet werkt goed. In hoeverre bent u het hiermee eens of oneens?
D. Contact opnemen met een gezondheidsprofessional via het internet is een aangename manier om te communiceren. In hoeverre bent u het hiermee eens of oneens?

Verwachting van inspanning/effort expectancy

Ik leg u wederom een paar stellingen voor. Kunt u aangeven in hoeverre u het hiermee eens of oneens bent? U kunt kiezen uit vijf opties, namelijk: helemaal mee eens, mee eens, weet ik niet, mee oneens of helemaal mee oneens.

24. A. Contact opnemen met een gezondheidsprofessional via het internet is makkelijk om te leren. In hoeverre bent u het hiermee eens of oneens?
    B. Contact opnemen met een gezondheidsprofessional via het internet past eenvoudig in mijn dagelijkse routine. In hoeverre bent u het hiermee eens of oneens?
    C. Contact opnemen met een gezondheidsprofessional via het internet is makkelijk om te doen. In hoeverre bent u het hiermee eens of oneens?

Sociale invloed/social influence

De volgende stelling gaat over sociale invloed. Dezelfde vijf opties gelden weer, namelijk: helemaal mee eens, mee eens, weet ik niet, mee oneens of helemaal mee oneens.

25. Contact opnemen met een gezondheidsprofessional via het internet is iets wat mijn vrienden of familie graag voor zichzelf zouden willen doen. In hoeverre bent u het hiermee eens of oneens?
26. Contact opnemen met een gezondheidsprofessional via het internet is iets wat mijn vrienden of familie graag zouden willen dat u gaat doen. In hoeverre bent u het hiermee eens of oneens?

- Kunt u uw antwoord toelichten?

Self-efficacy

De volgende vraag gaat over de moeilijkheidsgraad van het gebruik van internet.

27. Hoe makkelijk of moeilijk vindt u het om het internet te gebruiken? U kunt kiezen uit: heel moeilijk, moeilijk, neutraal, makkelijk, heel makkelijk of weet ik niet want ik gebruik geen internet.
- Kunt u uw antwoord toelichten?

Vaardigheden/skills/overig

De volgende vragen gaan over hoe u heeft leren werken met eHealth of hoe u eventueel zou willen leren werken met eHealth.

28. Hoe bent u te weten gekomen over eHealth?
29. Hoe heeft u eHealth leren gebruiken?
30. Wie heeft u geholpen om eHealth te leren gebruiken?
31. Wat vond u van deze manier?
32. Wat zou u zelf een prettige manier vinden om eHealth te leren gebruiken?
33. Als u beter wilt worden in het gebruik van eHealth, wie of wat heeft u daarbij nodig?

De toekomst

De volgende vraag is een schaalvraag gericht op het zelfstandig gebruik van eHealth in de toekomst.

34. Stel dat u in de toekomst eHealth wilt gebruiken, welk rapportcijfer zou u uzelf geven in hoeverre u denkt zelfstandig eHealth te kunnen gebruiken? Waarbij 1 ‘helemaal niet zelfstandig’ is en 10 ‘volledig zelfstandig’. Kunt u uw antwoord toelichten?

Appendix B Informed consent

Toestemmingsverklaringformulier

Titel onderzoek: Visueel beperkte ouderen en eHealth
Verantwoordelijke onderzoeker: Rosalie Hoogeveen
Door Bartiméus en de Universiteit Twente

Contactgegevens onderzoeker
Anoniem

In te vullen door de deelnemer

Ik verklaar op een voor mij duidelijke wijze te zijn ingelicht over de aard, methode, doel, risico's en belasting van het onderzoek. Ik weet dat de gegevens en resultaten van het onderzoek alleen anoniem en vertrouwelijk aan derden bekend gemaakt zullen worden. Mijn vragen zijn naar tevredenheid beantwoord.

Ik begrijp dat geluidsopnames of bewerking daarvan uitsluitend voor analyse en/of wetenschappelijke presentaties zal worden gebruikt. Ik geef toestemming dat citaten uit het interview geanonimiseerd gebruikt mogen worden in wetenschappelijke presentaties of publicaties van de resultaten van deze studie.

Ik stem geheel vrijwillig in met deelname aan dit onderzoek. Ik behoud me daarbij het recht voor om op elk moment zonder opgaaf van redenen mijn deelname aan dit onderzoek te beëindigen.

Naam deelnemer:

……..

Datum: …… Handtekening deelnemer: …..…….

In te vullen door de uitvoerende onderzoeker

Ik heb een mondelinge en schriftelijke toelichting gegeven op het onderzoek. Ik zal resterende vragen over het onderzoek naar vermogen beantwoorden. De deelnemer zal van een eventuele voortijdige beëindiging van deelname aan dit onderzoek geen nadelige gevolgen ondervinden.

Naam onderzoeker:

……..……

Datum: …… Handtekening onderzoeker: ...…….

Appendix C Information during the interview

Informatie gedurende het interview

Voorstellen
Beste deelnemer,

Ik ben Rosalie Hoogeveen en in samenwerking met Bartiméus doe ik onderzoek naar het gebruik van eHealth bij visueel beperkte ouderen. Ik studeer aan de Universiteit Twente en zelf ben ik ook visueel beperkt. Via uw begeleider van Bartiméus heeft u al iets gehoord over het onderwerp van dit onderzoek, namelijk eHealth. Voor we van start gaan met het interview zal ik u eerst meer uitleg geven over het doel van het onderzoek en over wat eHealth is. Vindt u het goed als ik dit gesprek opneem zodat ik later de gegevens anoniem kan verwerken?

Uitleg over interview, doelstelling van interview
Het aantal ouderen in Nederland stijgt en er wordt tegenwoordig verwacht dat mensen langer thuis blijven wonen. Een manier om gepaste zorg te bieden is het gebruik van eHealth. eHealth gaat een steeds grotere rol spelen in de gezondheidszorg. Er is echter weinig bekend over wat visueel beperkte ouderen weten over eHealth en of zij het willen en kunnen gebruiken. Deze informatie is nuttig voor Bartiméus zodat zij hun zorgaanbod hierop kunnen aanpassen. Het doel van het interview is om te kijken hoe visueel beperkte ouderen zich uiten over eHealth en wat hen stimuleert of tegenhoudt om eHealth te gebruiken.

Het interview zal naar schatting niet langer dan een uur duren. Het interview kan misschien vermoeiend zijn, mocht het niet meer gaan dan hoor ik het graag van u. Dan kunnen we een pauze inlassen of het interview op een ander moment voortzetten. Na afloop van het interview stuur ik een presentje naar u toe via de post als dank voor uw deelname.

Uitleg en voorbeelden over eHealth
eHealth is een Engels woord wat tegenwoordig ook een begrip is in Nederland. Het betekent eGezondheid. De ‘e’ staat voor elektronisch dus we hebben het over elektronische gezondheid. eHealth gaat over het gebruik van technologie waarbij men gebruik maakt van informatie of communicatie om de gezondheid en gezondheidszorg te ondersteunen of verbeteren. Bijvoorbeeld het opzoeken van informatie of met elkaar praten via het internet. Met technologie kan u bijvoorbeeld denken aan een laptop, tablet, smartphone of computer. Vaak wordt er op deze apparaten gebruik gemaakt van internet. eHealth kan bijvoorbeeld dus

ook via een internetpagina, app of email. Het gaat er bij eHealth wel altijd om dat het ter bevordering is van de gezondheid of gezondheidszorg.
Bij Bartiméus kan eHealth bijvoorbeeld op de volgende manieren gebruikt worden die verschillend van elkaar veel kennis en vaardigheden van de gebruiker vagen:

- Een afspraak maken met een gezondheidsprofessional via het internet door bijvoorbeeld een email te sturen.
- Een vraag stellen aan een gezondheidsprofessional via het internet.
- Een hulpverleningstraject krijgen van Bartiméus via het internet door videogesprekken te voeren (met Skype).
- Een tablet of smartphone gebruiken waar u in een app van Bartiméus informatie kan vinden over uw visuele beperking.
- Via het internet een cursus krijgen over hoe je om leert gaan met eenzaamheid of depressieve klachten.
- Met andere visueel beperkten ervaringen en kennis uitwisselen via het internet.

Heeft u hier tot nu toe nog vragen over?

Dan ga ik u nu het toestemmingsformulier voorlezen voor mondelinge toestemming. Dit formulier krijgt u na het onderzoek ook per post opgestuurd zodat u een handtekening kan zetten en het formulier kan retourneren met de retourenvelop.

Informed consent voorlezen en om toestemming vragen
Zie ander document

Heeft u tot slot nog vragen voor we gaan beginnen met het interview? Mocht u tussendoor vragen hebben dan kunt u die gewoon stellen.

Het interviewschema
Zie ander document

Afsluiting

We hebben nu veel aspecten van eHealth besproken. Ik heb al veel van u gehoord. Heeft u misschien verder nog iets dat u mij wil vertellen voor we dit gesprek afsluiten? Zijn er dingen die u nog graag wilt zeggen of bespreken?
Dan wil ik u heel erg bedanken voor uw deelname aan dit onderzoek en als dank zou ik u graag een presentje willen toesturen via de post. Tevens stuur ik u ook een verklaringsformulier op waarbij u schriftelijk toestemming geeft voor deelname aan dit onderzoek. Daarbij is een retourenvelop inbegrepen. Graag noteer ik uw adres zodat ik u het presentje en het formulier kan opsturen.

Mocht u na het onderzoek nog vragen hebben of in contact willen komen met mij dan kunt u mij bereiken op: Anoniem gemaakt