Assessment Instrument of Technology Acceptance Amongst People with Minor Intellectual Disabilities

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For people with moderate intellectual disabilities (PID) and their carers, eHealth is becoming increasingly important. However, there are no technology acceptance instruments known to determine what PID need to properly deploy eHealth. Therefore, we developed a technology acceptance assessment for PID. A design research approach is applied to develop a conceptual model based on the UTAUT2-model. Based on the outcomes of seventeen interviews with PID experts, two determinants (Public Financing & Voluntariness of Use) and two moderators (Health Literacy & Emotional State) are added to the conceptual model. The conceptual model is translated into a first assessment prototype using the Universal Design technique and Goegan et al's (2018) accommodating principles. The first tests that took place within this research confirm the applicability of the instrument and provides the first clues for the explanatory value of the conceptual model for the adoption of eHealth by PID.

Keywords: technology acceptance model, UTAUT2, assessment instrument, healthcare, mild intellectual disability

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1 Introduction

Approximately 1.1 million PID live in the Netherlands (Social and Cultural Planning Office 2023). Within the Netherlands the general consensus is that a person can be placed within de PID category if the person has an IQ between 50-70 or an IQ between 70-85 with additional problems within the area of self-management (e.g. managing personal hygiene) (National Knowledge Center for PID 2018). A significant part of this group needs support with their day-to-day activities (National Knowledge Center for PID 2018), or with personal- and mental healthcare. A large part of these support services (e.g. help with finding a suitable job or assisting with personal hygiene) are provided by organizations within the intellectual disability sector. Organizations within this sector are currently being challenged by a growing shortage of staff (UWV 2020) and increasing budget cuts. Additionally, the demand for the services of these organizations is growing as PID are more and more struggling to find their way in our contemporary society, a society that is increasing in pace, getting more digital and emphasizes on personal responsibility and self-management (FWG Foundation 2022). The use of eHealth has long been touted as a part of the solution to meet the current challenges in the healthcare sector (Dutch Government, 2022; Ossebaard & Gemert-Pijnen, 2016; Xiang & Venrick, 2017). Interest for eHealth within the intellectual disability sector has also been steadily growing (Oudshoorn et al. 2020). However, research regarding the specific determinants (factors that influence the behavioral intention to use) and moderators (factors that can influence the effect of one or more determinants) for a successful adoption of eHealth by PID is scarce and lagging (Frielink, Oudshoorn, and Embregts 2020; Oudshoorn et al. 2020) and if you would speak with PID and their carers they will tell you they are struggling to discover these determinants together in a practical setting. Giving attention to these adoption determinants can potentially help PID and their carers to realize a higher adoption rate and a more targeted and cost-effective appliance of eHealth which better suits the need of the individual PID (Frielink et al. 2020). These findings underpin the need for an instrument that enables and facilitates the conversation between PID and their carers about the adoption determinants for a specific eHealth solution and to evaluate them over time. Considering this, the following central research was formulated: *How may care providers determine the conditions for PID to successfully adopt eHealth?*

In the remainder of this paper, the core concepts of this research, 'technology acceptance', 'eHealth adoption' and 'design principles´ are discussed, followed by a description of the research method. The results of this study are presented in the results section followed by a discussion. The last sections contain the discussion and limitations of this study and wraps up with the conclusion.

2 Literature

2.1 Technology acceptance

The field of technology acceptance has a relatively long tradition. The first research publications in this field date from the late 1960's (Abdul Aziz et al. 2020; Koul and Eydgahi 2017; Rondan-Cataluña, Arenas-Gaitán, and Ramírez-Correa 2015). Pioneer in this field was (Fishbein 1967) with his Theory of Reasoned Action. His theory resulted in the TAM (Technology Acceptance Model) (Davis, 1986). Since the introduction of the TAM-model it has been used in numerous studies on the adoption of technology and in very diverse contexts (Rondan-Cataluña et al. 2015). (Venkatesh, Thong, and Xu 2012) incorporated the TAM-model along with other relevant models in their UTAUT-model (Universal Theory of Acceptance and Use of Technology). Research by (Bergmo 2015; Li et al. 2013; Rondan-Cataluña et al. 2015) shows that TAM and UTAUT(2) are the dominant models to explain the adoption of technology in existing research. Although there has been critique from other researchers regarding the relative simplicity of the models and their explanatory value (Li et al. 2013; Shachak, Kuziemsky, and Petersen 2019) the general consensus is that both models do explain the adoption of technology in a general setting (Rahman et al. 2017; Rondan-Cataluña et al. 2015). The lower explanatory value in specific settings can be mitigated by extending/changing both models for use in the context in which they are to be used (Rahman et al. 2017). Numerous researchers have adapted both models to better suit the context of their studies and elevate the explanatory value (Magsamen-Conrad et al. 2019; Shachak et al. 2019). The concepts that are embedded within the TAM- and UTAUT-models are usually operationalized in the form of a questionnaire (Williams, Rana, and Dwivedi 2015; Yousafzai, Foxall, and Pallister 2007). The original authors of the TAM- en UTAUT-model also used questionnaires to gather research data for the validation of their models. In these questionnaires the various concepts of the model are operationalized using one or more questions which measure the performance of

the concept. Usually, the answering of the question(s) is done quantitatively using a 7- or 5-point likert scale (Davis 1985; Venkatesh et al. 2012). Researchers that use a modified/extended version of one of the two models usually operationalize their modified/added concepts using existing research or using their own questions. (Ivanova 2022) for example, used existing research to operationalize additional determinants in the context of the adoption of mobile banking. In the context of eHealth adoption, the determinants 'health literacy' and 'eHealth Literacy' have shown the potential to elevate the explanatory value of the vanilla versions of both models (Chang et al. 2021; Magsamen-Conrad et al. 2019). In research on the adoption of eHealth both models are operationalized in the same way as they are operationalized in the general field of technology adoption (Li et al. 2013).

Based on this we assume that (1) TAM, UTAUT or UTAUT2 are suitable candidates for the foundation of the conceptual model.

2.2 eHealth adoption

Literature studies (Pagliari et al. 2005; Uribe-Toril 2021) show that the term 'eHealth' was introduced into research in 1999. Within this study eHealth is defined as 'the appliance of digital information and communication with the intention to support and/or improve the healthcare sector general and the health of a specific individual' (Lettow, Wouters, and Sinnige 2019). Some of the potential benefits that arise from existing research are providing more cost-effective healthcare, (Bergmo 2015; Swanepoel 2020) elevating healthcare quality (Ossebaard and Gemert-Pijnen 2016; Xiang and Venrick 2017) and elevating the self-management of the client/patient (Kelley et al. 2011; van Zelst et al. 2021) Other research however shows that implementing eHealth within existing healthcare processes and reaping the potential benefits isn't always easy and the percentage of eHealth implementations that deliver on their promise is sometimes lower than initially expected (Enam, Torres-Bonilla, and Eriksson 2018; Kraaijkamp et al. 2020). One key driver of a successful eHealth implementations that is mentioned across research is that of engaging with the client/patient en putting his/her needs central (Dutch Government 2022; Xiang and Venrick 2017; Zaagsma et al. 2021). TAM- and UTAUT(2) are the dominant models for explaining and researching the adoption of eHealth (Alqudah, Al-Emran, and Shaalan 2021; Heinsch et al. 2020). The TAM-model by (Davis 1985) defines 'Perceived Usefulness' and 'Perceived Ease of Use' as the most important

determinants (factors) that influence the behavioral intention for an individual to use a new technology. The UTAUT-model by (Venkatesh et al. 2003) is a modified and extended version of the original TAM-model which adds a set of additional determinants and a set of moderators (factors that influence the strength of one or more determinants). The key difference between the UTAUT and UTAUT2 (Venkatesh et al. 2012) models is that the original UTAUT model assumes non-voluntary use and UTAUT2 assumes voluntary use.

Research in the field of eHealth adoption by PID is relatively new. Only a few studies have been conducted on this subject (Frielink et al. 2020; Oudshoorn et al. 2020). The studies that have been conducted mostly focus on the adoption of a specific eHealth-solution or category. An example within this context is research on the adoption of digital mental health interventions (Vereenooghe, Trussat, and Baucke 2021). The studies that focused on the adoption of eHealth by PID are qualitative, and only the TAM-model was employed within this context (Vereenooghe et al. 2021). (Frielink et al. 2020) used a focus group approach in their research on facilitating and impeding factors for eHealth adoption by PID. Most of their results can be plotted on the concepts of the UTAUT-model. The bottom line is that further research on this topic is needed, as underpinned by (Frielink et al. 2020) and (Oudshoorn et al. 2020). The study of (Frielink et al. 2020) demonstrates that focus groups consisting of PID and their carers are a suitable setting for conducting research on the topic of eHealth for PID. In addition to the determinants for technology adoption as stated by UTAUT2, existing research shows that there are additional factors to consider regarding the adoption of eHealth in the general population and more specific PID: (1) (Schuurman, Speet, and Kersten 2004) state that most PID have lower than average financial means. This suggests that PID are less tempted to buy eHealth themselves as they are struggling to get through their day to day lives financially. (2) (Alqudah et al. 2021) state that voluntariness of use of an eHealth solution can significantly influence adoption in the general population. (3) eHealth adoption in the general population can be influenced by '(e)Health literacy' (Chang et al. 2021; Magsamen-Conrad et al. 2019). (4) Research in the general field of psychology (McCurdy, Scott, and Weems 2022) suggests that the emotional state of an individual can influence the intention and the skills needed to try something new and bring this into practice within the own personal context.

Based on this we assume that (2) Extension of TAM, UTAUT or UTAUT2 with the concepts of Health literacy, eHealth literacy and cognitive age will elevate the explanatory value of the vanilla versions of these models.

2.3 Design principles for PID instrument

There is a lot of diversity within the PID group and the individual needs regarding accessibility and literacy (National Knowledge Center for PID 2018, 2023). The goal of this research was to develop an instrument that would be inclusive for the broad PID group and could be used by every PID regardless of their literacy skills and understanding of the subject. The Universal Design method (Preiser et al., 2011) underpins the need for inclusive products and environments and provides seven principles to accomplish this. Universal Design has its roots in physical architecture but has been used to accomplish inclusivity in a variety of contexts and products (Aslaksen et al. n.d.; Crow 1997; Oliveira, MUNSTER, and GONÇALVES 2019). (Goegan et al. 2018) have used the principles of universal design to accomplish inclusive educational tests for PID. They've extended the seven general principles of Universal Design with four PID specific principles which they call accommodations. Publications by (Moonen 2018; National Knowledge Center for PID 2023; Schuurman et al. 2004) state that PID can benefit from visual and auditive support in the form of icons, answer options using smileys and spoken text. Another area that needs attention is the level of literacy skills of PID. In the Netherlands the general level of literacy is classified as 'B1' on the CEFR-scale (Common Framework of Reference for Languages) (Council of Europe 2023), the general level literacy level of PID however is somewhere between A1-A2 on the CEFR-scale (Lee-A-Fong 2018). This for example translates into the need for more concrete text usage and shorter sentences (Moonen 2018; National Knowledge Center for PID 2023). Based on this we assume that (3) The principles of Universal Design are a solid foundation for developing an inclusive research instrument for PID and (4) Extending the standard set of principles of Universal Design with the principles by (Goegan et al. 2018) will add extra value for the inclusivity of the instrument.

3 Method

A design science approach was used to conduct the research and develop the instrument. This approach enables working in iterations and small increments (Hevner 2007; Peffers et al. 2006). Working in small increments was an important precondition for this research because PID (can) have a lower-than-average attention span (National Knowledge Center for PID 2023) and can experience stress during long sessions (Schuurman et al. 2004).

The research methodology approach of (McLaren and Buijs 2011) was chosen to overarch the research because of its balanced emphasis on both the theoretical foundation and the design principles for the research instrument to be developed. This research methodology uses the design science approach as described by (Hevner 2007) as it's foundation to provide a framework for the development of a solid research instrument that is both theoretical solid and usable/applicable for the end-user population that is being targeted. Engaging with PID in a research context has its challenges, there must be enough time and individual attention to keep PID engaged and accommodate their personal needs during a research project (Schuurman et al. 2004). Because of this a representative sample that can be generalized for the PID population wasn't possible within the proposed timespan of this research. This resulted in a slightly modified version of the research methodology to better suit the qualitative nature of this research. The quantitative data gathering methods were swapped for qualitative equivalents and the order of the checkpoints was altered to better suit the needs of PID during the research, the design principles were checked first and the more theoretical checks in a later stage. For a more detailed overview of the research methodology that was used during this research please refer to appendix A.

3.1 Data gathering methods

Literature review

To find candidate determinants and moderators for the conceptual model and candidate design principles for the suitable form(s) for the instrument a literature review was conducted. This review resulted in a set of (four) assumptions (section 2) which were further validated during the later stages of the research.

Interviews

Seventeen interviews were conducted as an initial attempt to validate our four assumptions. The participant group consisted of six PID care providers, two behavioral scientists, one PID mental health nurse, one PID communication expert and seven PID. The interviews took place within three organizations in the intellectual disability sector and one organization in the mental-health sector. To ensure that all the interviews would cover the same topics a semi-structured topic list (appendix B) and interview guide were developed. The semi-structured character of the interview was carefully chosen to allow PID to deviate from the central topics and felt the freedom to talk about anything they wanted. The interviews with the care providers took place first to allow the researchers to get more familiar with the PID group and how to appropriately interview them. The care providers confirmed the finding of the literature study regarding the need for visual support for PID. As a result of this a PowerPoint was developed to visually support the interviews with PID and provide them with a clear structure as advised by (Schuurman et al. 2004). The participants that asked for approval were provided with a copy of the transcript.

Focus Group

The first concept versions of the instrument were validated by a focus group which consisted of four PID and one care provider. The goal of the focus group was to validate the design principles and to choose the forms of the instrument that best suited PID. The focus group also extensively reviewed the operationalization of the concepts within the various concept versions of the instrument. In the context of the research methodology the results of the focus group were used to execute the check on 'prescriptive utility'. The focus group took place in one session spanning a couple of hours. During this session the participants discussed the concept versions of the instrument with a researcher and provided feedback. The session was (again) supported using a PowerPoint.

Test Phase

A group of seven PID was used to assess the 'reliability', 'validity', and 'predictive utility' as described by (McLaren and Buijs 2011). Also, a second check on the 'prescriptive utility' was conducted. Data was gathered in the form of used versions

of the instrument. The test session took place at two separate moments across two separate organizations. The first test session took place in a group setting. At the request of the participants the second test session was done individually. During both sessions a PowerPoint was used to guide the session and the PID participants could freely choose a couple of eHealth examples that they already were using at the time or potentially want to use in the future. A few examples of the examples that were chosen by the participants: a smartwatch, a personal digital healthcare environment and a care robot. Using the chosen examples, all the participants used the instrument and provided the results to the researchers. The test phase resulted in a total of 15 used versions of the instrument which were used as input for further analysis regarding the explanatory value of the conceptual model (appendix C) and the practical use/applicability of the instrument for PID.

3.2 Selection of participants

Due to ethical considerations potential PID participants were not contacted directly. Contact with potential PID participants was established through the care managers and care coordinators of the participating organizations. Due to ethical considerations, no information about the background of the PID was shared with the researchers. The care managers and coordinators checked if the potential candidates fitted within the profile of PID. If the PID wanted to participate, the PID and a carer would fill in the informed consent form. The form and letter were tailored to PID, both were screened and approved by the Ethical Committee of HU University of Applied Sciences. There has not been any direct contact between the researchers and PID preceding the interview nor afterwards; if needed a care provider acted as proxy. For care-provider participants, the respective contacts within the participating organizations were contacted.

3.3 Data handling and analysis

All participants that participated within the interviews and focus group allowed for recordings to be made. These recordings were securely erased after the transcription was finished. The transcripts were done in verbatim form. This allowed for the researchers to more precisely determine if any socially desirable response was given by the participant. The transcripts were done manually to guarantee that none of the recordings would be available to third parties. The transcripts were anonymized by

assigning a unique code to the participant and removing any attributes that could potentially identify the participant. The transcripts were analyzed using the process of coding as described by (Baarda 2018). To streamline the coding process the application Atlas.ti was used. Atlas.ti enables researchers to visually guide and support the coding process.

4 Results

The assumption that the general technology adoption models TAM, UTAUT and UTAUT2 could be suitable for explaining eHealth adoption by PID was confirmed during the interviews. UTAUT2 seemed to be the most suitable to explain the adoption of eHealth by PID. Figure 1 shows a couple of quotes by PID and care providers from the interview transcripts that confirm this.

In addition to the main determinants, the UTAUT2-model also contains a set of moderators. These moderators (can) influence the main determinants and usage behavior. The influence of a couple of these moderators could be matched with the interview results, the influence of the other moderators could not be matched with the interview results but could also not be dismissed. For further details regarding the matching results of the existing determinants and moderators please refer to appendix D.

In addition to the validation of the standard UTAUT2 determinants and moderators the assumed determinants 'eHealth Literacy, 'Health Literacy' and 'Cognitive Age' were validated against the interview results. Both 'eHealth Literacy' and 'Health Literacy' were recognized in the interview results. A care provider on this subject: 'usually PID have a lower-than-average level of health literacy skills.' The recognition of 'Cognitive Age' was inconclusive and a couple of participants advised against the use of this determinant due to ethical reasons. A care provider on this subject: 'if you ask someone, how old do you think you are in your head? I don't know if that's ehm, PID like to be seen as normal.'

Additional determinants and moderators

As a result of the (inductive) coding process two additional determinants and one additional moderator were discovered: voluntariness of use, public financing, and emotional state. A couple of example quotes are shown in figure 2.

Figure 1: Standard UTAUT2-determinants with example quotes

Determinant	Example quote
Performance Expectancy	PID on a smartwatch: 'Initially I thought it was interesting to follow my sleep rhythm and to monitor my heartbeat. It was fun in the beginning, but it didn't add any value for me in the long term.'
Effort Expectancy	PID on the app 'DigiD' which must be used to access some healthcare services: 'I think it must be improved for people like us, regarding the information they provide, easier language, so that PID people can easily understand it and use it.'
Social influence	PID about a smartwatch: 'I bought one because everyone that I know has one, so I thought that I also should get one.'
Facilitating conditions	PID on the topic of a care robot: 'I think that the irritating voice of the robot keeps people from using it, we've said this months ago to the people of the pilot, but nothing has been done about it and we didn't hear anything about it since.'
Hedonic Motivation	PID on the pleasure experienced using a physical exercise app: 'Usually I'm not good at doing things for a long time but with this app, it doesn't feel like something that I must do, it feels like a game sometimes because you can win badges, I think it's fun!'
Hedonic Motivation	PID on the pleasure that is experienced using a physical exercise app: 'Usually I'm not good at doing things for a long time but with this app, it doesn't feel like`
Price Value	PID on the topic of making a full/partial contribution to the costs of eHealth: 'I would take that into consideration, but it must have benefits for me to do that.'

Figure 2: Additional determinants and moderator with example quotes

Determinant	Example quote
Voluntariness of use	PID: 'No one can force me to do anything, in my life so far, I've had to do a lot of things that I didn't want to do, I have my own opinion, so if something is forced on me, I will not do it.'
Public Financing	PID: 'ehm, I'm against all those things in healthcare that I must pay a partly contribution for.
Moderator	**Example quote**
Emotional State	Care provider: 'if you're mentally not well it can be difficult to start using something new.'

4.1 Suitable design principles for a research instrument for PID

The assumption that the principles of Universal Design extended with the 'accommodating' principles by (Goegan et al. 2018) would provide a suitable framework for a research instrument for use by PID was validated positively by placing the interview results in the context of these principles. For an overview of the final design principles refer to appendix E. The first set of concept versions of the instrument encompassed these forms: a questionnaire, a checklist, a 'praatplaat' (Dutch word for a specific form of visual aid) and a presentation form. All forms were developed as a physical and a digital variant. Different variants were developed for determining the determinants for adoption and to evaluate them over time. The digital version of the questionnaire also contained speech support. The review of all the concept forms was generally positive but modifications were made because of feedback that was given during the focus group and test phase. In the context of the research methodology, the result of the prescriptive utility check was positive. For examples of final versions of the instrument please refer to appendix F.

4.2 Performance of the instrument

The check on reliability was found to be positive. A total of three answers were found to be potentially not reliable answered by the participants. One participant, for example, provided an answer using a not happy smiley but in the previous questions gave the impression that he/she was positive. This is in line with the question of another participant who asked for a textual explanation regarding what the smileys meant. In the definitive forms more explanation regarding the answer

options was added. The check on validity confirmed that the instrument captured results that were in line with what was expected regarding the concepts within the conceptual model. The dataset that was gathered was too small to give a definitive answer on the predictive utility of the instrument. The results, however, provide the first clues for the predictive utility of the instrument.

5 Discussion and limitations

This research proposes a research instrument that PID and their care providers can use to determine and evaluate the determinants for a successful adoption of eHealth by PID. This research also demonstrates that using the UTAUT2-model extended with the determinants 'Voluntariness of Use' and 'Public Financing' and the moderators '(e)Health Literacy' and 'Emotional State' provide a solid foundation for a research instrument for the adoption of eHealth by PID. PID are a diverse group with special needs regarding the form of a research instrument (Schuurman et al. 2004). This research demonstrates that using a framework consisting of the principles of Universal Design extended with the principles of (Goegan et al. 2018) contributes to the development of inclusive forms for a research instrument for PID. These new insights contribute to future research in the field of eHealth and technology adoption by PID and the development of research instruments for PID in general. This study has several limitations. First, the most significant limitation is the small sample size that was gathered and used during the performance checks of the instrument. The results as presented should be viewed as a first indication of the performance and explanatory value of the instrument and not as definitive results. We urge for further use and research on the performance of the instrument. Repeating the 'Predictive Value' check with a representative sample would be a good starting point for future research. Second, the supporting material used during the interviews contained a set of examples. This was necessary to give the PID participants an impression of what was to be discussed. These examples may however have led to unintentional steering of the answers that were given. To mitigate this the first two stages of the coding phase were done using an inductive approach. However, unintended steering on a couple of interview subjects cannot be excluded. The applicability of the design principles and translation that was made to the context of a research instrument for PID would also be a great topic for further research on how to create inclusive forms of research instruments for PID.

6 Conclusion

PID are a vulnerable group that is often overlooked in our contemporary society (National Knowledge Center for PID 2023). (Chadwick et al. 2022) and (Lussier-Desrochers et al. 2017) describe a growing digital divide between people who can use and reap the benefits of digital technology and those who can't. The growing staff shortage and increasing budget cuts in the intellectual disability care sector can have a direct impact on the time that is available for the care and attention for PID (Dutch Healthcare and Youth Care Inspection 2023). It's tempting for care providers in this sector to replace certain aspects of their services with eHealth solutions. It is however crucial that PID are engaged in this process to have a good change of adoption success (Dutch Government 2022). Implementing eHealth to counter personal shortage and budget cuts without PID engagement can potentially contribute to the growing digital divide in our society and that would not be in line with the 'client central' approach that many care providers in this sector have embedded within their organizational vision. So how can care providers bridge this digital divide and engage with PID to determine the conditions which are necessary for an individual PID to successfully adopt eHealth? This brings us to the answering of the central research question. Care providers may use the instrument which is proposed in this paper to engage with PID and together explore eHealth solutions and determine which adoption factors are necessary for PID to adopt these eHealth solutions. The proposed instrument can also be used to evaluate and monitor progression on the adoption determinants over time. The test phase of the instrument has proven that the developed forms are suitable for PID and provide enough flexibility to be tailored to specific situations.

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Appendix A

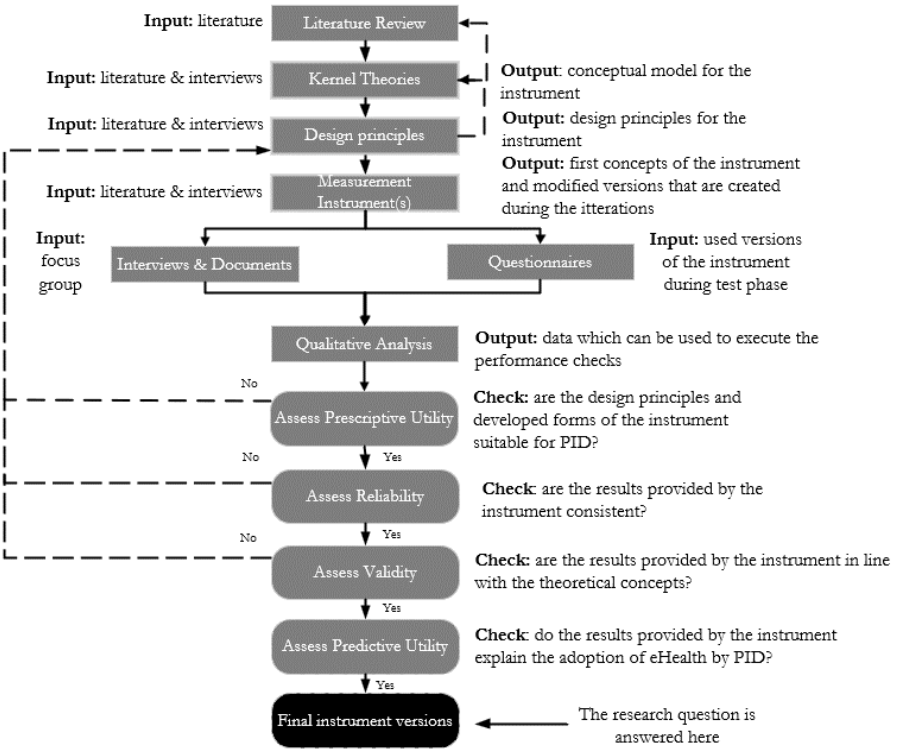

Figure 3: The modified version of the methodology of

Source: (McLaren & Buijs, 2011)

Appendix B

During the (semi structured) interviews a topic list was used to ensure that every interview followed the same structure, and no topics were left unaddressed. Separate topic lists were made for PID (figure 4) and their carers (figure 5). Both topic lists were translated into an interview guide and supporting PowerPoint. For this article the original topic lists were translated from their original language (Dutch) into English to enhance readability for international readers.

Topic #	Topic	(possible) sub-topics and questions
-	Introduction	- Introduction of the interviewer - Some personal information about the interviewer (e.g job and hobbies) - Introduction of the interviewee - Some personal information about the interviewee (e.g. job and hobbies) - Age and gender of the interviewee (not mandatory
-	About the interview	- Introduction to the term 'eHealth - Introduction to the purpose and structure of the interview
1	Usage of technology by the interviewee	- What devices does the interviewee use (daily)? Why does the interviewee use these devices and what for (to accomplish which tasks)? - What does the interviewee like about these devices? - What does the interviewee not like about these devices? - What kind of obstacles does the interviewee experience while using these devices? - The usage of online (governmental) services by the interviewee - What kind of obstacles does the interviewee experience while using these services? - The usage of social media by the interviewee What does the interviewee like about social media? - What does the interviewee not like about social media? - What kind of obstacles does the interviewee experience while using social media?
2	Usage of eHealth by the interviewee	- Usage of eHealth by the interviewee (the examples in the PowerPoint can be used to start the conversation) - Why the interviewee uses these eHealth solutions - Why the interviewee doesn't use some of the examples in the PowerPoint - What the interviewee likes about these eHealth solutions - What the interviewee does not like about these eHealth solutions - What can be improved on these eHealth solutions according to the interviewee
3	The ideal eHealth solution for the interviewee	- What would be the ideal eHealth solution for the interviewee according to the interviewee? - What would it look like? - Which functionality must it provide? - For what purpose or development goals would the interviewee use it?
4	Determinants for the adoption of eHHalith	- Determinants of eHealth usage by PID (which factors are important for eHealth adoption and usage in the long term according to the interviewee?) - Prioritizing these determinants (which are most important according to the interviewee?
5	Selection of eHealth by and for the interviewee	- Does the interviewee (actively) search for eHealth solutions that can help with their personal (healthcare) goals? - Do the carees of the interviewee help with searching for suitable eHealth solutions and/or propose eHealth solutions to the interviewee? - Would the interviewee appreciate more initiative form their carers on the topic of eHealth?
6	On the process of selecting eHealth with carers and talking about it	- If cares proposed an eHealth solution to the interviewee how would they like to explore this solution? Together with the care? Alone? First alone and then together with a cares? - What kind of aid would help the interviewee to explore an eHealth solution and talk about it with carer? How would this look like? - With what frequency would the interviewee like to evaluate the usage of Health with the carer?
7	On the support with the usage of eHealth	- Does the interviewee need help with the usage of technology and eHealth? - What kind of help would be appreciated? - Does the interviewee think enough help is available/provided? - Is there already someone in their network (e.g. carer, parent, family member) that can provide help with technology and eHealth? Who is this? - Who would the interviewee first contact when help is needed with technology or eHealth? - What kind of role does the interviewee expect from their carers regarding eHealth?
-	Wrap up	- Am questions? - Any suggestions or feedback regarding the interview contents of process?

Figure 4: the topic list that was used for the interviews with the carers

Topic #	Topic	(possible) sub-topics and questions
-	**Introduction**	- Introduction of the interviewer - Some personal information about the interviewer (e.g job and hobbies) - Introduction of the interviewee - Some personal information about the interviewee (e.g. job and hobbies) - Age and gender of the interviewee (not mandatory
-	**About the interview**	- Introduction to the term 'eHealth - Introduction to the purpose and structure of the interview
1	**Usage of technology by the interviewee**	- What devices does the interviewee use (daily)? Why does the interviewee use these devices and what for (to accomplish which tasks)? - What does the interviewee like about these devices? - What does the interviewee not like about these devices? - What kind of obstacles does the interviewee experience while using these devices? - The usage of online (governmental) services by the interviewee - What kind of obstacles does the interviewee experience while using these services? - The usage of social media by the interviewee What does the interviewee like about social media? - What does the interviewee not like about social media? - What kind of obstacles does the interviewee experience while using social media?
2	**Usage of eHealth by the interviewee**	- Usage of eHealth by the interviewee (the examples in the PowerPoint can be used to start the conversation) - Why the interviewee uses these eHealth solutions - Why the interviewee doesn't use some of the examples in the PowerPoint - What the interviewee likes about these eHealth solutions - What the interviewee does not like about these eHealth solutions - What can be improved on these eHealth solutions according to the interviewee
3	**The ideal eHealth solution for the interviewee**	- What would be the ideal eHealth solution for the interviewee according to the interviewee? - What would it look like? - Which functionality must it provide? - For what purpose or development goals would the interviewee use it?
4	**Determinants for the adoption of eHHalith**	- Determinants of eHealth usage by PID (which factors are important for eHealth adoption and usage in the long term according to the interviewee?) - Prioritizing these determinants (which are most important according to the interviewee?
5	**Selection of eHealth by and for the interviewee**	- Does the interviewee (actively) search for eHealth solutions that can help with their personal (healthcare) goals? - Do the carees of the interviewee help with searching for suitable eHealth solutions and/or propose eHealth solutions to the interviewee? - Would the interviewee appreciate more initiative form their carers on the topic of eHealth?
6	**On the process of selecting eHealth with carers and talking about it**	- If cares proposed an eHealth solution to the interviewee how would they like to explore this solution? Together with the care? Alone? First alone and then together with a cares? - What kind of aid would help the interviewee to explore an eHealth solution and talk about it with carer? How would this look like? - With what frequency would the interviewee like to evaluate the usage of Health with the carer?
7	**On the support with the usage of eHealth**	- Does the interviewee need help with the usage of technology and eHealth? - What kind of help would be appreciated? - Does the interviewee think enough help is available/provided? - Is there already someone in their network (e.g. carer, parent, family member) that can provide help with technology and eHealth? Who is this? - Who would the interviewee first contact when help is needed with technology or eHealth? - What kind of role does the interviewee expect from their carers regarding eHealth?
-	**Wrap up**	- Am questions? - Any suggestions or feedback regarding the interview contents of process?

Figure 5: the topic list that was used for the interviews with PID

Appendix C

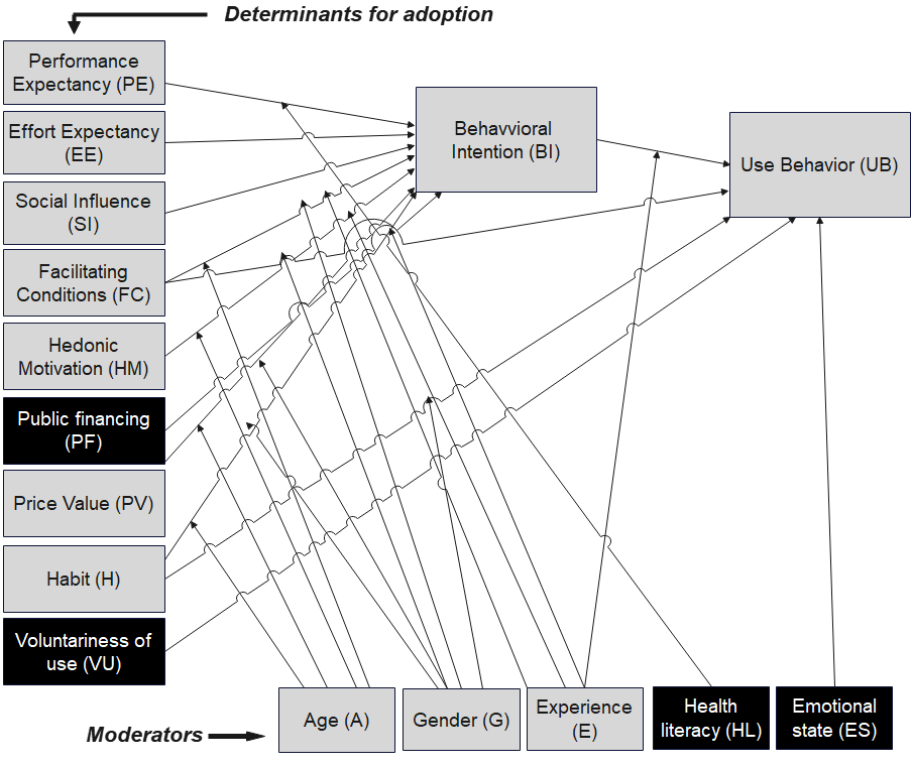

Figure 6: conceptual model on which the instrument is based

Appendix D

Figures 7 and 8 show the results of the matching process between the interview transcripts and the existing determinants and moderators that were hypothesized from the literature review.

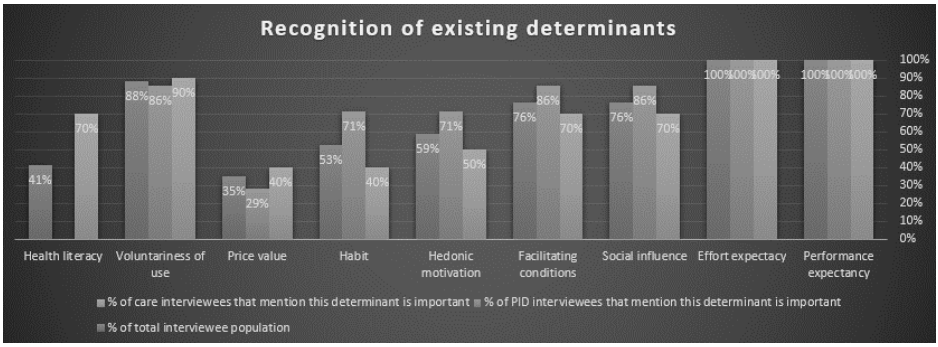

Figure 7: the recognition of existing determinants by the interviewees

UTAUT2 Moderator	Influences	Mapping to interview results
Age	Habit	The younger PID interviewees actively search for apps and devices that can help them with their health, (intellectual) development and self-management. The older PID interviewees don't do this.
	Price value	Not confirmed within the interview results but can also not be excluded based on the interview results.
	Hedonic motivation	The younger PID interviewees are open and enthusiastic about trying out a care robot. They think they will enjoy and get pleasure out of the usage of the robot. The older PID interviewees don't want to try out the care robot and some find the idea of a care robot scary.
		The younger PID interviewees are enthusiastic about trying out virtual reality glasses and think it would be fun. The older PID interviewees don't want to try out the virtual reality glasses and don't think the usage will be fun.
	Facilitating conditions	All the PID interviewees value good (technical) support regarding eHealth.
		The younger PID interviewees mostly use Google or another internet search to troubleshoot potential problems themselves before using an (external) helpline like a carer, family member or support desk.
		The older PID interviewees mostly contact a family member or carer to help with troubleshooting.
Gender	Habit	Not confirmed within the interview results but can also not be excluded based on the interview results.
	Price value	Not confirmed within the interview results but can also not be excluded based on the interview results.
	Hedonic motivation	Not confirmed within the interview results but can also not be excluded based on the interview results.
	Facilitating conditions	Not confirmed within the interview results but can also not be excluded based on the interview results.
Experience	Habit	A couple of interviewees think that the usage of an eHealth solution for a longer time will make the usage easier. They think the usage becomes more of a habit when they use the eHealth solutions for a longer time.
	Hedonic motivation	Not confirmed within the interview results but can also not be excluded based on the interview results.
	Facilitating conditions	A couple of interviewees think that people with prior experience with an eHealth solution will need less support with the adoption process of a (new) eHealth solution. When they get more familiar with the usage it is needed. They also think they need less talks with others (e.g. carers) to evaluate the usage of the eHealth solution.
	Use behavior	A couple of interviewees think that prior experience with an eHealth solution can influence the adoption process of a (new) eHealth solution. This influence can be positive or negative, it depends on prior experience. A couple of interviewees think that a negative prior experience with eHealth can raise bias extensively for PID.

Figure 8: the matching of existing moderators with interview results

APPENDIX E

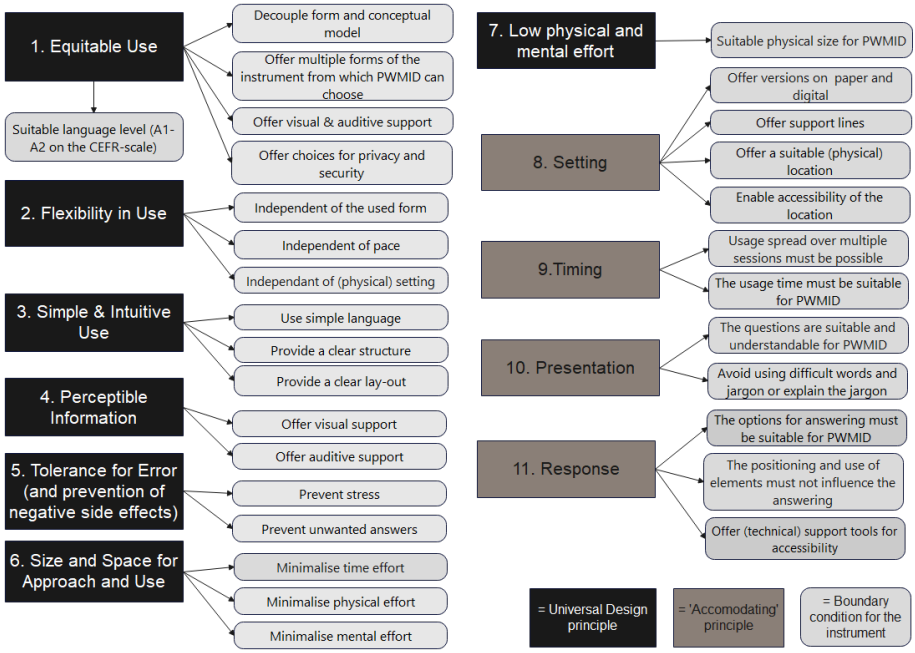

Figure 9: the final design principles on which were used to develop the forms of the instrument

Appendix F

Figures 10 – 17 shows two examples of forms of the instrument; one of the questionnaire forms and one of the 'praatplaat' (a Dutch word for a visual aid to guide a conversation). Both can be used for determining the determinants prior to the first usage of an eHealth application together with PID. Please contact the authors for the other forms of the instrument. All definitive forms of the instrument were made in the Dutch language. Because English forms of the instrument were not tested during the test phase the validity of an English translation cannot be guaranteed. Therefore, the Dutch versions are shown here. The icons used in this version of the instrument are property of 'SpelPartners VOF' and kindly provided for free for this research.

Vragenlijst – met picto's

Eerste kennismaking met een apparaat of app voor jouw hulpvraag

Hoi!

Leuk dat je jouw mening wilt geven over een apparaat of app!
Het apparaat of de app kan jou misschien wel helpen bij jouw ontwikkeldoelen.

Je kunt deze vragenlijst samen met jouw begeleider invullen.
Jouw begeleider mag de vragen ook voor jou invullen.
Het is dan wel belangrijk dat je het eens bent met de antwoorden die de begeleider invult.
Je mag deze vragenlijst natuurlijk ook alleen invullen.
Als je vragen hebt kun je altijd bij jouw begeleider terecht.

Na het invullen weten jij en je begeleider beter of het apparaat of de app jou kan helpen.
De antwoorden die je gegeven hebt helpen ook bij het verbeteren van het apparaat of de app.

Voor we echt beginnen vragen we je een paar gegevens in te vullen.

Deze gegevens mag je invullen maar dat hoeft niet:

Jouw naam: …….

Deze gegevens hebben we echt van je nodig:

Jouw leeftijd: …… jaar

Ik voel mij: ☐ Man ☐ Vrouw ☐ Transgender
☐ Non-binair ☐ Intergender ☐ Agender
☐ Anders: …….

De vragenlijst gaat verder op de volgende bladzijde.

1

Figure 10: questionnaire example – page 1

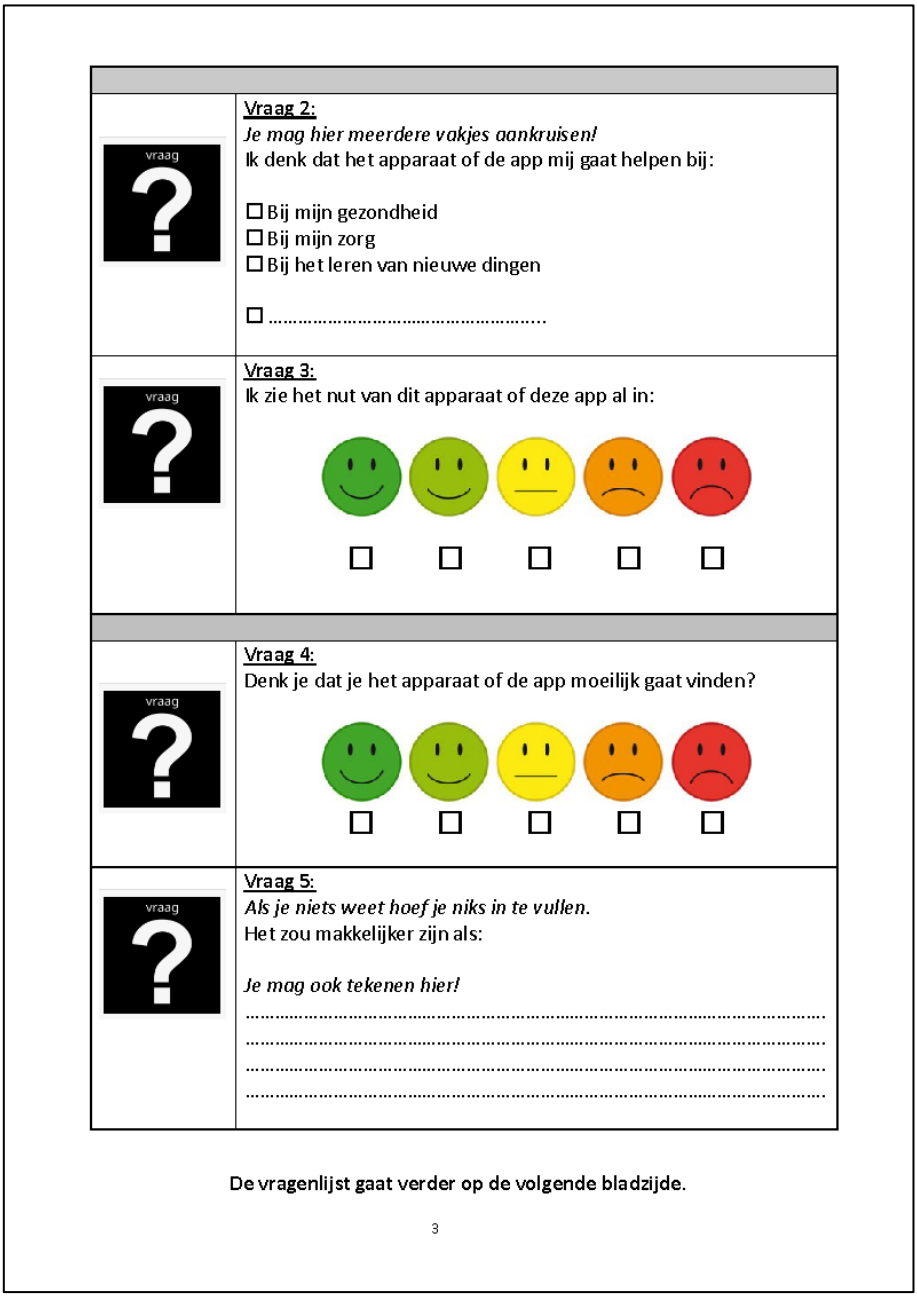

Figure 11: questionnaire example – page 2

	**Vraag 10:** Ik heb mensen die mij kunnen helpen met het apparaat of de app als ik vragen of problemen heb: ☐ Ja ☐ Nee ☐ Weet ik niet
	**Vraag 11:** *Je mag hier meerdere vakjes aankruisen!* Ik kan bij deze mensen terecht met mijn vragen over het apparaat of de app: ☐ Begeleiding ☐ Familie ☐ Vrienden ☐ Kennissen ☐ .....
	**Vraag 12:** Ik denk dat ik plezier zal hebben bij het gebruik van het apparaat of de app: 
	**Vraag 13:** Ik denk dat ik dingen kan leren met dit apparaat of deze app: 

De vragenlijst gaat verder op de volgende bladzijde.

5

Figure 12: questionnaire example – page 2

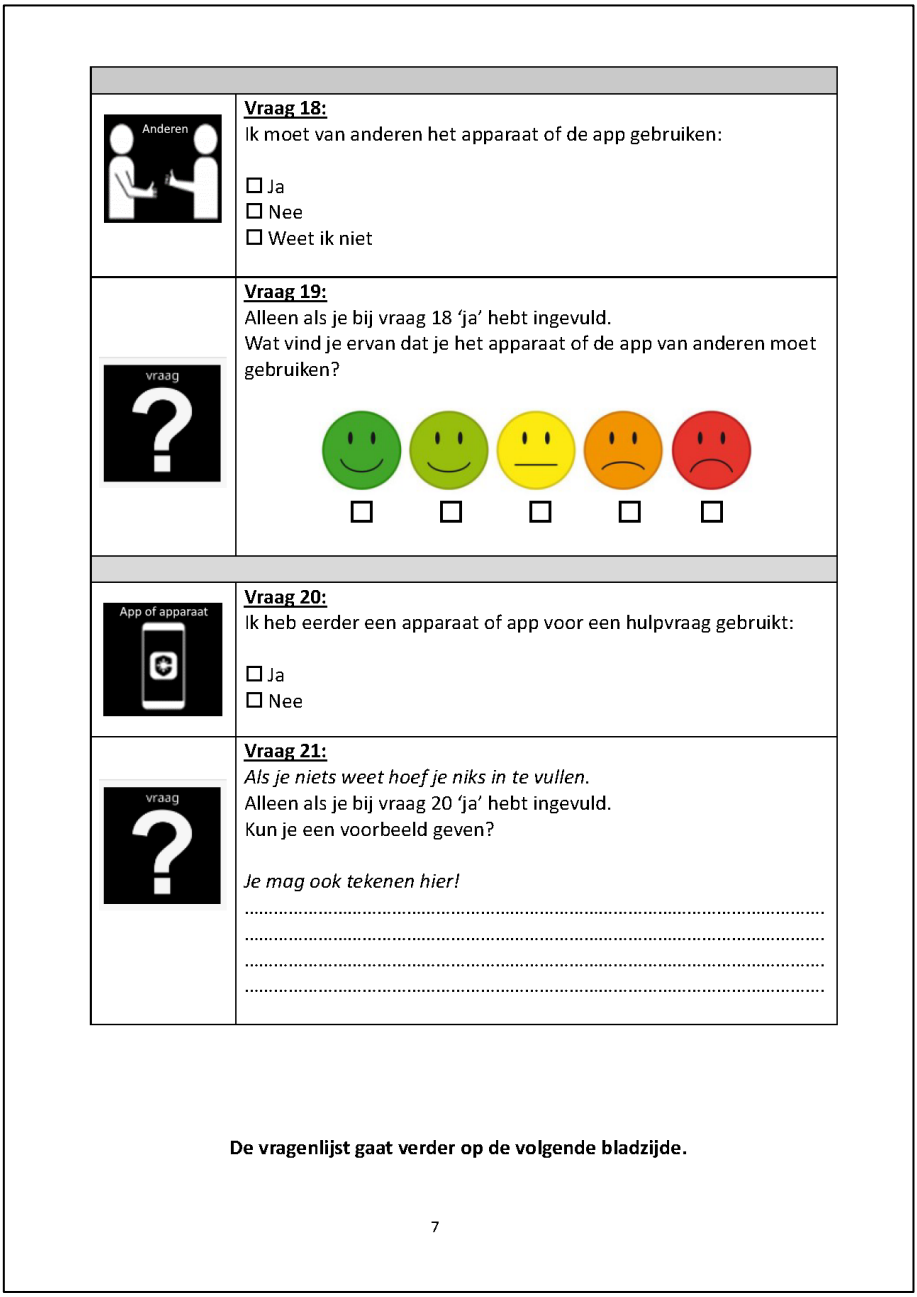

Figure 13: questionnaire example – page 3

De laatste vraag:

	**Vraag 26:** Ik wil het apparaat of de app gaan gebruiken: ☐ Ja ☐ Nee ☐ Weet ik nog niet

Dit is het einde van de vragenlijst.

Dankjewel voor het invullen!

De picto's in deze vragenlijst zijn gemaakt met:

pictostudio pro

9

Figure 14: questionnaire example – page 4

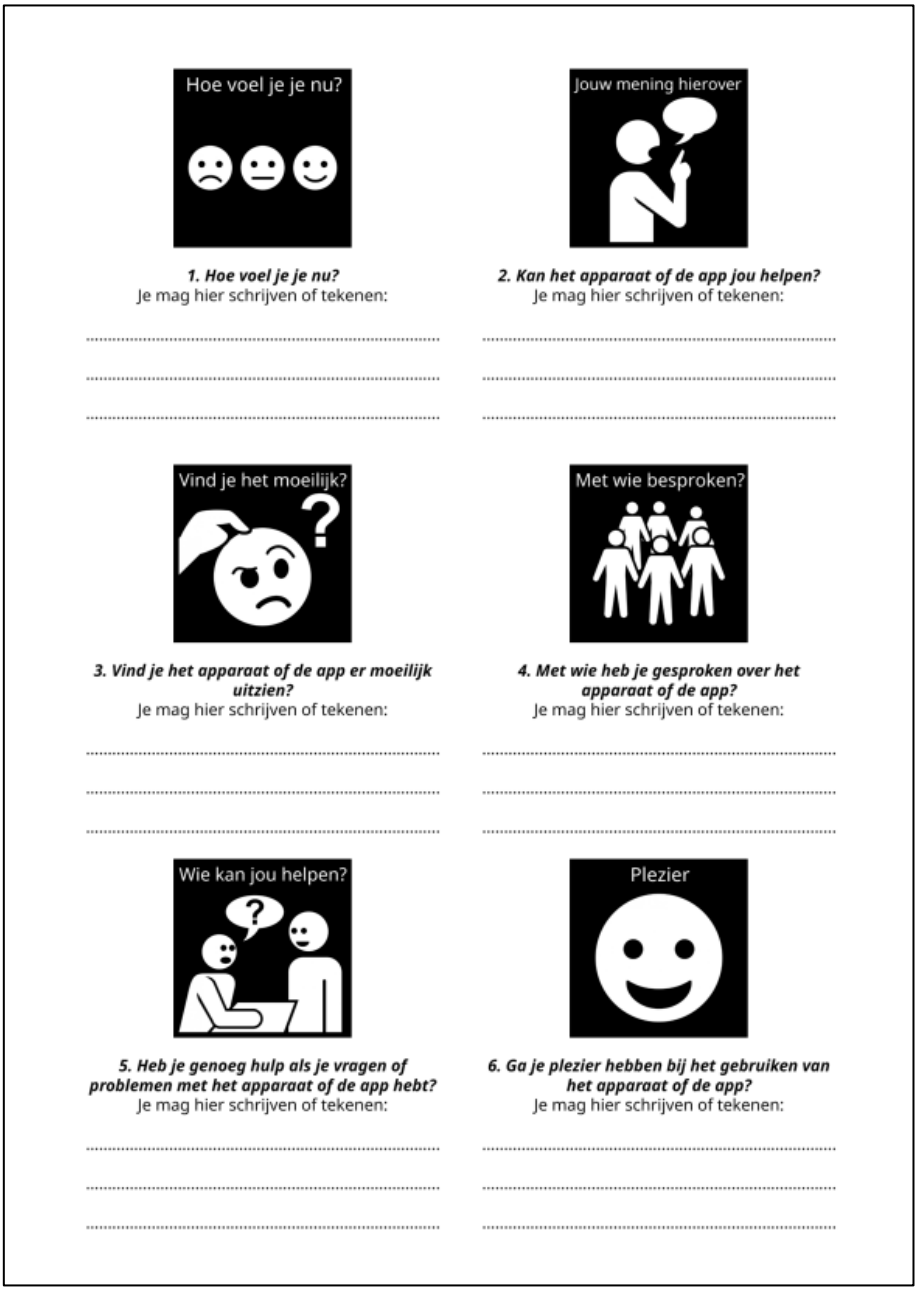

Figure 15: praatplaat example – page 1

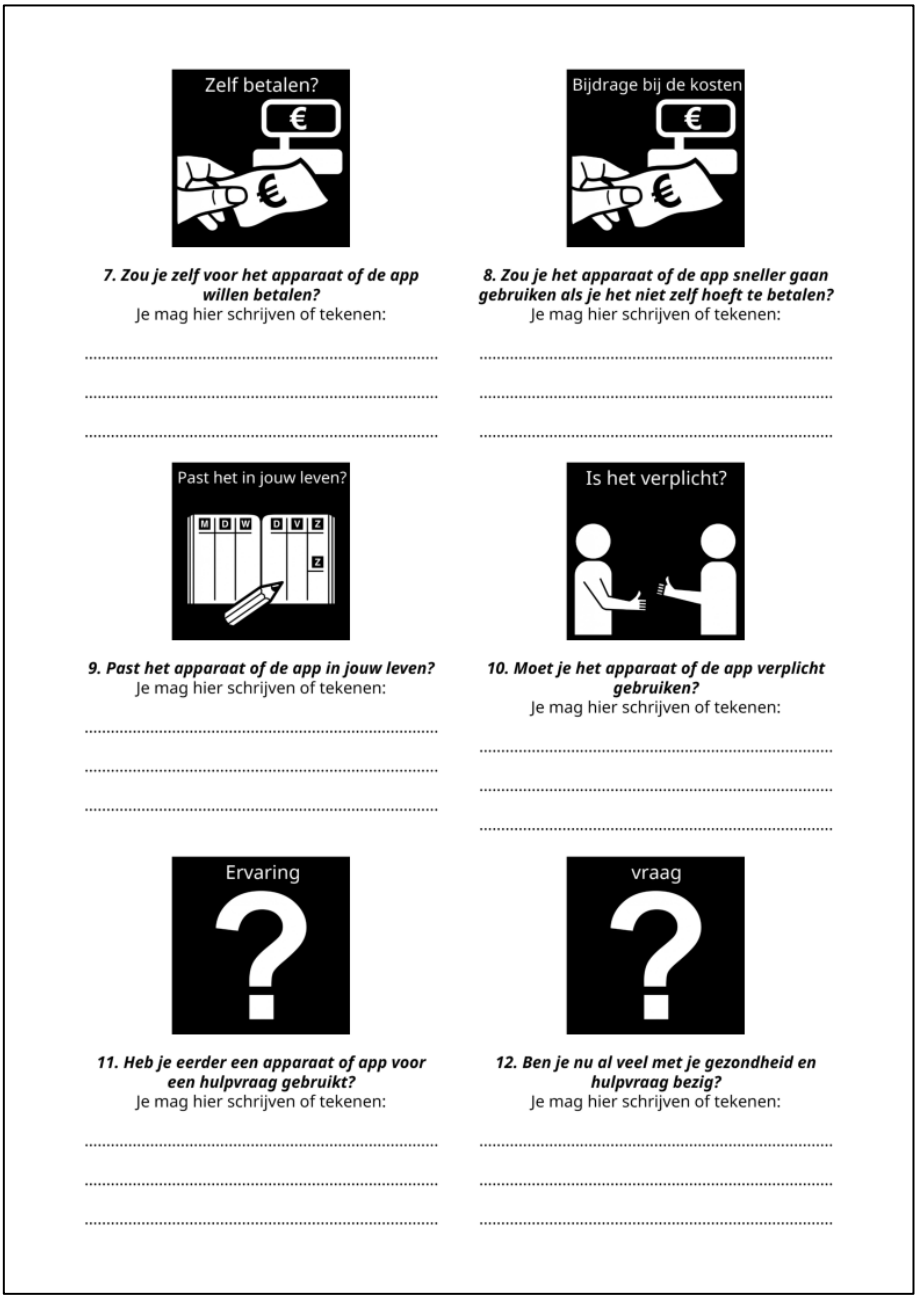

Figure 16: praatplaat example – page 2

13. Kun je makkelijk zelf dingen over je gezondheid en hulpvraag opzoeken?
Je mag hier schrijven of tekenen:

.....

.....

.....

14. Zou je het apparaat of de app willen gaan proberen?

.....

.....

.....

De picto's in dezevragenlijst zijn gemaakt met:

pictostudio pro

Figure 17: praatplaat example – page 3