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Creating an App Motivating People with Intellectual Disabilities to Do Physical Activity

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Abstract

People with intellectual disabilities (IDs) often have a sedentary lifestyle and this can lead to cardiovascular disease, diabetes, obesity and depression. Few games and apps promoting physical activity for people with IDs exists and having fun motivates this user group to do physical activity.

The objective was to find how an app should motivate people with IDs to do physical activity. In addition, the project wanted to find out how to design apps for people with IDs and navigational systems for people with IDs.

The design process includes both expert interviews and a focus group consisting of experts. The app was evaluated by people with IDs and caregivers using observations and interviews.

During the design process several guidelines for developing an app or game promoting physical activity including navigational assistance and designed for people with IDs was created. These guidelines were later used to develop an app.

The user test was small and did not conclude if the app motivated the users to do physical activity, but some users did say they enjoyed the app. Some caregivers expressed their concern about combining motivation to do physical activity with navigation and the use of technology for people with IDs.

Sammendrag

Personer med psykisk utviklingshemming har ofte en stillesittende livsstil og dette kan føre til hjerte- og karsykdommer, diabetes, overvekt og depresjon. Det finnes få spill og apper som fremmer fysisk aktivitet for utviklingshemmede og det å ha det gøy er motiverende for denne brukergruppen.

Målet med dette prosjektet var å finne ut hvordan man bør motivere utviklingshemmede til å gjøre fysisk aktivitet. I tillegg prøver prosjektet å finne ut hvordan designe apper og navigeringssystemer for utviklingshemmede.

Design prosessen inkluderer både intervjuer med eksperter og en fokusgruppe med eksperter. Appen ble evaluert av personer med psykisk utviklingshemming og ledsagere og brukte bare observasjoner og intervjuer.

Underveis i design prosessen ble det utviklet flere råd for utvikling av en app eller spill som motiverer utviklingshemmede til fysisk aktivitet og inkluderer både et navigeringssystem og designing apper og spill for utviklingshemmede. Disse rådene ble så brukt til å utvikle en app.

Brukertesten var liten og fant ikke ut om appen motiverte utviklingshemmede til å gjøre fysisk aktivitet, men noen bruker sa at de likte den. Noen av ledsagerne uttrykket bekymring om å kombinere motivasjon til fysisk aktivitet med navigering og bruk av teknologi for utviklingshemmede.

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Acronyms

ARASAAC the Aragonese Portal of Augmentative and Alternative Communication

ASD Autism Spectrum Disorder

DNT The Norwegian Trekking Association

FTU Friluftsliv Tilrettelagt for Utviklingshemmede

ID Intellectual Disability

IDI Department of Computer Science

IDs Intellectual Disabilities

MMORPG Massive(ly) Multiplayer Online Role-Playing Game

NFU The Norwegian Association for Persons with Intellectual Disabilities

NSD Norwegian Center for Research Data

NTNU The Norwegian University of Science and Technology

PA physical activity

UiT The University in Tromsø - The Arctic University of Norway

UNN The University Hospital of North Norway

Chapter 1

Introduction

1.1 Context

To beginning of this thesis gives some background information on Intellectual Disability (ID). Further there is also some information on physical activity (PA) for people with IDs. Do people with intellectual disabilities exercise enough, what motivates to PA and what is barriers to PA?

1.1.1 Definition of Intellectual Disability

ID consist of a variety of different diagnosis and has three criteria; reduced mental capacity, lack of adaptation and the condition needs to be visible before age 18 (NFU 2018). People with IDs has a different levels of challenges regarding motor skills, language understanding, social competence and ability to do everyday tasks. Often abstract concepts can be difficult to understand. Some are able to read, but can struggle to understand the meaning of what they are reading (NFU 2018).

According to Bufdir (2018[b]) intellectual disabilities can be divided into four different degrees based on IQ. These degrees are:

- Mild - IQ 50-69
- Moderate - IQ 35-49
- Severe - IQ 20-34
- Deep - IQ under 20

Intellectual disabilities could have many different causes, both from before birth, during birth and after birth. They include chromosome abnormalities, metabolic diseases, infections and diseases during pregnancy (e.g. rubella), birth defects (e.g. premature birth and low birth weight) and injuries or diseases after (e.g. meningitis and accidents) (NFU 2018). People with IDs often have additional disorders like autism, epilepsy and physical disabilities (NAKU 2019)

“Developmental Disabilities is an umbrella term that includes intellectual disability but also includes other disabilities that are apparent during childhood” (AAIDD 2018). Further they explain that some development disabilities are mostly physical like cerebral palsy and epilepsy, others can be both cognitive and physical like Down Syndrome or fetal alcohol syndrome. Intellectual disabilities are mostly cognitive.

Autism Spectrum Disorder (ASD) is an development disability and is a spectrum of disorders and affects communication with other people and repetitive behavior (NIMH 2018). 31 % of all children with ASD also have an IDs (CDC 2018).

1.1.2 Physical Activity and Intellectual Disabilities

The Norwegian Directory of Health recommended that adults should do at least 150 minutes of moderate PA every week (Norwegian Directorate of Health 2019). They define moderate PA as activities that leads to quicker breathing than usual, like walking quickly. The activity should be varied and include strength training and some should be exchanged with a smaller amount of high intensity training, but all activity helps. People with impaired functioning or reduced health that are unable to reach the amount advise are recommended to be in as much PA as possible. Further Norwegian Directorate of Health (2019) tell that PA is proven to give a health benefit and exceeding the minimum advise gives a higher health benefit. Lack of PA can lead to different diseases, like cardiovascular disease, diabetes and cancer (Warburton, Nicol, and Bredin 2006).

Many adults with IDs had a sedentary lifestyle (Vivienne A. Temple, Frey, and Stanish 2006). This was concluded with a literature review on PA levels for adults with IDs. V. A. Temple (2007) found that 50% of adults with IDs preferred sedentary activity, while 30% preferred moderate and 31% preferred vigorous activity. Dairo et al. (2016) also did literature review and found that only 9% of people with IDs reach the recommended amount of PA. 50% of the PA for adolescents with IDs came from the time spent at school (Queralt, Vicente-Ortiz, and Molina-García 2016). The study also found that girls were less active then boys.

V. A. Temple (2007) mentioned many contributing barriers for people with IDs to have a sedentary lifestyle. Some of them include accessibility to physical activities, cost of PA, personal health, feeling lazy and the weather. The preference for sedentary activities also contributed to people not choosing PA. Social factors were also mentioned as barriers, both the lack of people to participate in PA and feeling that others stopped them from doing PA.

Some of activities perceived as enjoyable for many people with IDs was dancing, walking, bowling, training with weights and aerobics or exercise classes (V. A. Temple 2007). PA had a high reported total enjoyment in this study. It is important that the PA is fun, like including music or games in the PA (Mahy et al. 2010). They also found that the PA should have a purpose, here both rewards and a purpose other than the PA were motivational.

1.2 Motivation

There exist few research projects on exergames for people with intellectual disabilities (The Norwegian National Research Ethics Committees 2019[c]) and research in this field is needed. A search on Google Scholar for “exergames intellectual disability” suggest exergames for other groups like people with autism spectrum disorder or elderly. Searching for “intellectual disabilities physical activity app” and “intellectual disabilities physical activity game” both only give one game or app for the target group and promoting physical activity.

Mahy et al. (2010) found that PA for people with IDs should be fun, so a game could potentially be promising. Because of the limited research into this topic, further research into this topic is needed.

Some apps and games with similar goals are Pokèmon Go and the Friluftsliv Tilrettelagt for Utviklingshemmede (FTU) app. Pokèmon Go is a popular game motivating people to walk, but is not an app customized for people with IDs. The FTU app is an app for people with IDs and shows upcoming nature and hiking events at a specific location. These apps were used as a motivation for this project and is discussed further in the following subsections.

1.2.1 Pokèmon Go

Pokèmon Go is a popular mobile game and has been downloaded over 800 million times according to Google play (*Pokémon Go* 2018). According to the description at Google Play *Pokémon Go* (2018), to catch Pokemon you should walk around your neighborhood. The game uses GPS to pin point your location and when you walk close a Pokèmon, you catch it with a Pokeball. Another part of the game is to hatch eggs, this is done by walking a specified distance.

The game has been proven to have a positive effect on physical health for particular engaged players over a 30 days period and increases number of step with over 25% compared to before they started playing (Althoff, White, and Horvitz 2016).

1.2.2 Friluftsliv Tilrettelagt for Utviklingshemmede(FTU)

The Norwegian Trekking Association (DNT) have a subgroup for people with intellectual disabilities, called Friluftsliv Tilrettelagt for Utviklingshemmede (FTU). FTU’s goal is for people with intellectual disabilities and their families to enjoy nature (Tvilde 2017). To make the nature experiences easier to find and more available for people with IDs an app was created, the FTU app. The app gives an overview of the events schedule for people with IDs and present information about these events in a way that is easy for people with IDs to understand *FTU* (2018).

The app uses multiple levels of communication to describe the events. The different levels are symbols, simple text and a more complicated text. To help people who struggle to

read a text-to-audio function is also included. Figure 1.1 show the use of symbols and simple text to describe an event.



Figure 1.1: Screenshot showing the description of an event in the FTU App, available at *FTU* (2018). The text explains what the participants will do at this event and where they will meet.

This program and app show the importance of nature and hiking for people with IDs, but also the need for an adapted app. The app is however not used during the event.

1.2.3 Personal Motivation

When I moved to a new place I noticed how difficult it was to find good hiking trails. Where I lived before I had over several years found good hiking trails and had friends recommend trails often. In the city I had moved to I did not have this and had to try to find trails myself. It made it less motivating to go on hikes/walks and also resulted in less hiking trips. This made me think that suggesting routes the user could walk might make starting to go on walks/hikes easier because they would know where to walk.

1.3 Research Questions

The project began with gathering some background information into what an ID is and PA for people with IDs. A search into games, exergames and apps promoting PA for people with ID was executed, but gave few results. This made me believe that further research into these topics was needed.

V. A. Temple (2007) found walking to be one of the activities mentioned most as enjoyable by people with IDs. The importance and joy people with IDs get from nature experiences was mentioned by Tvilde (2017), but is also something I personally believe is important to everyone. A focus on outdoor activities and mostly walking therefore seemed appropriate.

Because of the use of technology in this project the users should be young and have grown up with the use of digital devices. According to Queralt, Vicente-Ortiz, and Molina-García (2016) 50% of the PA for people with intellectual disabilities comes from the time spent at school. When young adults leave school, it is important to find new motivation towards PA. This project will therefore focus on young adults either finishing school soon or people who already have finished school. The user group chosen for this project was people with IDs between the ages of 16 and 35.

The objective of this project is to make a game-inspired app that is fun to use and motivates the user to go on hikes. The app should also be easy to use and designed for people with IDs.

The research questions for this project were chosen to be:

RQ1 How should game-inspired applications motivate young adults with intellectual disabilities to do outdoor physical activity?

RQ1.1 How to design navigational assistance systems for young adults with intellectual disabilities?

RQ1.2 What is important when designing games and applications for young adults with intellectual disabilities?

For the main question the motivational factor when using apps for outdoor PA for people with intellectual disabilities. To answer this question two sub questions are also needed. Games promoting PA uses maps, but because people with IDs have difficulty understanding abstract concepts, maps and navigational systems designed for people without IDs could be difficult to use. Therefore navigational assistance systems designed for people with IDs is also researched. Many games and apps can also be too complex and difficult for people with IDs, because of the complicated tasks and language. The second sub question is therefore regarding designing games and applications for people with IDs.

1.4 Findings

The evaluation of the app and guidelines was not able to come to a certain conclusion about the motivational factor. The app was fun, but the story and medals did not seem to be very interesting for the users. Some participants found the navigational assistance part of the app interesting and fun, so perhaps this could motivate to PA.

The navigational assistance system should use street level pictures, this makes it easier for people with IDs to navigate. Arrows is also widely used in these systems and together with some easy-to-read text provided enough information for participants with IDs to know witch direction to walk. The system should give the instructions automatically, so the participant do not have to change to the next instruction themselves and know they are reading the correct instruction.

The design should be straightforward with many pictures and large buttons and texts. When text is included it should be easy-to-read text, this was much easier to read and the participants with IDs needed less time to read the text. It is important to include

stakeholders in the design process. Caregivers and other people working with people with IDs gave valuable feedback and especially getting feedback from people with IDs is important.

Combining motivation to PA, navigation and using technology at the same time was said by experts to potentially be too difficult for many people with IDs. The evaluation did not come to a conclusion about this, so this is still a concern.

1.5 Outline of the Report

This thesis starts with a description of the research method used by this project in Chapter 2. This chapter describes the overall process, data gathering methods, how data was analyzed, the participants and the ethics for this project. The sections about ethics includes a discussion on informed voluntary consent, the participants rights and how the data will be stored.

In Chapter 3 the literature review is presented. This literature review looks into games and apps promoting PA, system design for people with IDs and navigational assistance systems.

Further Chapter 4 present the results from the expert interviews. These interviews gave additional information about motivation to PA, navigation and design of apps and games for people with IDs. The participants in these interview have experience working with people with IDs or making apps for people with IDs.

Chapter 5 is called “Towards a Prototype”. This chapter present the guidelines for the app, which is a result of the findings from the literature review and the expert interview. Using these guidelines an app is suggested. A focus group was then conducted to get feedback from experts on the suggested guidelines and app. The participants had experience working with people with IDs and/or technology for people with IDs. Lastly the development process for the app is described, including both the development of the prototype and how the route was made.

The app is then evaluated by people with IDs and caregivers, the results from this user test can be found in Chapter 6. This chapter presents what the participants thought about the motivational aspects of the game, the navigational assistance system and the design of the app.

In Chapter 7 the reliability of the results in this thesis is discussed. This includes the literature review, the participants, the user test and ethical responsibilities.

Lastly the thesis includes a conclusion and a suggestion of further work, this is shown in Chapter 8. The conclusion includes a summary of the results and a section explaining the work done in this research projects. The further work section presents many different topics to continue the work from this thesis.

Chapter 2

Research Method

This chapter talks about the research method used in this project. The first part discuss the process, data gathering methods, data analysis methods and the participants in the project. The second part looks into the ethics, including the ethical foundation for the project, description of consent, the participants rights and how data was stored.

2.1 Process

The project had a design and creation strategy and included several data generation methods. A game-inspired app was created and used in the empirical investigation. A figure of the research process can be seen in Figure 2.1

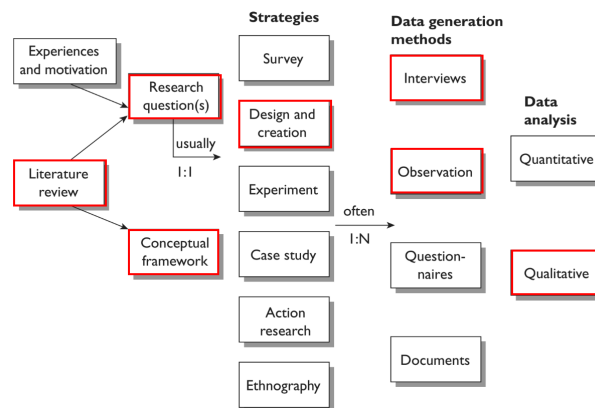


Figure 2.1: Research process for the project. Diagram from Oates (2006)

The first step was a literature review, here the research was split up into the different research questions from Section 1.3. The papers on apps and games promoting physical activity (PA) are not designed for people with Intellectual Disabilities (IDs), because of the limited amount of research already mentioned in Section 1.2. The literature review also includes papers on designing apps and games for people with IDs and navigational assistance systems for people with IDs.

Throughout the project I joined The Norwegian Association for Persons with Intellectual Disabilities (NFU) at some of their hiking and nature events. This was a good opportunity to get new contacts in the community of people with IDs, their family and caregivers. These events was useful for me to personally learn more about people with IDs and how these hiking trips were arranged. They were also used as an opportunity to learn what people with IDs themselves thought about PA and hiking.

The literature review was used as a starting point for the guidelines and experts on people with IDs, PA and digital systems was interviewed for further knowledge. The experts was interviewed because of minimal amount of information on apps and games promoting PA for people with IDs. Tsikinas and Xinogalos (2018) found that educators should be included in the design process of serious games, so including people who hosts events with outdoors PA for this type of game, was thought to have a similar effect.

The knowledge gathered so far was used to propose guidelines and later an app. As a step in the design process the guidelines and app is evaluated by expert on people with IDs, technology and outdoors PA. This was done through a focus group, where screenshots of a simple prototype using a prototyping tool and a short description was added to a presentation.

The guidelines was changed based on the experts opinion and a new prototype was developed. This prototype was a working mobile app and an empirical investigation including people with IDs using the proposed game. This looked into what the users think about this type of game and suggested guidelines.

To gather data from the user test observations and interviews was used. The players were observed when playing the game and interview after trying the game. The interviews was done with a caregiver present. If the participants had difficulties communicating verbally, the caregivers would be better at interpret their opinions and thoughts on the app and test session, this is advised when the user has communicative issues (Emerson et al. 2012).

The caregivers that participated in the user test was also interviewed after the user test. This is done to get their opinion on the test session, how they though the app worked in practice and what they thought the user felt about the app.

2.2 Literature Review

To find the papers for the literature review the databases ACM Digital Library, IEEE Xplore Digital Library and ScienceDirect was used. For papers on navigational assistance systems for people with IDs Google Scholar was used instead. This was done because of the limited number of papers in the other databases. The databases and search words used for each subsection is shown in Table 2.1.

Only papers from 2014-2018 was chosen to get the latest research on these topics. For the navigational assistance systems older papers was also included because of the limited amount of newer papers.

Related Subsection	Databases	Search Words
Games and Apps Promoting Physical Activity	IEEE Xplore Digital Library ACM Digital Library ScienceDirect	“mobile (exergame or exertion game or physical activity game) and intellectual disability”
System Design for People with IDs	IEEE Xplore Digital Library ACM Digital Library ScienceDirect	“design intellectual disability” “game intellectual disability” “app intellectual disability”
Navigational Assistance Systems	Google Scholar	“outdoor navigation intellectual disability”

Table 2.1: Search strategy

The papers for games or apps promoting PA was found searching for “mobile (exergame or exertion game or physical activity game) and intellectual disability”. Only games and apps that used walking as the main physical activity was included and those targeting a specific illness, injury or elderly were excluded. Apps and games promoting physical activity for people with IDs was as mentioned in Section 1.2 difficult to find, games and apps designed for people without an ID was therefore used. One paper was found through a reference in another paper included in the literature review.

For how to design games and apps for people with IDs searches like “design intellectual disability”, “game intellectual disability” and “app intellectual disability” was used. Both games and apps was included to make sure the guidelines would be suitable for both.

To find papers for navigational assistance systems for people with IDs a search for “outdoor navigation intellectual disability” was used. One paper was given to me by my advisor, but was also included in the papers provided by this search.

2.3 Data Gathering Methods

2.3.1 Individual Interviews

The expert interview were semi-structured, to make it possible to ask follow up questions if the something was unclear or the question was misunderstood. The questions was written to be as open ended as possible to give the participant the opportunity to add their own opinions and collect richer data.

The interviews done after the user test was unstructured and the questions were based on the earlier user test. Preparing questions before hand would not allowed for a discussion on the problems that occurred during the user test. It was difficult to predict all of these situations that occurred and it was therefore difficult to include them in the interview guide.

The interviews done in Trondheim was done in person and recorded on an phone. For interviews with people not living in Trondheim, the interviews was done over Skype for

Business and recorded with the built in recorder. The interviews was transcribed before staring the analysis.

2.3.2 Group Interviews

Group interviews was only used during the user test. This test consist of two individuals with IDs and one or two caregiver, depending on how much assistance was believed to be needed.

The caregivers knows the communication method of the user and should be used for people with issues related to communication (Emerson et al. 2012). The caregivers are included in these interview because it is believed that they can interpret the answers and the users feelings better than an interviewer new to the user, but also make them feel safe in this new setting. V. A. Temple (2007) also used caregivers in interviews to give a trustworthiness to the answers related to the participants daily PA. Mahy et al. (2010) on the other hand deliberately excluded caregivers from the interviews as some think the caregivers will affect the users answers.

The interviews were unstructured and addressed issues that emerged during the test session related to the use of the app and PA. At the end questions about the experience of the app and session as a whole were also asked. Important questions should be written in advance to make sure the language is simple without complex and abstract language (Emerson et al. 2012). This is done to make sure the user understands the question and gives the interview more credibility (Lloyd, Gatherer, and Kalsy 2006).

2.3.3 Focus Group

A focus Groups is a carefully planned discussions and is a fast method to get qualitative data (Kontio, Lehtola, and Bragge 2004). This method was used to quickly get some feedback from experts before testing the game on users. The goal was to find small improvements to the guidelines and the app.

Kontio, Lehtola, and Bragge (2004) say that 3-12 participants is most used, for this focus group the goal was 6 participants. In this focus group 7 participants had accepted the invitation, but one had to cancel last minute. The participants had different backgrounds and this lead to a multidisciplinary discussion about the app. We over recruited slightly in case someone had to cancel last minute.

The preparation phase is important and a poorly prepared focus group will possible lead to bias and superficial results (Kontio, Lehtola, and Bragge 2004). The focus group was conducted in cooperation with another master project working on increasing PA with the use of an app for young adults with IDs. The event was scheduled for two hours and followed a strict schedule, see Table 2.2. We decided on 15 minutes for introductions and 45 minutes for presentation of the current work and discussion for each project. The rest of the time was used for breaks between presentations and thanking the participants for coming at the end.

Topic	Time
Introduction	15 minutes
Presentation project 1	45 minutes
Break	5 minutes
Presentation project 2	45 minutes
Thank participants for coming	10 minutes

Table 2.2: The schedule for the focus group

The focus group started with an introduction round of all of the participants. Followed by a quick presentation of the common characteristics of the two projects, to make the participants familiar with the basis for the projects and how they related to each other. Permission to audio record the discussion was also asked all of the participants.

Next a presentation on this project was given, the schedule for this presentation can be found in Table 2.3. The first part of presentation consisted of the current status of the project and the guidelines for the app. This was followed by a short discussion about the guidelines, discussing which guidelines are important and if there were guidelines the participants disagree with.

The second part of the presentation consisted of a presentation of the app suggested in Sections 5.2 - 5.5 and how the guidelines was used in the app. Further a discussion on how the participants thought the app would be in regards to motivation to do PA, navigational assistance and the design was included. The discussion also touched on how the app would be used at day centers or housing for people with IDs. The full program can be seen in Appendix D.1.

Topic	Time
Presentation of the guidelines	5 minutes
Discussion	10 minutes
Presentation of the app idea	10 minutes
Discussion	20 minutes

Table 2.3: The schedule for the presentation of the project

This was followed by a presentation and discussion from the other project and lastly thanking the participants for coming to the focus group. After this there were some mingling between the participants and the hosts, talking very informally about the projects and further plans.

Immediately after the event a briefing was conducted. In addition to the people working on this project, the briefing consisted of the students working on the other project. The briefing was used to discuss the feedback from the focus group, looking for differences in opinions and searching for the most important points.

2.3.4 Observations

Observations is a method that is used a lot when working with people with IDs, because when asked questions many will give the answer they think is desired and not the truth (The Norwegian National Research Ethics Committees 2019[c]). It is also a method to include people that struggle to answer questions in an interview setting (Hubbard, Downs, and Tester 2003). This project uses qualitative analysis and descriptions about the users feelings about the app, where and why the user struggle or enjoy the game was collected.

I have participated in a couple of hiking trips through The Norwegian Association for Persons with Intellectual Disabilities (NFU) including people with IDs and caregivers. This experience was used to see the difference between hiking trips without a game or an app and just walking.

The observations was used in addition to the the interviews during the user test. The notes from the observations during the user test was analyzed together with the interviews.

2.4 Data Analysis

2.4.1 Expert Interview

After all expert interviews described in Section 2.3 was transcribed a table for each interview was made. Following the advice given in Oates (2006), each question got its own row to split the data in themes. The transcribed data was added to the left side of the table and long text was split into paragraphs.

On the right side notes was added when rereading the transcription. If the transcription was difficult to understand, the recording was listen to. This could be to determine if the yes and a long pause was the person agreeing, then thinking or if the participant was just thinking about the question. This phase was used to focus the answers some and remove some unnecessary text. An example of part of this table can be seen in Figure 2.2.

9	<ul style="list-style-type: none"> ja. Jeg tror det. Det vil jo være bra. Spesielt hvis man har sånn, ehh, real view, street view, ikke sant. hvor du ser tingene rundt deg, der du går. Det er god læring i det. Men det er igjen det med bakkemannskapet sant. vil du som bakkemannskap, så får du det til. Vil du det ikke så, altså du får det resultatet du selv vil. 	<ul style="list-style-type: none"> Ja, jeg tror utviklingshemmede vil ha en fordel av spesialtilpassede apper for navigasjon Spesielt street view er viktig Bakkemannskapet er igjen viktig og hvis de vil, så for de det til
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Figure 2.2: Example of how a part of the table used in the analysis process looks

A summary of each interview was created based on the notes from the table and is included in Appendix C. This summary was then sent to the interviewed person and asked if they still ment the same or if they felt that something had been misinterpreted. The summary

used in the rest of the analysis process have included the changes from the comments of the participants.

The analysis used an inductive approach, but the research questions was used as large categories during the analysis process. An inductive approach finds categories and themes in the data and not from existing literature or theory (Oates 2006). A new main category of extra features was also added for the ideas that did not fit under any of the existing categories.

For each category different themes from all the interviews was gathered, going through all interview in each category, before moving on to the next category. A table representing the different opinions was made, following the advise of Oates (2006). These tables was constantly changed, merging multiple opinions meaning the same and splitting up tables into multiple tables.

The tables was used together with the summaries of the interviews to write the results in Section 4. The transcriptions was reread to look for good quotes and to check again that the experts opinion was analyzed correct. To verify some of the information from the experts, some new literature was search for.

2.4.2 Focus Group

For the focus group much of the same method of analyzing the data from the experts interviews was used. The focus group included less data, so some steps was skipped. This included making tables of each participants thoughts on different topics, since all the data was came from one interview and few participants expressed an opinion on the same topics.

To start with, the focus group discussion was transcribed and the different presentations was labeled to make it simpler to look up later. This transcription included the participant code for all of the comments, making it possible to link each quote to the participant that said it.

Following the method mentioned in Oates (2006), the useful data from the discussion in the focus group was chosen. This data was then added to a summary, which can be seen in Appendix D. This summary includes both interpretations of the discussion and quotes. The transcription was reread to make sure that all the important points from the focus group was included and that the interpretations was correctly interpreted.

The data was then added to a table with three columns; themes, codes and comments. In this analysis an inductive approach was also used and the themes was found from the data. The second column included both interpretations and quotes and the third column was my own comments on the data collected on this theme. After the initial table was made, some smaller themes were merge together and larger once was split into two themes during the process.

2.4.3 User Test

The data analysis process for the user test is very similar to the expert interviews and the focus group. Firstly all of the interviews was transcribed and the notes taken during the observation was added to the same document. The method from Oates (2006) was used and a table with three columns; themes, codes and personal notes was made. In the beginning there were four categories; motivation to physical activity, navigation, design and other. Useful data from the observations and interviews in the user test was added to one table per user test and the caregiver interviews to separate tables. The useful data was then added to a summary sorted by the previously mentioned main four categories. These summaries can be seen in Appendix E.2 and Appendix F.2.

The data analysis for the user test did use the same inductive approach used in the data analysis of the expert interviews and the focus group. An inductive approach is to use the data to find the themes in the data (Oates 2006). For the user test several themes was found in each category. Some themes were the same for both user tests and others were only present in one of them.

In the caregiver interviews the exiting categories was used as themes making this more of a deductive approach (Oates 2006). This was done because of the small amount of data collected from these interviews, making it difficult to split the categories into several themes.

2.5 Participants

2.5.1 UiT and UNN

The project was done in cooperation with The University in Tromsø - The Arctic University of Norway (UiT), The University Hospital of North Norway (UNN) and their project “Effect of physical activity with e-health support in individuals with intellectual disabilities. A randomized controlled study”, see <https://forskningsprosjekter.ihelse.net/prosjekt/HNF1353-17>. Currently the project is in the beginning phase and collecting data through interviews and analyzing the data. The PhD candidate is a psychologist.

The project assembled a multidisciplinary team from multiple universities in Norway as collaborators. This includes people with backgrounds in health and computer science. People from this team participated in the interview in Chapter 4.

In addition to the app made in this project, other students have also working on different apps and games promoting PA for people with IDs. These projects was either master thesis at UiT, master thesis at NTNU or student projects in the course “Advanced mHealth systems and applications” available for master students at UiT.

UNN hosted a seminar in Tromsø October 3. and 4. 2018, inviting all co-supervisors, students working on games or apps motivating to PA, other employees at UNN and some invited speakers.

2.5.2 FTU App and Smart Cognition

One of the speakers at the seminar at UNN in October 2018 included the founder of Friluftsliv Tilrettelagt for Utviklingshemmede (FTU) and he is currently event manager for two FTU locations. FTU arranges outdoors events all over Norway adopted for people with intellectual disabilities and has an app to inform about these events. The app is developed and maintained by Smart Cognition.

Another speaker at the seminar was the CEO of Smart Cognition, he has an education in computer science. Smart Cognition is working on a leisure activities platform for people with intellectual disabilities using artificial intelligence and machine learning. The platform will automatically process information and present it in a way customized to each individuals communication level and preference.

Employees from these companies and organizations participated in the expert interviews in Chapter 4.

2.5.3 Intellectual Disability Nurse

An intellectual disability nurse (Vernepleier in Norwegian) that have worked at the Institute of Mental Health at NTNU (formerly Høyskolen i Sør-Trøndelag) was contacted to participate in the project. She has arranged several hiking trips for people with IDs and is currently a part of the team hosting outdoor events for people with IDs in Trondheim through The Norwegian Association for Persons with Intellectual Disabilities (NFU). She was initially contacted about one of these outdoor events she was hosting and was later interviewed in one of the expert interviews.

2.5.4 Physical- and Occupational Therapists

For the focus group a physical therapist was contacted. She has previously worked with people with IDs, but currently works as department manager. She is personally very interested in PA and hiking.

An occupational therapist was also contacted to participate in the focus group. She works at a day center for people with IDs and has a lot of experience with the user group.

2.5.5 Department of Computer Science Employees

Several employees from Department of Computer Science (IDI) participated in the focus group. This was people with experience in designing apps for people with IDs, but some also had additional experience working with people with IDs.

2.5.6 Day Center in Trondheim Kommune

The prototype of the game was tested on people with intellectual disabilities. Contacts from Trondheim Kommune, NTNU's Institute for Mental Health and NFU's outdoor events was contacted to find users.

The participants was recruited from a day center in Trondheim Kommune. The participants was recruited by the caregivers and needed to have an ID and be 16 - 35 years old. The caregivers were also informed that the participants would borrow a phone, so they did not need to own a phone. People at this day center mostly have moderate level of IDs, but many also have additional diagnoses like autism or related to mental health. The caregivers included in the user test was also recruited from the same day center and already knew the users.

2.6 Ethics

An application to the Norwegian Center for Research Data (NSD) has been applied for and approved. This application addresses many of the ethical concerns including consent, what data is gathered, data storage, sharing of data and anonymization of data. The full NSD application can be seen in Appendix A. This is the final version of the application and has been approved by NSD.

Data collected from people with IDs is based on public interest and scientific research. To be able to include people without the competence to give consent it is important that the research can gain the participant or the group the research is done on (The Norwegian National Research Ethics Committees 2019[a]). Physical Activity is important and Norwegian Directorate of Health (2019) recommends a minimum of 150 minutes of moderate physical activity each week. Further they say that physical activity leads to better health and decrease the possibility for over 30 conditions and deceases. Dairo et al. (2016) found that only 9% of people with IDs reach these goal.

It is important to include people without the competence to consent to include people with all degrees of ID. The user group naturally includes people with varying ability to consent (Bufdir 2018a). To do research on the user group it is important not to exclude people without the competence to consent, so that the research is only valid for people with the competence to give consent (Bufdir 2018a).

2.7 Voluntary Informed Consent

2.7.1 Consent for People with Intellectual Disabilities

In research experiments it is desirable to get a legally binding consent. This consent must be evaluated for each situation and not just based on the person (The Norwegian National Research Ethics Committees 2019[c]). To be able to consent the participant needs to be

able to resonate and judge options, express credible choices that are sustainable over time and understand the consequences of their choices (Bufdir 2018a).

In this project the users ability to consent will be determined in cooperation with health care professionals working with the participant. This follows the advice given by The Norwegian National Research Ethics Committees (2019[b]) when it comes to determining the competence to give consent and consulting with someone independent to the research project on this matter.

Some adults with IDs cannot make legal and economic decisions for themselves and instead has a guardian to make legal and financial choices (Lovdata 2019). This makes the ethical liabilities of this project especially important (The Norwegian National Research Ethics Committees 2019[c]). Because of the use of guardians, the guardian's will sign the consent forms for the participants without the competence to give consent. The participants will still be informed about the experiment and agree to it as well.

They also say that if the participant decline to participate in the project, this is more important than family or guardians agreeing to participate. The participant verbally or through alternative supplementing communication agreeing or declining is an opportunity for the participant to express their possible reluctance to the project.

2.7.2 Informing People with Intellectual Disabilities

To reach a high enough level of understanding about the project to be able to consent, the information needs to be adapted to people with IDs. This information needs to explaining the advantages and disadvantages of the choice.

The participants will get an informational letter including about the project, what participating in the project means for them and how their privacy will be protected. The letter also includes a place to sign, used as a method to collect consent from users in need of a easy-to-read consent form. This is written with easy-to-read text following the guidelines from Inclusion Europe (2009). Figure 2.3 show a part of the informational letter explaining the participants rights. In addition to using short sentences, some of the difficult words have been replaced by descriptions of the word.

The information can also be given verbally for participants that prefer this and the consent will also in this case be given verbally or using alternative supplementing communication. This measures has been included to give the participants a larger opportunity to decide for themselves and a way to decline participating. The Norwegian National Research Ethics Committees (2019[b]) explains that even if the participant is not deemed able to give consent, they should receive information about the project.

2.7.3 Voluntary Participation for People with Intellectual Disabilities

All participation in research is voluntary, but this can be a difficult word for people with IDs (The Norwegian National Research Ethics Committees 2019[c]). In the informational

letter the word voluntary is not used, but explained instead. Because of the lack of opportunities to decide over their own life, many people with IDs find the concept of voluntary difficult to understand as well (The Norwegian National Research Ethics Committees 2019[c]).

2.7.4 Consent for Experts, Caregivers and Family

To maintain the ethical responsibilities for people without IDs, they will also sign a consent form. Their participation will be based solely on voluntary informed consent.

The participants will agree to support the users during the user test and an individual interview afterwards. The information collected about them includes name, contact information, education and their relation to people with IDs. They will also be recorded during the user test.

2.8 Participants Rights

2.8.1 Rights of Participants in the User Test

Anonymity is important in research, but can be difficult to keep in projects including people with IDs. Based on background information like where the person lives and the participant's health, it is possible to identify the participant in some cases (The Norwegian National Research Ethics Committees 2019[c]). To reduce the possibility of this happening, the background information given about the participants is not very detailed, but will be enough to justify the results. The word anonymity can be difficult for people with IDs to understand and the meaning of the word is therefore described in the informational letter.

We tried to limit the amount of very personal information gathered that is very important that is kept confidential. Only the most basic health information, most significantly whether the participant has an ID, was gathered for the user test. Other information gathered included their thoughts on the app and PA. Information that is more important that stay confidential can be included by the participant themselves (The Norwegian National Research Ethics Committees 2019[c]). Someone could mentioning very private information about their health or say negative things about their caregivers, their housing or day center. This information will be considered carefully if it should be included in the evaluation.

In addition to the anonymity and participation being voluntary, the participant also has the right to see what information about themselves is stored. To explain that participation is voluntary, an additional sentence about being able to quit if they want to is added. To see the complete list of the participants rights, the participants rights section of the informational letter is included in Figure 2.3.

Dine rettigheter:

Du bestemmer selv om du vil være med

Du kan slutte når du vil

Du kan få se informasjonen om deg selv

Informasjonen blir ikke lagret med ditt navn

Figure 2.3: Information about the users rights from the easy-to-read informational letter. The text explains the participants rights.

2.9 Collecting and Storing Data

A minimal amount of background information about the participant was gathered. What day center and housing for people with IDs they have been recruited from was gathered, but only the type was presented. This decision has been made to limit the possibility of identifying the participants based on the name of day center or housing. During the user test more data was collected. This includes sound recordings during the test session.

When using observations there is a chance that information not included in the consent form and the NSD application is observed. The Norwegian National Research Ethics Committees (2019[c]) suggests not including information outside of the project description, this advice will be followed during the user tests.

Mobile devices from The Department of Computer Science at The Norwegian University of Science and Technology (NTNU) was used to play the game and to record the observations and interviews. The data gathered in this project was stored in NTNU's OneDrive cloud storage service. This is administered by NTNU and has a Data Processor Agreement including claims on data protection with Microsoft corp. This service includes a change log, access restrictions, access log and encryption when stored and transferred. The data will only be processed by the students, the project leader and internal employees at Department of Computer Science.

Chapter 3

Literature Review

A literature review was conducted in the beginning of the project. The literature review looked into how games and game-inspired apps motivate to physical activity (PA), navigational systems for people with an Intellectual Disability (ID) and designing apps and games for people with IDs. Each of these topics are linked to a research question and together will help answer the main research question.

3.1 Method for Retrieving Articles

To find the papers for this literature review the databases ACM Digital Library, IEEE Xplore Digital Library and ScienceDirect was used. For papers on navigational assistance systems for people with IDs Google Scholar was used, because of the very limited number of papers in the other databases. Table 3.1 show the databases and search words used for each subsection. Only papers from 2014-2018 were chosen to get the newest research on these topics. For the navigational assistance systems older papers were also included because of the shortage of newer papers. More information about the method used for the literature review can be found in Section 2.2.

Related Subsection	Databases	Search Words
Games and Apps Promoting Physical Activity	IEEE Xplore Digital Library ACM Digital Library ScienceDirect	“mobile (exergame or exertion game or physical activity game) and intellectual disability”
System Design for People with IDs	IEEE Xplore Digital Library ACM Digital Library ScienceDirect	“design intellectual disability” “game intellectual disability” “app intellectual disability”
Navigational Assistance Systems	Google Scholar	“outdoor navigation intellectual disability”

Table 3.1: Search strategy

3.2 Game or Apps Promoting Physical Activity

The databases and search words used to gather the papers used in this section is shown in Table 3.1. To be included the papers needed to research an app or game promoting PA. The game or app also needed to have the possibility to be used walking outside and therefore be a mobile game or app. The papers needed to be targeted towards general PA and not targeted towards a specific illness, disease or elderly. Their needs for PA are often different than that of the general public, like games targeted towards elderly including fall prevention training.

In this section the game or app idea used in the different papers are studied and looks into how they try to motivate to PA. Research into how PA is measured and if any of games or apps increased PA is also looked into.

3.2.1 Game Ideas

There are many different methods to motivate people to do PA, see Table 3.2. The challenges in the app or game can be complex and require cognitively challenging problem solving. In O-Mopsi by Fränti, Mariescu-Istodor, and Sengupta (2017), this was the case. The challenge in O-Mopsi is digital orienteering and was used in urban areas. The game is different from regular orienteering because the targets are not marked with an exact coordinates and the order of the targets are not fixed, see Figure 3.1. The tasks in this game was therefore first to find the shortest route, go to the correct area and then find the target based on a photo.



Figure 3.1: O-Mopsi view of map containing targets

In some games the challenge was larger and taking step towards the goal was the motivational factor. Morrison and Bakayov (2017) created Stickers for Steps, where the goal was to collect all the stickers. The user got new sticker after waking a specific number of

steps, the number of steps required increases throughout the day and resets at midnight. The social part of the game was a large focus in the research. The social interactions included in the game was face-to-face meetings with other users, where the users would exchange stickers. These interactions worked as icebreakers and resulted in conversations about the game, used routes and general topics often followed the exchanges. The social interactions of the game were enjoyed by the users and the game was more engaging when seeing other people like the game. Screenshots from Sticker For Steps can be seen in Figure 3.2.

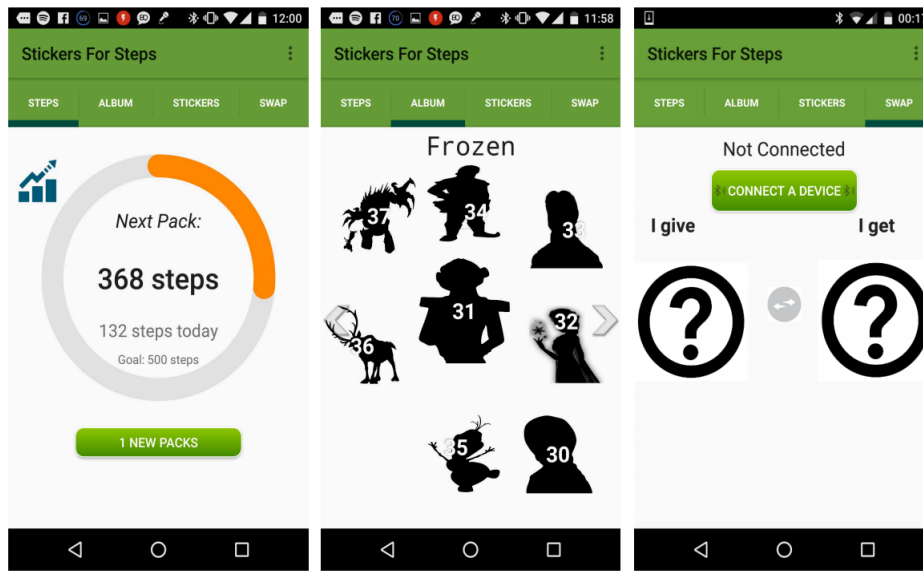


Figure 3.2: Screenshots from Stickers For Steps. Shows view of required steps until next pack of stickers, the sticker album and the sticker exchange view

Stanley et al. (2015) presented Gemini Redux, a game where the challenge for PA was not required to play the game, because it was not part of the primary game play. The primary game was created as a Massive(ly) Multiplayer Online Role-Playing Game (MMORPG). The PA was used to strengthen an animal companion, this companion could be used in the primary game. The PA is measured on a phone and includes an app for the user to keep track of the amount of PA they have done. The app also reminded the user to do PA through alerts on the user's phone.

Research on Pokémon Go was done by Marquet, Alberico, and Hipp (2017). In this game the PA was in the user catching Pokémon, to do this the user needed to change locations in the real world (*Pokémon Go* 2018). The target of the game was to become the best Pokémon trainer and catch all the Pokémon. This target was the same as the original Pokémon game and TV-series.

3.2.2 Measurement of Physical Activity

To measure the amount of PA, a simple step count was frequently used. This measurement was used by Gemini Redux by Stanley et al. (2015) and Stickers For Steps by Morrison and Bakayov (2017). These are mobile games or apps, that are played either completely

Name	Type of challenge	Measurement of physical activity
O-Mopsi	Digital orienteering	GPS
Stickers for Steps	Collecting stickers and social interactions	Steps
Gemini Redux	MMORPG and benefits because of physical activity	Steps
Pokémon Go	Success in the virtual Pokémon world	GPS and steps

Table 3.2: Games and apps promoting physical activity

or to some extent on phones. Additional fitness trackers were not needed because the user's phones measured the number of steps taken by the user.

Some games do not measure the amount of PA but used arriving at a place as the PA. This was used in O-Mopsi by Fränti, Mariescu-Istodor, and Sengupta (2017). The focus in this game was not necessary the sum of PA, but the PA is a byproduct of playing the game. It was designed to be used only when walking but could be used with other forms of transportation as well.

Location-based targets was used by Pokémon Go as well, but Pokémon Go also showed the step count and the length walk each week. These measurements were used in some extra features, this made the focus more on PA.

3.2.3 Changes to Amount of Physical Activity

Research into whether games and apps can increase the participants PA has been done. This was what Marquet, Alberico, and Hipp (2017) researched in regarding to Pokémon Go. This research used college student and split the participants into two groups, one that declared themselves as Pokémon Go players and one that did not. All participants measured their steps with an accelerometer and the participants also answered a small questionnaire about their playing habits three times a day. The participants PA was measured for one week. The research did not find a significant difference in PA between players and non-players. This is argued to be a result of people entering this research project either was interested in PA or digital games. The researchers believe that Pokémon Go could increase the amount of PA for people with a sedentary lifestyle, which is also what Althoff, White, and Horvitz (2016) found.

According to the research done by Althoff, White, and Horvitz (2016), Pokémon Go increased PA by 25% for engaged players. The researchers suggested playing Pokémon Go had a positive effect for people who play a lot of games and had a sedentary lifestyle.

Stanley et al. (2015) researched if using the game Gemini Redux increase the amount of PA for the players. The first day of the experiment was used to get a baseline of the players level of physical activity and a tutorial was presented. The research experiment continued for 9 more days, where the players played the game. The game did not report an increased level of PA either. This was thought to be because of the detachment between the PA increasing the strength for the animal companion and the primary game play. In the future they proposed including small games as motivation for PA and make the connection between the PA and the primary game play clearer.

Article	Test Period	Changes Using Game
Marquet, Alberico, and Hipp (2017)	1 week	Little difference
Althoff, White, and Horvitz (2016)	30 days	25% increase
Stanley et al. (2015)	10 days	No change

Table 3.3: Changes to Amount of Physical Activity

3.3 Navigational Assistance Systems

To find papers used in this section, a search for “outdoor navigation intellectual disability” was done. The papers suggested navigational assistance system for people with IDs and included research on the suggested features and the complete system. To see the full information about the search, see Table 3.1

This section shows how these systems displayed the directions to the user and what features has been added to make it simpler for the user to navigate to the target destination. Safety features or features proposed for future systems are also discussed. Lastly research into how the route are formed and what role the caregivers had in this procedure. Table 3.4 summarize the results from this section.

3.3.1 Presentation of Directions

Navigational systems for people with IDs have different primary tactics for the navigational assistance. Kramer, Covaci, and Augusto (2015) proposed an app, POSEIDON. This app used a map and straightforward text for the primary view and was designed for people with Down’s syndrome. At important steps in the route, pictures at street level were shown, this feature was very helpful. A few differences in the resemblance between the map and the real world was however demanding for some. Figure 3.3 show how the user interface of the navigational assistance system POSEIDON.

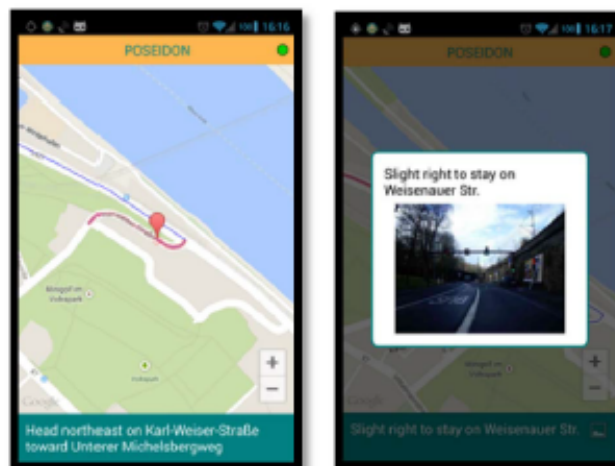


Figure 3.3: Map view and street level picture in Poseidon navigational system

Garcia de Maria, Carro, and Haya (2012) suggested an app for people with cognitive disabilities, called Where Should I Go? (WSI-GO). The app consists of two different modes, one is an audio mode and the other a visual mode. The “audio mode” only include audio directions. This mode was most helpful for people with fewer cognitive limitations, because less time needed to be spent watching the screen. The researchers reported some issues regarding left and right and this led to a few users walking in the wrong direction.

The “visual mode” from Garcia de Maria, Carro, and Haya (2012) and Gomez, Montoro, et al. (2015) suggest using street level pictures and straightforward text but have also included different additional features. Using street level picture to identify landmarks or other objects, was described as helpful by Garcia de Maria, Carro, and Haya (2012). Some problems with the variations in the pictures and the real-world lead to some confusion and struggles when navigating using the “visual mode”.

The “visual mode” in the app proposed by Garcia de Maria, Carro, and Haya (2012) also used arrows on top of the street level pictures. The arrow points in the direction the user should walk, see Figure 3.4. Sound prompts (beeps) was used to alert the user about changes in the visual interface.



Figure 3.4: Street level picture from “visual mode” in Where Should I Go?

Gomez, Montoro, et al. (2015) developed an app called AssisT-OUT. This app used street level pictures and a progress bar to inform the user how far they had gotten in the current step. Two buttons were also included to change to the following or previous steps. An example of the user interface for AssisT-OUT is shown in Figure 3.5. The app also used text to audio to include people who struggle with reading. To alert the user of a decision point vibrations was used. People with cognitive disabilities had a larger chance of reaching their target destination with AssisT-OUT then with simply using Google Maps.

3.3.2 Safety

Regarding safety issues, Kramer, Covaci, and Augusto (2015) found that people using the app looked at the phone most of the time. The caregiver therefore had to remain the



Figure 3.5: Screenshots of AssisT-OUT

Name	Directions	Safety Features	Configuration of Route
WSI-GO visual	Street level pictures and simple text		Mapped area
WSI-GO audio	Audio		Mapped area
AssisT-OUT	Street level pictures and text to audio	Help button	Automatic
Poseidon	Map with street level pictures	Notifications before crossing the road	Manually

Table 3.4: Navigational assistance systems for people with IDs

users to pay attention to the road and not to look at the phone when crossing the road. They suggest that the user should get an alert when crossing the road.

Gomez, Montoro, et al. (2015) suggested adding a help button. This button would be used if the user got lost and needed help. When the button was clicked, the caregivers was notified and received the location of the user. This made it possible for the caregivers to quickly find the user.

3.3.3 Configuration of Route

AssisT-OUT by Gomez, Montoro, et al. (2015) automatically collected the street level pictures from Google Street View. This limited the time needed to make a new route and makes it possible to include recalculation of the route if the user walks in an incorrect direction in the future.

In WSI-GO by Garcia de Maria, Carro, and Haya (2012) and POSEIDON by Kramer, Covaci, and Augusto (2015) the street level picture had to be added manually. For WSI-GO the area had to be mapped also allowing for recalculation of the route, but in POSEIDON the route was added manually by a caregiver.

3.4 System Design for People with IDs

To find papers for this section multiple searches were done. The searches done were “design intellectual disabilities”, “game intellectual disability” and “app intellectual disability”. When choosing papers a wide selection were chosen, including both apps and games. To see the complete search, see Table 3.1

This section starts by discussing the role of stakeholders in the design process. This includes both caregivers and people with IDs. Secondly the user interface is discussed, followed by sections about communication and where an app or game should be customized. Lastly this section looks into how to use collaboration, monitoring and feedback.

3.4.1 Role of Stakeholders in the Design Process

Tsikinas and Xinogalos (2018) researched suitable design frameworks for serious games for people with IDs. The research conducted a literature review exploring design of serious games for people with IDs and further examined which design frameworks for serious games suits the proposed processes. None of the design frameworks was perfectly suitable and the design frameworks would have to be customized to design games for people with IDs.

When designing games for people with IDs stakeholder was important, like including individuals with IDs, caregivers or parents in the design process. Tsikinas and Xinogalos (2018) concluded that actively including educators in the design was important for the success of the serious game.

Wilson et al. (2016) proposed an app for people with IDs that would help them communicate their goals. This was achieved by producing a picture of themselves achieving their goal, see Figure 3.6. To design this app a co-design process was used and included people with IDs and students studying information technology for a period 1.5 year.

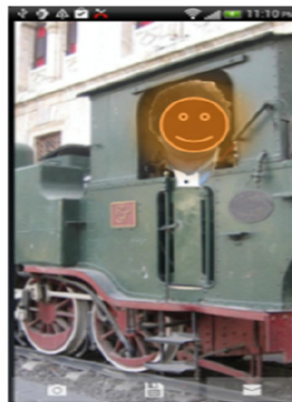


Figure 3.6: Finished picture produced with Put Yourself in the Picture

3.4.2 User Interface

Tsikinas and Xinogalos (2018) said that the user interface needed to be straightforward, clear and with minimal input required. The game should have large text, few distractions and high contrasting colors.

Cano, Fernández-Manjón, and García-Tejedor (2016) developed a video game for people with IDs as a way to learning how to use the subway, a screenshot of the game can be seen in Figure 3.7. The game consisted of many different situations that could happen when using public transport. This includes finding the correct platform and strangers coming up and talking to you. They also advice that the size, color and reading speed of the text is significant and should be customized to match the user.

Wilson et al. (2016) found that there should only be one stream of available action to make the app intuitive for the user. This way the stream of actions is always the same and this makes it predictable for the user.

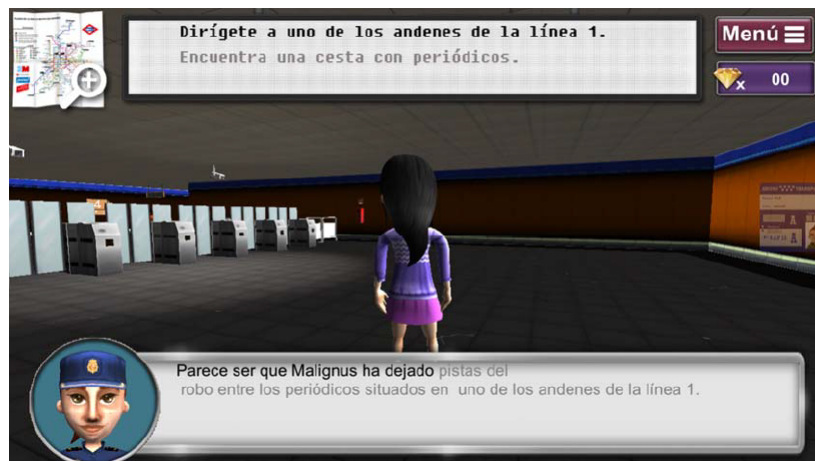


Figure 3.7: Subway station in Madrid from the video game Downtown

3.4.3 Communication and Language

The language and communication used in apps and games for people with IDs are important. Cano, Fernández-Manjón, and García-Tejedor (2016) used both written and spoken instructions and the language was straightforward and clear. A video tutorial for all tasks was also included.

Wilson et al. (2016) have focused their apps on the importance of communication for people with IDs, specifically communicating their goals in a way adopted for the user. They found that the visual communication was important and that it should be possible to use the application with icons only. Real picture as close to the user's life as possible was preferred.

3.4.4 Customization

The difficulty level of a game needs to be adjustable to be suitable for all people with IDs. Tsikinas and Xinogalos (2018) advice that the difficulty level should be customized to suit the individual because of this variance. The difficulty level needed to be increased gradually, but it should be increased so that the user continues to learn. To include the need for different difficulty levels, Cano, Fernández-Manjón, and García-Tejedor (2016) used three levels, “easy”, “medium” and “hard”. Some of the more difficult and stressful features, like the time limit could be turned off.

The help the user identify with the main character, the protagonist should be customized to resemble the user (Tsikinas and Xinogalos 2018). Cano, Fernández-Manjón, and García-Tejedor (2016) included a character that could be customized to resemble the user.

3.4.5 Collaboration

Collaboration and being social was important for people with IDs (Wilson et al. 2016). The picture of the user achieving their goal could be shared to their caregivers and parents via email. Sending the picture to their parents was appreciated by the users. The users often also include multiple people in their pictures and was generally very social during the sessions. The researchers propose to include social media as well in the future.

3.4.6 Monitoring

It is important to include monitoring of progress in serious games for people with IDs, this can be used to locate issues or difficulties the user experiences (Tsikinas and Xinogalos 2018). Including this monitoring could be used to helps educators improve the learning experience. Cano, Fernández-Manjón, and García-Tejedor (2016) included a learning analytic to monitor the progress in their game and to evaluate problems with the game.

3.4.7 Feedback

Tsikinas and Xinogalos (2018) found that it was important to continually give feedback. The feedback needs to be positive and negative feedback should be minimal or completely avoided.

Chapter 4

Interviews with Experts

Tsikinas and Xinogalos (2018) found that it was important for educators to be actively involved in the design process of serious games. Using this logic for games or game-inspired apps promoting physical activity (PA), it is necessary to involve people hosting events for outdoors PA for people with Intellectual Disabilities (IDs). This was the main reasons for having this interview.

The interviews also gave a view into how these types of outdoor events are organized. It gave some insight into the life of people with IDs and the people around them, including both caregivers and families.

The questions are divided into four main categories. These categories are:

- General questions about games for people with IDs
- Questions about motivation for exercise for people with IDs
- Questions about navigation for people with IDs
- Questions about designing games for people with IDs

This is a very similar division as the research questions, but also included a category for general questions. All of the Questions can be found in Appendix B. A summary of the answers given in the interviews can be found in Appendix C and are split up by participants. The interviews were semi-structured and further information about the method used for gathering and analyzing data can be found in Chapter 2.

4.1 Participants

For the interviews a selection of people with different backgrounds and areas of expertise were chosen. Some of the participants was contacted about participating in the interviews after first meeting them through the project i Tromsø, see 2.5.1. Name1 was contacted because of her work organizing outdoor activities for people with IDs in Trondheim. Table 4.1 show the participant's code, education and place of work. More information about the participants can be found in Section 2.5. Some of the people interviewed are also parents to someone with an ID.

Code	Background	Place of Work/Affiliation
Name1	ID nurse	NTNU
Name2	Business	DNT and Smart Cognition
Name3	Advisor PhD project	UiT
Name4	Psychologist	UNN and UiT
Name5	Computer Science	Smart Cognition

Table 4.1: Information about the participants in the interviews

4.2 Motivational Factors

This section looks at what motivates to PA. The answers gathered through the interviews have been collected in Table 4.2. As mentioned in the interviews, what is motivating will vary a lot from person to person.

Motivational Factors	Name1	Name2	Name3	Name4	Name5
Competition	X	X			
Being Social	X	X	X	X	X
Food and Campfire	X		X	X	X
Other Purpose			X	X	
Something happening along the way	X	X	X		
Sense of Accomplishment	X	X	X		
Predictability	X	X	X	X	
Caregivers involvement	X	X	X	X	
Rewards	X			X	

Table 4.2: Possible motivational factors for physical activity for people with intellectual disabilities

4.2.1 Social Aspect

The most mentioned factor was being social and was mentioned by everyone as a possible motivational factor, this is also mentioned by Mahy et al. (2010), Kuijken et al. (2016) and V. A. Temple (2009). Some said that the social factor is especially important when the individual moves out from their parents and into their own apartment. Name 2 mentioned that approximately 80% is on disability benefits and do not work, therefore use a lot of time at home. This is also supported by Wendelborg, Kittelsaa, and Wik (2017), which found that 80% of all 18 and 19 year olds were on disability benefits. Living in an apartment alone and not having work or school to go to make many adults with IDs lonely and is mentioned in many interviews.

When it comes to who it is most fun to do PA with, the answers differ some. Some said that it was most fun to meet someone other than their parents and families. Others said

that going hiking with family was appreciated for people living in their own apartment, because they got to spend some time with their family.

Some said that being social can be less important if they have a complex ID or in combination with autism. Name4 think that people with autism also like to be a part of the group, but will mostly stay in the background and observe.

4.2.2 Competition and Cooperation

Competition is mentioned as something that can be a motivational factor for some people with IDs. It does however not motivate everyone as mentioned by Name2, but that doing activities together is generally something people with IDs enjoy.

When it comes to cooperation between people with IDs the answers vary some, but most agree that it will be a bit difficult. It will not suit everyone and be dependant on the group. Both Name3 and Name4 mentions teams sports and that some people can do team sports and cooperate. Having a caregiver helping and selecting the groups is mentioned by most people interviewed.

4.2.3 Importance of Caregivers

Most of the people interviewed also said that the people around the person with an ID is very important. This was explained well by Name3, saying “They are very dependant on the people around them. That the caregivers also are motivated and maybe both like physical activity and makes it more pleasurable during the hike, like talking together and having fun. Just a pleasurable setting”. Name2 mentioned that body language is a large part of how many communicate, so the caregivers body language is very important. Mahy et al. (2010) agrees with this and V. A. Temple 2009 fund that caregivers where important both when it comes to social and environmental support.

4.2.4 Another Purpose for Physical Activity

Many participants mentioned that for many it is important to have another purposes for the exercise. Some of the purposes mentioned includes; walking the dog, walking somewhere to watch someone play sports, going out with the trash, going to see your friends or eating some food. This is also one of the factors motivating towards PA mentioned by Mahy et al. (2010).

Food and campfires was specifically mentioned by almost everyone as motivational when doing outdoor PA. Name5 said that if it was hiking trips in the wood, it is fun to make a campfire and some healthy food.

4.2.5 Predictability and Well Communicated

Predictability and well communicated activities is important and most participants mentioned it in their interview. Name2 also said that clear messages about what is going to happen is very important, but also that you give comparable choices. This could be questions like “do you want to play an game while walking around or just go on a hike and talk”. This can be related to the importance of communication for people with IDs that is the basis for the development of the app “Put Yourself in the Picture” by Wilson et al. (2016).

4.2.6 Enjoyable

Most people interview said that the activities should be fun. Name2 focus a lot on playing your way through PA and gave an example using reflex spray to mark a trail and then walking in the dark with flashlights. Kuijken et al. (2016) also found that the PA should be enjoyable for people with IDs. Name1 thinks that walking on a road when nothing else is happening often is demotivating and that walking on smaller trails in the woods is more exciting.

4.2.7 Sense of Accomplishment

A sense of accomplishment was talked about throughout the interviews with several of the participants. It is mentioned as something motivational towards PA, a sort of reward. Several of the participants believe the users will get a sens of accomplishment when being able to successfully navigate or cooperate with others. The importance of a sens of accomplishment is in it self a a reason not to increase the difficulty level too quickly.

When it comes to sense of accomplishment as motivation for PA for people with IDs, Name3 said the following, “A lot of people say that a sense of accomplishment is important. To feel that you achieve something, so to repeat something can often be good.”

Sense of Accomplishment and self-esteem is a topic in several research projects and is mentioned in variety of settings. Patterson and Pegg (2009) found that serious leisure could give people with IDs a sense of accomplishment and increase self-esteem. According to Tideman and Svensson (2015) self advocacy could also increase people with IDs self-esteem.

4.2.8 Rewards

Rewards are mentioned as motivation for PA, this is also supported by Mahy et al. (2010). When it comes to what sort of rewards should be used in a game, there was a lot of different advice. Name3 mentioned that it is important that the reward is clear and recognized as a reward. Some said that in this types of games physical rewards should not be included. Name1 used the following example, “You can not say, when you get home now, you can go to the kiosk”.

Rewards	Name2	Name3	Name4	Name5
Visual	X	X	X	X
Melody		X	X	X
Speech		X		
Praise from others	X		X	X

Table 4.3: Examples of rewards for physical activity through app or game

The suggested rewards can be found in Table 4.3. Visual rewards was suggested by everyone giving advice on the rewards and included suggestions like stars, roses or smileys. A simple happy sound or Melody is recommended by almost everyone. Name3 also suggests a voice saying something like, “good or great”.

Many people mention praise from others as a great reward. Name2 suggest that at events, you praise people having reached a milestone in the game, like number of events you have attended.

4.2.9 Popular games and themes

Popular games have been used to create games promoting PA, like Pokèmon Go (*Pokémon Go* 2018) created based on the Pokèmon game. Looking at what games are popular for people with IDs can be interesting and give ideas for what can be used in games for people with IDs.

In the interviews it is mentioned that both the cognitive abilities and interests can be diverse and games used by people with IDs vary a lot. Several participants mentioned picture lotto as a popular game that is used quite a lot by people with IDs. Simple board games have been used like snakes and ladders. Animal Yatzy can also be used, but dices with numbers can be too complex.

Name2 talked about some of the activities he had held at the FTU events. This included obstacle courses, rebus runs and learning about nature, like birds, insects and mammals with an ornithologist or a Barber pitfall trap. He think it is important to play throughout the hiking trip at these events and it should not just be a goal far into the future.

Music was mentioned by both Name1 and Name3 as something people with ID often enjoy. Name3 also talks about people watching music videos and dancing to them.

4.3 Designing Applications or Games for People with Intellectual Disabilities

When designing applications or games for people with IDs there is a lot to think about. This section looks at the advice mentioned in the interviews, Table 4.4 show these advice and who mentioned them.

	Name1	Name2	Name3	Name4	Name5
Simple	X	X	X	X	X
Not Childish	X		X		
Cool Design	X		X	X	
Recognizable			X		
Large Text/Buttons	X			X	X
Contrast in colors					X
Multiple Communication Levels	X	X		X	X
Adjustable Based on Interests				X	X
Adjustable Difficulty Level		X		X	X

Table 4.4: Suggestions on user interface through interviews

4.3.1 Straightforward User Interface

Everyone agrees that the user interface should be straightforward with as few distractions as possible. Name5 said that people with IDs needs more time to perceive and process things, so the user interface should include few things to think about. Name4 mentions that it should not be unnecessary and disturbing elements on the screen. A straightforward user interface is also supported by Tsikinas and Xinogalos (2018).

4.3.2 Games and Applications Should Not be Childish

It was said that it is important for the design not to be childish. Name3 further explained the importance of not having a childish design for adolescents and adults with IDs, saying that they are adolescents and adults and identify with their age. Even if their level of competence is the same as a child, they know that they are older.

Several participants mentioned that the design should be attractive or cool. Name3 also said that including something recognizable is very useful and that it could give a sense of achievement or recognition.

4.3.3 Large Text and Buttons

Large buttons, text and surfaces is mentioned by several participants. It can be difficult to click the button if it is too small. Some can have decreased vision and good contrasts between the colors is important. Having large text and high contrast between colors was also found to be important by Tsikinas and Xinogalos (2018).

4.3.4 Communication

Most of the participants agree that different types of communication should be added. Name3 said that in this project it would be more beneficial to design the app to one specific target group and that it did not need to be suitable for everyone with IDs for a project of this size. This would possibly limit the need for several different types of communication to be used.

Communication Levels	Name1	Name2	Name4	Name5
Symbols/Pictures	X	X	X	X
Audio	X	X	X	X
Easy-to-read text	X	X		X

Table 4.5: Different levels of communication suggested in interviews

The different levels of communication mentioned includes symbols or pictures, audio and easy-to-read text. Downton by Cano, Fernández-Manjón, and García-Tejedor (2016) used both easy-to-read text and audio in their video game. Most agreed on the use of these communication levels, see Table 4.5. Name4 did say that she thought that text would be difficult to understand for most and should not be used to give feedback. The importance of symbols are supported by Wilson et al. (2016), which found that an app for people with IDs should be possible to use only with symbols.

For the users that cannot read, it is important to remove the text. The text will only be a disturbing and distractions should be avoided for people with IDs. Name2 said that in the platform he has been working on, there will be an option to remove the text and only use the communication symbols and audio.

4.3.5 Individually Customized Games and Apps

Name4 said that people with IDs can have very specific and all consuming interests, so she would like there to be some way to adapt the app or game to each persons interests. This could be to just choose the protagonist of the game or app from a list, but there should be several choices. Customizing the protagonist in the game to be similar to yourself is said to be important by Tsikinas and Xinogalos (2018) and Cano, Fernández-Manjón, and García-Tejedor (2016).

Finding the correct difficulty level of an app or game can be difficult, some of the participants wants the difficulty level to be customized a bit to the individual. This struggled to find the correct difficulty level was further explained by Name1. She thinks it is important that the game or app is not too simple for people with mild IDs, since the game could be perceived as suitable for children. At the same time navigation can be difficult for people with more severe IDs.

4.3.6 Changes and Increased Difficulty

The overall impression is that people with IDs like to repeat task, especially task they accomplish. This was mentioned by almost everyone interviewed and the sense of achievement was an important topic throughout all of the interviews.

Some meant that the difficult should be increased, but most also mentioned that if the difficulty was increased it had to be increased slowly. Name4 thought it was possible that people with IDs would not understand reaching the next level or the progress in the game. Name3 mentioned a football coach she read an interview about. He said that they usually worked on the same task year after year and when he tried to add something new, it was not always appreciated. Tsikinas and Xinogalos (2018) also found that the difficulty should be increased slowly.

At the same time it is also important that there is something new, this could increase the motivation. Name4 thinks that it does not necessarily have to be more difficult, but doing the exactly the same multiple times a week can become boring.

Name4 mentions increasing the length of the routes when they get into better physical shape, but it should be increased slowly. Name1 agrees with this and thinks the areas also could change, you could have some routes in the woods and some close to home in more urban areas.

4.4 Navigation

4.4.1 Use of Navigational Assistance Systems

When it comes to navigational systems most of the people interviewed agree that they think using systems with maps, like Google Maps would be difficult. This is also what Gomez, Montoro, et al. (2015) found. Name4 told about people with severe IDs not being able to walk over to their neighbors using simple maps their parents had drawn up. Further saying that maps are very abstract and can be difficult for people with IDs to understand. Name5 told that he has previously used a game called Stolpespillet with his son and that he finds this a bit fascinating. It is therefore believed that people with milder IDs would be able to use maps, this view is also shared by Name1. Name2 said that the voice and the re-calibrating will be a big help when using Google Maps. If you walk the wrong way, you are told to turn around and walk the other way.

All agree that a specially adapted system would be beneficial and easier for people with ID to use. Different features was suggested and Table 4.6 shows which features were suggested by each participant.

Name2 said the following about navigational assistance systems designed for people with IDs and if they would be easier than Google Maps to use. “Yes, I believe so. It will be good, especially if it includes like the, ehh, real view/street view”. The street view is something Name4 and Name5 also brings up as an important feature. As mentioned before maps can be to abstract for people with IDs. Kramer, Covaci, and Augusto (2015)

Feature	Name1	Name2	Name3	Name4	Name5
Street View		X		X	X
Audio			X	X	
Notifications	X				

Table 4.6: Important features in a navigational system for people with intellectual disabilities

said that this was found to be an important feature in their application and Gomez, Montoro, et al. (2015) and Garcia de Maria, Carro, and Haya (2012) both use street view picture as the main way of navigating. Issues related to left and right is also brought up by multiple participants, but this issue was also found by Garcia de Maria, Carro, and Haya (2012). As a solution to this issue with left and right, Name4 said that someone should point the direction you should walk.

Name3 said that audio should be included as well, since many cannot read. Notifications at decision points in the route is mentioned as something that could be beneficial both for people with IDs and their caregivers.

Many mentions the role of the caregiver or parents when it comes to navigation. They can be a good support in trying to navigate and when it comes to the safety during the hike.

4.4.2 Safety Features

Regarding possible safety features, two types were included in the interviews. The first is notifications at key points in the route, similar to what Kramer, Covaci, and Augusto (2015) suggested. The second is an alarm button that notifies parents or caregivers when the alarm is pressed and sends the location of the user. This is similar to what is suggested by Gomez, Montoro, et al. (2015).

The notifications was mentioned as something that could work, at both decision points in the route and at pedestrian crossings. Name3 told that these notifications is something that needs to be learned and learning something new takes longer for people with IDs than people without IDs. One participant is also unsure if the user actually would look at their notifications.

The alarm was positively received by everyone, especially for people with a mild ID walking alone. Name1 mentions that people with IDs can have problems explaining their location, so sending the location would make it possible to locate the user quicker. This is also the reasoning for adding the help button in AssisT-OUT by Gomez, Montoro, et al. (2015). It is also believed that automatically connecting a call to a parent or caregiver can be a security for people with IDs when they are lost.

Name2 on the other hand is worried that some could think it is fun if a lot of people come running and giving them attention when the alarm is set off. Name4 also said people might not know they are walking in the wrong direction and only press the alarm when

they are scared. This could lead to the alarm also being set off when they are not lost, but scared.

In the end it is the caregivers or parents that are responsible for the safety of the individual with an ID. As Name2 said, if they come to the event alone then they do not need assistance to walk around. If they come with caregivers, it is their responsibility to maintain the safety. The safety needs to be a focus and he said that the safety at an event is important for people to continue to these events.

4.4.3 Choosing the Outdoor Area

When choosing an area, there were three main concerns mentioned in the interviews; safety, the ground you walk on and the impact of the surroundings on the individual with an ID.

Regarding safety, traffic was the most mentioned issue and was mentioned by everyone. According to Name3 it is important to keep the attention on the traffic, both cars and bikes. When playing a game while walking in urban areas, it is easy to lose this attention. Name4 also mentions water and avoiding areas like docks. Open areas are easier to have control over for the caregivers.

It is also important that the ground is flat and solid. Regarding this Name5 mentioned problems with balance among people with an IDs and Name1 noted that some are dependant on wheelchairs.

The surroundings needs to be carefully considered. Several mentioned that there should be few distractions and that there should be few people around. This is similar to the advice on the user interface and is mentioned both earlier in the interview and Tsikinas and Xinogalos (2018). This then gives urban areas a disadvantage and suggest that the woods or in nature could be better for this purpose.

Everyone interviewed thought that playing the game in nature was a good idea, but some said that urban areas could be preferred in certain situations. Name4 think that urban areas close to home could be preferred if it is a solitary activity. If it is a group activity, people are more inclined to travel to the event and nature would be more suitable. Another participant mentioned that hiking in nature could make it more exciting and different from an everyday evening walks.

Suggesting nature as the most suitable, could be affected by the people interview. Both Name2 and Name1 have spent a lot of time arranging hiking trips and nature events for people with IDs and are passionate about these types of events for this group.

4.5 Extra features

During the interviews some ideas did not relate to motivation towards PA, navigation or design of apps or games was brought up. This was ideas to make the hike better and extending the experience of the trip. These ideas are discussed in this section.

4.5.1 Equipment List

Name1 suggested a checklist to remember all the equipment needed for the hike. Before you leave your home, you get a checklist that can be set up by the parent or the caregiver and vary based on seasons. She said that people with IDs often struggle with finding appropriate clothes for the season and weather, so having something based on seasons would be a big help. It does not have to be a list you have to follow, but could be suggestions of what you might need. It should include questions like “Do you need a flash light?” or “Do you need a raincoat today?”. This could potentially decrease the weather barrier mentioned by V. A. Temple (2007) to some extent. If you know how to dress for the weather the hiking experience would possibly be better, even if it is raining it will be better, because you will not get soaking wet. These suggestions can also be based on today’s activity. If you are suppose to bring food for the campfire, the question “Should you bring sausages for the campfire today?” could be added.

4.5.2 Physical Copy of the Symbols

Name2 mentioned printing out some symbols and bringing them to the event to help with the communication. Some people with intellectual are used to communicate using pictures and navigating for symbols on a small phone can be difficult when you are outside. Bringing a physical copy of the symbols used in this event ensures that the most important symbols also are available for the user at the events.

4.5.3 Monitoring progress

Monitoring the progress of the user when it comes to the amount of PA is suggested by Name4. The parents could check how often it is used or how far each user walks on each trip. Maybe the parents could set some goals and check if the goals was met. This type of monitoring was found to be important in serious games by Tsikinas and Xinogalos (2018).

Monitoring can also be used as a communication and learning tool and extend the hiking experience. Name2 thought this could be used in the learning process related to navigation and be a communication tool for this process. In areas where the user have struggled, you could go back and discuss what to do in this situation. It is also possible that there just was something fascinating at this location and then it could be used as a communication tool. Maybe a tree has fallen to the ground and a lot of time has been spejt looking at this, the monitoring could be used to find this spot and start a conversation about it.

Name5 thinks that adding pictures from the trip could be a great way to communicate about the trip. The importance of communication tools for people with IDs is talked about in Wilson et al. (2016). Also communicating through pictures and using pictures to explain what you have done earlier is mentioned as important. Further Name5 explains if you do not live with your parents, you can communicate with them about the event or

hiking trip you participated in earlier and this will extend and increase the total experience of the event or hike.

4.5.4 Tutorial

Name4 mentioned the importance of easy user manuals, uncomplicated administration and the possibility to get help when needed. If this is not included, the systems were often no longer used. Both she and Name2 said that the system should include an easy to understand user manual with pictures and a video tutorial. This manuals should be possible to use for both by the caregivers, parents and the person with an ID. Video tutorials was also used in the game Downtown by Cano, Fernández-Manjón, and García-Tejedor (2016).

Chapter 5

Towards a Prototype

This chapter starts with a presentation of the guidelines for game-inspired apps promoting outdoors physical activity for people with Intellectual Disabilities (IDs). These guidelines are based on the finding from the literature review in Chapter 3 and the initial interviews in Chapter 4.

Further the idea for the game-inspired app is presented. This app follows the guidelines from Section 5.1 and uses ideas from game design. In Sections 5.3, 5.4 and 5.5 the game idea is discussed in relation to how the app meets the guidelines from each of the research questions.

A focus group was then conducted to get feedback on the proposed app and guidelines from experts. This section includes both a summary of the planning and results.

The last section describes how the app was developed. This includes both the technical decisions and making the route and story used in the evaluation.

5.1 Guidelines

Based on the literature review in Chapter 3 and the expert interviews in Chapter 4 guidelines for a game-inspired app promoting outdoor physical activity for people with Intellectual Disabilities (IDs) was proposed. These guidelines were divided in groups based on the same division used earlier in the report based on the research questions.

5.1.1 Motivation to Physical Activity

The following guidelines was found through the literature review in Section 3.2 and the expert interviews in Section 4.2. Both the literature review and interview looked into games and apps promoting physical activity, but the interviews was specifically targeted towards physical activity for people with IDs.

Guidelines for motivation to do physical activity:

- The app should be fun

- Caregiver should be included and motivated for the physical activity
- Social aspects should be included
- A reward, medal or positive feedback should be given
- Motivation needs to be given throughout the hike
- Motivation should be given with straightforward concepts that is understandable for people with IDs

5.1.2 Navigational Systems for People with IDs

To find the guidelines related to navigational assistance systems for people with IDs the literature review in Section 3.3 and the expert interview in Section 4.4 was used. These sections look into navigational assistance systems for people with IDs. How these systems present the directions and safety when navigating outdoors are the main topics.

Guidelines for navigational assistance systems:

- Use street level pictures at decision points
- Include audio instruction
- Use sound prompts and/or vibrations at decision points
- Include arrows
- Try to place routes away from traffic, deep water and places with many people
- Include an alarm button if the user will walk alone

5.1.3 Designing Systems for People with IDs

The guidelines for designing systems for people with IDs was based on the literature review in Section 3.4 and the expert interviews in Section 4.3. The guidelines included both the user interface, customization to individual users and the importance of stakeholders in the design process.

Guidelines for designing systems for people with IDs:

- straightforward and clear user interface
- Large and straightforward text and colors with high contrast
- Possible to use only with images and spoken instructions
- Possible to customize themes
- Possible to customize difficulty both with the story and how far to walk
- Not to childish
- Changes and increased difficulty level should be introduced slowly

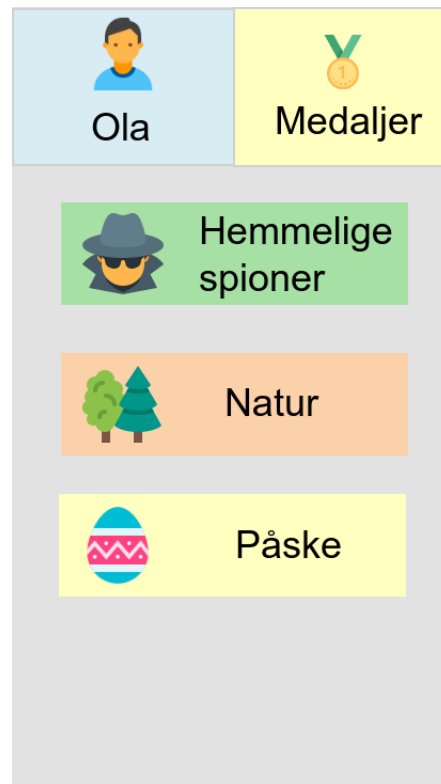


Figure 5.1: Start screen where the user choose what stories to play. The stories to choose from are “Secret spies”, “Nature” and “Easter”

- Include stakeholders in the design process, either caregivers or people with IDs

5.2 Idea

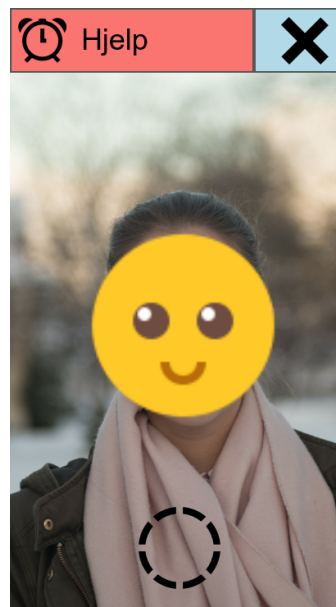
The goal was that the game should be fun and not too childish. It should be straightforward to use and give the user a sense of accomplishment, mentioned in Section 4.2 as very important for people with IDs. Most importantly the game should motivate the user to do outdoor physical activity.

The idea was that the game should be a story or a quest the user joins. This story or quest is told on various places and the user has to walk between the points, thus promoting physical activity. These stories vary in themes, difficulty and type of story points. Figure 5.1 shows the start screen and the different stories the user can play.

A story point consists of one or more story screens and can be four different types; text, text and image, questions or taking a picture. These screens can be seen in Figure 5.2a - 5.2d. The use of these types of screens can give different types of games and also vary the difficulty level. Some screens include both pictures and images for communication, therefore rely less on text. Other screens include only text like the question screen and should only be used for people that are comfortable reading easy-to-read text.



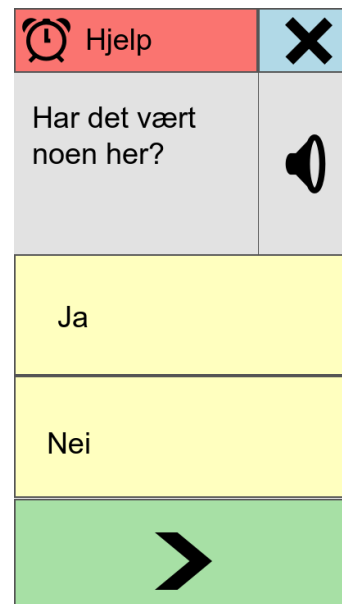
(a) Picture and text screen. The text says “You are on a secret mission”



(b) Taking a picture screen. This example includes a selfie of an anonymous person.



(c) Text screen. The text says “You found a secret building. Take a picture with it.”



(d) Question screen. The question is “Has anybody been here?” and the answers are “yes” and “no”.

Figure 5.2: Available story screens

5.2.1 Gamification

According to Huotari and Hamari (2012) “Gamification refers to: a process of enhancing a service with affordances for gameful experiences in order to support user’s overall value creation”. Using this definition this app can be seen as gamification. The physical activity of walking is enhanced with a gameful experience through the story and reward system. The value created for the user by this app is the physical activity the user does.

In Fuchs, Fizek, and Ruffino (2014) Deterding recommended looking at the wider system and the context when using gamification and not only gamification mechanisms. When developing the game idea the context was considered and specially the role of the caregivers. How the game fits into the users everyday life, a day center or housing for people with IDs.

5.2.2 Magic Circle and Pervasive Games

The game-inspired app followed the magic circle first mentioned by Huizinga (1938), but defined by Salen and Zimmerman (2004). The magic circle separates the game from the real world. In basketball where the rules of basketball apply at the basketball court when playing a game, but when the game finishes the rules no longer apply. The game creates its own rules that apply and make sense inside this magic circle.

The game-inspired app was not an pervasive game which was the original idea, because it does not expand the magic circle (Montola, Stenros, and Waern 2009). The route was set, the game has to be played at a set time and only the players playing with you are a part of the game. The choice to not make a pervasive game was made because of the users need for predictability of route and the need to include caregivers when playing. This makes it difficult to design something to be played anywhere and anytime.

The app will be used when walking and sometime around other people, many people use alibis to justify playing (Deterding 2017). For this app alibis like playing to increase physical activity could be used. For the caregivers it is also possible to use the alibi of doing their job. This way playing the game will be less embarrassing for the player.

5.2.3 Creating the Routes and Stories

A route in Trondheim was created for the testing and a few more will hopefully be added in the future. For each new city the app is going to be used in, a couple of routes has to be added. So far this consist of manually adding the pictures, text, audio and coordinates of each point.

For now the available route exist in the app, but in the future one option is that caregivers or parents can create their own stories and routes. This gives the caregivers some control over the areas the app will be used in and an opportunity to personalize the content.

5.3 Motivation to Physical Activity

5.3.1 4 Fun Keys

Lazzaro presented the four fun keys in Isbister and Schaffer (2008), “hard fun”, “easy fun”, “serious fun” and “people fun”. She found that games should include multiple fun keys and the player would switch types of fun while playing. The suggested app included some part of all these fun keys, but because of the varying cognitive abilities this can vary from person to person. The four fun keys have been included in the following way:

- The “hard fun” part of the game comes from the navigation. For most people navigation will be a challenge and give a sense of accomplishment when succeeded. The “hard fun” can be very individual and some might find the navigation straightforward.
- The “easy fun” comes from the story, which increases the players curiosity and is used as a break between difficult navigation.
- “Serious fun” is included because of the physical activity and the reward for exercising, but can also be added by making a quiz and including learning in the story.
- People with IDs rarely do anything alone and this game will most likely not be an exception. The “people fun” will be included by interacting with caregivers, family and friends. The player can have different role and interactions including; leader, mentor, cooperation and communication.

The “four fun key” could be added and customized to the individuals. If the navigation is too difficult the caregivers could help. Some might like learning and want an informational story about birds, but others want an entertaining story.

5.3.2 Social Interactions

Social interactions have been mentioned as motivational for most people with IDs. Advice on these interactions vary, some think family is most popular others think it should be friends. Competition was both recommended and warned against, cooperation could also be difficult if the rules were too complex. For the app it was decided that it can be played alone or in a small group. What types of interactions is up to the users and the types of stories made. Competition can be included by trying to collect the most medals. The interactions can also be talking about the game, everyday things and where to go. There should in addition be a caregiver or parent present to help with the navigation and other possible difficulties related to the app.

The app makes it possible to take pictures during the trip. This is something that I have seen people with IDs enjoy and talk about during some hiking trips with The Norwegian Association for Persons with Intellectual Disabilities in Trondheim. Sharing pictures after a hiking trip can also make it more social and a way for people with IDs to communicate what they have been doing this day. For users not living with their family, it could be

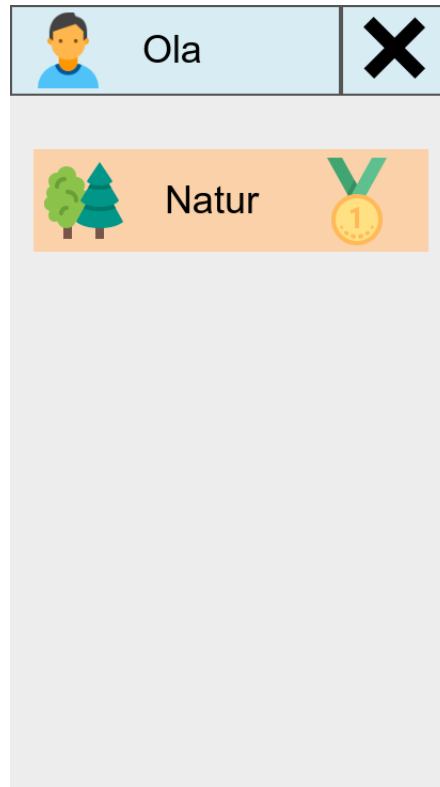


Figure 5.3: Medal after completing game about nature

a way to include them in their everyday life. Kydland, Molka-Danielsen, and Balandin (2012) found that sharing photos using Flickr could possibly be a useful tool to decrease loneliness for people with IDs. They also found that Flickr was a way for the participant to express themselves.

5.3.3 Rewards

After finishing a story the user earns a medal, consisting of a medal icon, the icon for the story and the story name. All of the users medals can be viewed in the medal screen, see Figure 5.3. This can also be shown to others, so that the user can show what he or she did during the hiking event and how much exercise the user has done. This can add some competition to the social interactions as well and competition is mentioned as motivational in the expert interviews in Section 4.2.

5.3.4 Frequency of Story Points

The story points should be divided throughout the route without too large gaps between points. This should be done too keep the focus and motivation throughout the hike. This can be a straightforward screen with a image and a text saying you encountered an animal or something else fitting the story.

5.4 Design

5.4.1 Easy-to-Read Text

The app used an easy-to-read text, following the European standard Inclusion Europe (2009) recommended by The Norwegian Association for Persons with Intellectual Disabilities (NFU). This standard include guidelines on everything from involvement of people with IDs, words and sentences, to which font to use. The key points in this standard is to use simple words that are repeated throughout the document and short sentences. Words from other languages, initials and metaphors should be avoided. The font should be simple and coherent throughout the document and the letters should be large.

NFU also recommends an easy-to-read newspaper called Klar Tale (NFU 2019). Klar tale is a Norwegian newspaper for people with dyslexia, people starting to learning Norwegian or other types of reading challenges (Klar Tale 2019). The written version is available both online and on paper and a spoken version is available on a CD and as a podcast. The newspaper includes stories about Norway, the world, culture and sports. This newspaper was used to find examples of easy-to-read texts, to further learn how to write easy-to-read texts.

5.4.2 Straightforward User Interface

The app should not be too childish. The app therefore had a straightforward design, but does not include typical childish elements like pink, princesses, characters that are children or superheroes. Playing is often seen as something childish and adults rarely play in the streets (Deterding 2017). Making a game-inspired app that is not childish can therefore be difficult. It is important that the stories do not have to childish themes.

To make the text readable the font size was large and simple, following both the easy-to-read standard and the advice from Chapter 3 and 4. The contrast between the colors will be high, both between background colors and the text color. The text is black and the backgrounds are in pastel colors, which are pale color and have a high contrast to the black text. The different background colors are all different colors and also have a high contrast between one another. Some colors have been chosen to represent the meaning of the text/button. The alarm button is red as this often is seen as danger and the next button is green, which often represent completing a task. This can be seen in Figures 5.2a - 5.2d.

5.4.3 Communication Methods

Some people with IDs struggle with reading (NFU 2018), the app will therefore also include text-to-audio reader, several images and communication images. The images used will be straightforward and mostly objects, since this is the preferred images type for people with IDs (Rocha et al. 2018). This will give the app very similar communication methods as the FTU app mentioned in Section 1.2, but will not include the difficult text

mostly meant for parents or caregivers. It will be possible to use the app only with the audio, icons and images, but the question screen requires reading and can only be used when the user can read straightforward text. It is also possible to use it if the user gets help to read it and answer the users chosen answer.

The communication pictures used in the app is from the Aragonese Portal of Augmentative and Alternative Communication (ARASAAC). ARASAAC is a platform that offer graphic resources for people with problems related to communication and is created by the Government of Aragon (Spain) (ARASAAC 2019). This platform has been used in several research projects. In Gomez, Jaccheri, et al. (2018) ARASAAC is used to help children with Autism Spectrum Disorder learn to read, through a mobile app for tablets called Leo con Lula. Baldassarri et al. (2014) presented a tool to help people with complex communication needs. This tool used pictures from ARASAAC as a way for the user to choose what they wanted to communicate.

5.4.4 Customization

To customize the app to the individual user, both the themes of the story, the different types of story screen and the route it self was possible to customize. This means that a user that was very interested in nature can play stories about this and user interested in a specific movie or story can use this as inspiration for a story. The story points can be adopted to fit the users cognitive level, what the user likes and what motivates the user. Some users likes taking photos and others like learning, this can be included in the story. Lastly the route should be customized both in location and length to fit the user the best possible way.

5.5 Navigation

Learning navigation increases the users independence, because he or she will get more freedom to visit more places alone. Independence and self advocacy was found to be very important to people with IDs in a Swedish case study by Tideman and Svensson (2015). They also found that the increased independence and use of self advocacy gave increased self-esteem.

5.5.1 Navigational Assistance

To help people with IDs navigate between the points navigational assistance was added. The use of maps was found to be difficult and to abstract for people with IDs and was not included. Instead street level pictures was used at every decision point or when there is a large distance between decision points. The use of street level pictures at decision points can be seen in Figure 5.4.

A short directional description was also included, telling the user where to go next. This was given both in a easy-to-read text and spoken instructions. For people struggling with

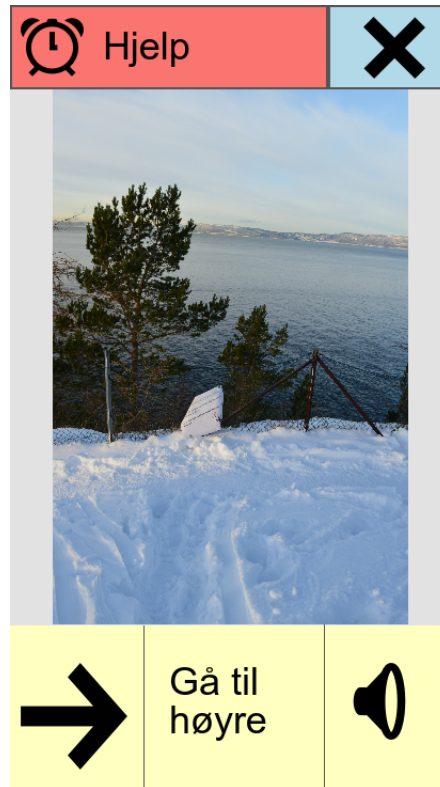


Figure 5.4: Navigation assistance screen. The text here says “walk to the right”.

the difference between right and left, an arrow was added to all navigational screens. This can be seen in the navigational assistance screen in Figure 5.4.

A notification in the form of a sound prompt and vibrations was also added when the user is close to a decision point. This will limit the time needed to look at the screen and give the user more time to watch his or her surroundings. This is especially important in more risky areas like areas with traffic.

5.5.2 Safety

An alarm button as suggested in Gomez, Montoro, et al. (2015) was included in the prototype. This alarm will be used when the user is lost and needs help. When the alarm button is clicked, a caregiver or parent will be contacted and the location of the user will be shared. The button is red with an alarm icon and has been chosen because of the associations with an alarm.

When setting up a route the area for playing should be considered based on what suits each user best. Setting up routes in nature is recommended, this area have little traffic and often less people than urban areas. Routes in urban areas close to where the user lives can also be used for more everyday hiking trips with less barriers to start.

5.6 Focus Group

5.6.1 Planning

This focus group was well planned and had a strict schedule. This makes the results from a focus group more reliable and less likely to be bias (Oates 2006). The focus group was split into four parts; introduction, project 1, project 2 and an ending. The presentation for this project consisted of a presentation and discussion about the guidelines and a presentation and discussion about the suggested app idea.

The presentation of the app included several screenshots of a prototype made with Proto.io (Proto.io 2019). This made it simple to make a prototype and to test it out on a phone. A complete story was not made, as making all of the navigational and story screens would be very time consuming. Since a complete story was not made only screenshots from the prototype was included in the focus group.

The participants in the focus group consisted of a two therapists and some employees from Department of Computer Science (IDI). The therapists and one employee at IDI had experience in caring for people with Intellectual Disabilities (IDs). The employees from IDI had experience designing apps and games for people with IDs. Table 5.1 shows each participant, their occupation and place of work.

Code	Occupation	Place of Work
Name1	Physical Therapist	Øya Helsehus
Name2	Occupational Therapist	Day center for People with IDs
Name3	Phd Candidate	IDI
Name4	Postdoctoral Fellow	IDI
Name5	“Visitor at IDI”	
Name6	Postdoctoral Fellow	IDI

Table 5.1: Background information about the participants in the focus group

5.6.2 Guidelines

The participants agreed that the content of the guidelines was a good suggestion and that the guidelines was not missing any points. One person did however note that mixing motivation to do physical activity, navigation and using technology together could be to difficult for people with IDs. She felt that all of these points was challenging and that tackling just one or two could be a big challenge for many.

One participant found the guideline regarding the difficulty level unclear and that it was difficult to understand whether it talked about the instructions or the physical activity. Others also agreed that the guideline could be rewritten to be clearer about the difficulty level.

5.6.3 Motivation to Do Physical Activity

Several of the participants thinks that the motivational part of the project is the most important, where Name1 goes so far as to say that “To nail that (the motivation), I think that’s the success factor”. Name2 also pointed out that the game had to be fun and catchy for it to be a success.

The navigational part had to be a bit challenging for most of the people with IDs to be motivational. Name2 said that many are routine people and like to walk the same route, but she also believe that many with a cognitive level on the highest part of the scale, will need a challenge. Relating this to the 4 fun keys (Isbister and Schaffer 2008), the app needs “hard fun” to be motivational. She further said that navigating through different routes in a known area will be the best solution for that user group, as it will provide both a challenge of navigating a new route and the safety of being familiar in the area.

5.6.4 Reward

The expert interviews in Section 4.2 talks about the importance of rewards to motivate people with IDs. Name1 wondered if digital rewards, like getting a medal in the game can be to abstract and difficult to understand. She thinks that in some cases the rewards have to be something physical that the caregivers bring.

Another issue is that having the same rewards each time can decrease the motivation after a while. To prevent this, Name4 suggests “I think one way to reduce the risk of hitting the saturation point is to have a reward system”. Further he explained that you could change the reward system each time the user was no longer motivated to do the same route, this would increase the users motivation again.

When it comes to rewards some also think that being able to use the app themselves would be a reward. This can also be seen as increasing their independence, which is important for people with IDs (Tideman and Svensson 2015).

5.6.5 Designing Applications

When it comes to using technology, Name2 said that “A lot of these people use Facebook and Snapchat and, but they really don’t understand how to use it”. Like writing status updates on Facebook is something many do not understand.

Many people with IDs can’t read and some of the participants talked about the importance of using symbols. Wilson et al. (2016) found that the use of symbols are important and this was also confirmed in during the expert interviews in Section 4.3. Name2 said that they used the system Abilia for their communication using symbols.

The system should also be straightforward. One participant said that in addition to using symbols it had to be self-instructional, since many struggle with textual instructions. There should also be few choices, because making decisions can be hard. This is similar

to what Wilson et al. (2016) found about only having one stream of actions, which will naturally limit the choices the user has.

One participant ask why a quiz was included as an example, perhaps feeling that this would be complex for people with IDs. Quizzes, text and learning was further mentioned as something that was challenging for people with IDs and maybe should not be used in this game.

When it comes to personalizing the rewards or themes, the participants felt that this was important. This was also something the participants in the expert interviews in Section 4.3 thought was important. Name4 suggested that you could have different worlds where the user collects different items and that these items could be customized based on the users personal choice. He continued suggesting one world where you caught Pokémon, one where you picked berries, one where you picked mushrooms and one where you caught animals.

5.6.6 Navigation Assistance

In the navigational assistance part of the app, it is important to focus on the permanent parts of the pictures. Name6 mentioned a navigational assistance app that he had made for his master thesis, a study using this app is also included in the literature review in Section 3.3. Further he explained that during the evaluation of the app with users with Down's syndrome, many struggled with non-permanent elements of the pictures. He said that pictures of parked cars with different colors than the once that was currently parked there, made the users not recognize the place.

There were also some questions about how the pictures was add to the app. Could pictures from Google Maps be used or did the caregiver have to take pictures at the decision points?

Some participants wondered what would happen if the user walks outside of the route. This topic was mentioned in the interviews with experts in Section 4.4, when talking about Google Maps, the re-calibration of the route was mentioned as a great help.

5.6.7 Caregivers Role

One question that was raised by Name4 was, is it a good idea for the caregivers to have such a central role? Further Name1 said that if technology is to be used in health care it needs to be less work for the employees and that the app should focus on the motivation and not the caregivers. This is also mentioned by Name2, she thinks that the users should only relay on some support when using an app promoting physical activity.

The caregivers setting up the route can give them some control over where the user is and possible situations that may arise. Name4 said "I don't think it's a negative point if caregiver makes these routes". Further discussion mentioned both that the caregivers would know the users abilities for physical activity and pick a suitable area, as well as knowing areas the user could get lost.

One participant also wondered if the caregivers had their own app, like a mirrored app just for the caregivers. This was again mentioned when it came to caregivers creating stories and routes.

5.6.8 Cognitive Level

When it comes to including users of age 16-35 in this project, several felt that this was highlighted too much. Name2 said that “The cognitive ability level is more important (than the age group), and you see people 50 years who is using technology”. Some also toughed that the type of intellectual disability should be further limited as some of the disabilities are very different.

When limiting the research to only a limited disorders and levels of ID, one of the participants toughed that you could risk not including users that are motivated by the app. People with lower cognitive abilities could also find the app motivational, if it included something that the user was interested in.

5.7 Development

5.7.1 Making the Working Prototype

The prototype was made using Unity (Unity 2019) and is made for android phones. Using Unity made the process of creating the app quick and simple. Using unity also allowed for mirroring the “run game” function on the desktop to a phone, so you could see have the game would look on a . When more functionality was included to the app it had to be built and run, but this process was also straightforward.

The current prototype did not have to much of a need for a complete MySQL database and a server, since it only needed to store some information about a story. A SQLite database was therefore chosen as it is zero-configuration and serverless (SQLite 2019). The largest files was not put in the database, but directly accessed from a file. Some temporary values that are used between scenes is stored in a static file. This includes the current screen, making it possible to continue the game from the main scene. Using SQLite also exclude the need for mobile data while walking, which many people with IDs had turn off according to the interviews with experts, see Appendix C. The phones used in the evaluation also lacked SIM-card so the use of mobile data to access a database was not possible. If it at a later stage is decided to change to another database, the current database controller could be removed and a new one created.

The Unity project has been posted to GitHub and can be found at <https://github.com/idawol/AppMaster>. This includes the code for the app with the story used in the user test and the build of the app for Android.

During the focus group some concerns about the question screen and including a quiz, see Section 5.6. Quiz was mentioned as an enjoyable activity for people with IDs in the expert interviews, see Section 4.2.9. It was therefore decided not to completely eliminate



Figure 5.5: Updated question screen. The question on this screen is “Does fish hide in beaver huts?”. The answers for this question is either “yes” or “no”.

the possibility of adding a quiz, but each story should only include a small number of questions screens. Another issue raised about the question screen was that it relayed heavily on text, so small images was added next to the choices. The new question screen can be seen in Figure 5.5. Using this images and the audio should make it possible to use this screen without needing to read.

To create stories for this prototype the values related to the story needs to be added to the database. A tutorial on how to add a story can be seen in Appendix G.2.

5.7.2 Making Route for Testing

The area chosen for the user test was Haukvatnet, an area that often is used by people with IDs. Next to this lake there is a cabin that different organizations for people with disabilities in Trondheim could use. This area has an asphalt road making it easy for all of the users to walk here. This area is recommended for people in wheelchairs or that needs a flat and solid ground to walk on (Mauland 2019).

The route is a bit simple with one major decision point and two decision point from the cabin to the hiking trail. From earlier hiking trips for people with IDs, I learned that this major decision point could be an issue and that there had been instances where someone had gone the wrong way at this decision point.

For the story a theme that was thought to be popular for the largest amount of people

was chosen. The theme should be gender neutral and not too childish. A story about a detective was therefore chosen, including a theft of a necklace the user should solve. This also adds some "hard" fun from the four fun keys (Isbister and Schaffer 2008), which is important for user that are not challenged by the navigation.

All of the screens had been used in the story that was used in the testing, but it mostly consist of text and text and image screen. The camera screen was used to take a picture of the cabin where in the story the necklace was stolen. The question is which direction the tracks from the thief goes.

All of the audio used in the app is read by me. This was done because the voice would be in the dialect from Trondheim, where the users lived.

Chapter 6

Evaluation

This chapter presents the evaluation of the app and starts with a short description off the execution of the user test. This is followed by the results related to motivation towards physical activity, the navigational assistance systems and the design of the app. Lastly an explanation of what happen when one of the users quit the user test before reaching the end of the route is included. This section includes both what frustrated the participant and the ethics related to this.

6.1 Execution of User Test

The user test evaluated the app and guidelines described in Chapter 5 and included a tutorial, observations and interviews. The tutorial went through the most central screens from the tutorial found in Appendix G. The participants user account was created for the participants and then they each got a phone. The caregiver also had a phone to follow the story and navigation and to better help the participants. The participants was then instructed to start the story. During this user test the participants was interviewed and observed. The interviews were unstructured and a complete list of topics can be found in Appendix E.1. After finishing the user test the caregivers were interviewed about their thoughts on the app. These interviews were also unstructured and included the topics found in F.1. The data collected can be found in Appendix E.2 and Appendix F.2.

The user test included four users and two caregivers, but one consent form was lost on the way. The results from the participant with the missing consent form has not been included in this evaluation. Each user test consisted of two participants, one caregiver and one test leader. The participants are presented in Table 6.1 and more information can be found in Section 2.5.

6.2 Motivation towards Physical Activity

The goal of the app is that it should be fun, in the expert interviews found in Section 4.2, having fun was mentioned as motivational for people with IDs. The user test showed

Name	Description	User test
Participant 1	Female with IDs	User test 1
Participant 3	Male with IDs	User test 2
Participant 4	Female with IDs	User test 2
Caregiver 1	Works at the day center	User test 1
Caregiver 2	Works at the day center	User test 2

Table 6.1: Participants in the user test

that the app was fun for the participants. Two of the participants in the user test was asked if they thought the app was fun and they both answered yes. Further they were asked if they thought they would like to play it again and this got mixed answers. One participant said that maybe once was enough and the other said yes he would like to play it again.

One participant said that she did not like to take this many breaks and wanted an app that had less and shorter breaks. The concept of this game therefore does not fit her wishes for an app promoting physical activity. Caregiver 1 on the other hand said that she liked the concept, but said the app needed some improvements.

6.2.1 Motivation Through the Story

During the user test it did not seem like the story was exciting. The participants talked little about the story and when asked or talked to about the story the participants showed little interest. Caregiver 2 said that this story could be catchy for some, but it depended on who uses the app. The lack of interest in the story could be because some of the participants had difficulties following the story. Participant 1 managed to guess the correct thief, but when asked why she said that they had nearly the same hair color in the pictures. This similarity of hair color was just a coincidence and not one of the clues.

6.2.2 Motivation Through Navigation

During the first user test the participant seemed to find it exciting and fun to navigate. Participant 1 and Caregiver 1 had the following conversation about the app:

- **Caregiver 1** - “Participant 1, do you think that it was a bit fun?”
- **Participant 1** - “Yes, it was a bit fun”
- **Caregiver 1** - “Yes, I can see it on you”
- **Participant 1** - Some laughter

The participant in user test 1 was very focused on the navigation through the test session, this show some interest for the navigation. This is also supported by Caregiver 1 saying that it was more exciting to come to the intersection when talking about the motivational factor of the story.

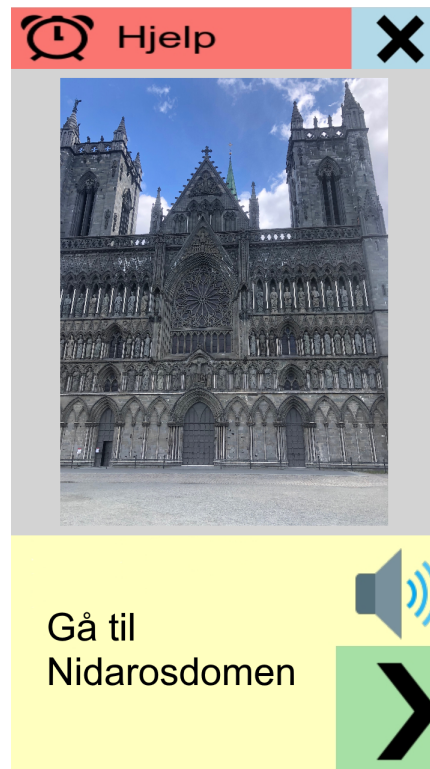


Figure 6.1: A suggestion of how to include looking for tourist attractions in the app. In this case the text reads “Walk to Nidarosdomen” and includes a picture of the church

6.2.3 Other Ideas for the App

Participant 4 expressed her wish for an app only counting the number of steps. She said herself that she had an app on her phone that counts the steps and that she likes to use it. She had a goal of 10,000 steps each day which is the recommended goal (*Pacific Physical Activity Guidelines for Adults* 2008). She then says that she struggles to reach this goal and almost never reach it, suggesting that this goal is too ambitious. *Pacific Physical Activity Guidelines for Adults* (2008) suggested that sedentary people should not start their goal at 10,000 steps each day, but instead set their goal 2,000 - 3,000 steps higher than their current number of steps. Caregiver 1 suggests adding a reward based on the number of steps into the current app. This was suggested with this user in mind and for other users with the same interest. For some users counting the number of steps could be distracting.

Participant 3 suggest using this to explore the city and using it for tourists. Having a route exploring tourist attractions is also something that was mentioned in the expert interviews in Appendix C by Name2. He suggested that you could try to find Nidarosdomen based on a picture. A suggestion of how this could be used in the app is shown in Figure 6.1. Having a few routes of tourist attractions in some of Norway’s most visited places could possibly fun and something the users would like.

6.2.4 Physical Activity

How physically demanding the app was depended very on the participants. In user test 1 the participant was clearly tiered, having a heavy breath throughout the test session. The heavy breath is a sign of physical activity at a moderate level which you should do for 150 minutes a week (Norwegian Directorate of Health 2019).

The participants in user test 2 however thought that they had to walk slowly to be able to use the app. This was because the app needed some time to know that the user was inside the radius of the target. Participant 4 called the speed they had to walk in “snail speed” and said that she usually walked twice as fast. The difference in walking speed is also something I noticed when participating in the hiking trips with The Norwegian Association for Persons with Intellectual Disabilities (NFU). To limit this problem the distance from the target could be set in the user setting, having two speeds of walking “normal” and “fast”.

6.2.5 Social Interactions throughout the session

During user test 1 the participant was very concentrated and quiet. For this participant the social interactions was very limited. The participant was asked some questions, both related and not related to the app, but was too concentrated on the app to answer or gave very short answers.

The participants in user test 2 talked throughout the test session. Participant 4 even said that she liked to only talk when walking, saying that she does not need something like this app. This difference in the wish for social interactions is consistent with what I have seen at the hiking trips with NFU, this was also what the interviews with experts found.

6.2.6 Reward

There was little response for the medals they got when completing the route in both user test. Participant 3 quickly closed the medal screen and the participant from the first user test showed little interest when the medals they got was mentioned. This could have several explanations, such as not understanding this digital medal or not wanting a medal. It is also possible that the user wanted to get back to the rest of the group quickly and was nervous about the user test.

6.3 Navigational Assistance

6.3.1 Understanding the Instructions

It looked like the participants understood where to go when looking at the correct navigational screen. Most of the participants read some instructions out loud and when asked

pointed the correct way. One participant did say that she already knew what way to walk and did not want to use the app in one intersection, so it is possible that some of the participants already knew the route.

The street level pictures seemed helpful and Participant 3 said that he used the pictures to navigate. Participant 1 said she recognized where her location was based on the picture, there was a problem that many of the pictures looked similar. Figure 6.2 show the street level pictures used in intersection 14 and 15 in the app. These pictures look similar and both include the trail and some trees. This concern was mentioned by Caregiver 2 saying that many of the pictures included a hiking trail and some trees, the pictures therefore looked very similar.

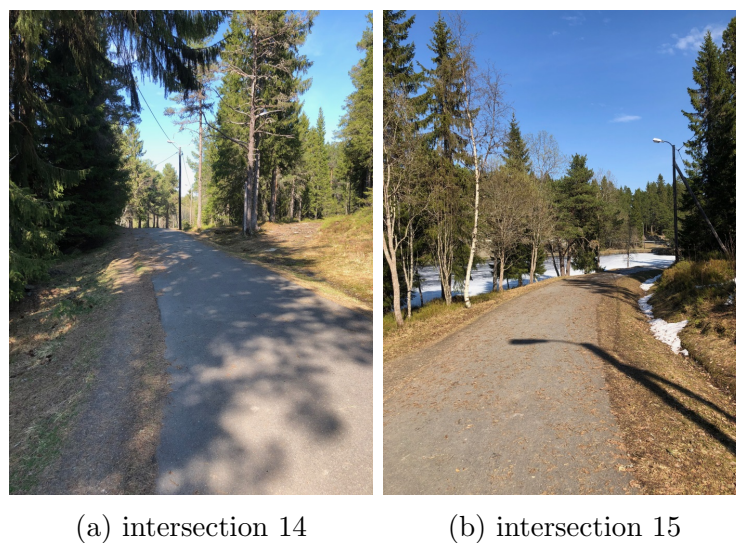


Figure 6.2: Pictures of similar intersections used in the app

Participant 1 was asked if she thinks she would dare to walk on her own in the wood with this app, but answers that she would not. Caregiver 1 agrees and says that she thinks many would not be able to walk alone. Caregiver 1 also mention the usefulness of an navigational assistance app, mentioning learning to navigate to work or their parents house.

Some of the instructions was difficult to understand for the participants. Participant 4 think the stop and wait instruction is difficult to understand, asking how long you should wait when discussing the stop and wait instruction. Caregiver 2 suggest changing it to “stop and click the forward button” (“Stopp og trykk videre” in Norwegian). She also think that left and right is used to much, since this is something many people with IDs struggle with.

6.3.2 Reading the Instructions at the Correct Time

Many of the participants struggled with knowing if they were at the correct screen or not. The navigational assistance system relayed on the user clicking the next button after reading the instruction. This was understood by the participants at the beginning of the test session. Participant 4 said “No, it is only each time it says “pling”, click (the button) and nothing more”. However the participants often need to be reminded to click the next button, using the lack of a beeping sound to check if they are at the correct screen.

One participant got frustrated by the other participants phones beeping and not hers, this was mostly because she was further away from the target location. In the other user test this was not an issue because the participants where so focused on their own phones.

Participant 3 did not think that the next button was annoying, but still did not seem completely comfortable with when to click the next button by the end of the test session. Both caregivers think that the navigational assistance system should be more automatic or at least include some sort of lock to stop the users from reaching screens further ahead in the story.

6.3.3 Using the App Outdoors

At the time of the user test there was some areas on the hiking trail that was covered in snow and ice. This made it a bit difficult for some of the participants to walk and some of them did not have the best shoes for walking this route. Because of the amount of snow and ice, one of the participants wanted to take a shortcut back. This could be a problem when the participant knows the target destination of the route and reach an obstacle, since the participant would miss several screens on the way.

When using the app outdoors there is also some problems with hearing and seeing the screen. Some participants struggled with hearing what was said because of noise from other people in the area, this was solved by moving a bit further away from the noise. The sun also made it a bit difficult to see the screen when walking outside, especially some of the dark colored elements with low contrast. Having a high contrast is important for people with IDs (Tsikinas and Xinogalos 2018) and the strong sunlight made it more difficult to see the screen.

6.4 Designing Apps and Games

6.4.1 User Interface

There was some small issues with the user interface, but also features that worked well. Always having the next button green seemed like it was appreciated and made it simple for the caregivers to explain how to move forward in the story. This became clear when the participants had to take a picture and there was a grey button instead of a green one.

According to Caregiver 1 people with IDs like pictures and find the pictures used in this app straightforward. Some of the participants tried to click on the communication pictures, perhaps waiting for the sound of the picture or more information about the picture. It is also possible the participant thought that clicking the communication pictures was the way forward in the app.

6.4.2 Understanding the Story

All of the participants could read and would often read some text out loud. The caregiver also confirmed that Participant 1 could read. Participant 3 read the text quickly and had the following talk about reading the text:

- **Test leader** - “Don’t you want to read the story?”
- **Participant 3** - “Yes, I read quickly when it’s these small, short words”
- **Test leader** - “Yes, okay”
- **Participant 3** - “If it had been a newspaper page, then it would have taken half an hour. But when it is this small words, then it is alright”

The text refereed to here was written using the easy-to-read standard by Inclusion Europe (2009), so using this standard does make the text easier to read.

Because the participants in these user tests could read the audio instructions was not used. All of the participants tried playing the audio instruction after being told about the function, but did not use it without being told to play the audio instruction.

The participants did not seem very interested in the story. Caregiver 1 think that the story and tasks were to difficult for the participant in user test 1. She also thinks that they were more interested in the pictures and that having tasks like click on the picture of the beaver would be better.

Many participants clicked quickly through the screens and did not use a lot of time looking at each screen. They often only used enough time to read the screen very quickly and not looking at the images or thinking about the story. Caregiver 2 thinks this is something many people with IDs would do.

6.4.3 Take Picture Screen

Some participants struggled a bit with taking a picture and said they had taken a picture, but the app did not show this. Most likely the problem here was that the participant accidentally touched the screen. Some participants also wanted to rotate the phone when taking pictures, but the app did not support this.

Overall taking pictures was received well with one participant taking out his own phone and taking a photo as well. In the hikes by NFU taking pictures was also observed as something people with IDs liked. One of the pictures taken during the user test can be seen in Figure 6.3.



Figure 6.3: Picture taken by one of the participants in the user test

6.4.4 Accidentally Touching the Screen

Many participants struggled with accidentally touching the screen when walking between the target locations. Participants mostly touched the next button, changing to a screen further in the story, but also with the play audio instruction button. This accidentally clicking on buttons created some frustration for some of the participants. When Participant 4 accidentally touched the play audio instruction button, she said the following about the event:

- **Participant 4** - “But he talks to me anyways, because it said”
- **Test leader** - “You probably accidentally touch the button”
- **Participant 4** - “No I have not. I held it (the phone) like this (holding the phone and not touching the screen) and then it started talking”

The app did include a feature that made it possible to jump to a specific screen based on the screen ID. This feature was used several times, mostly if the participant had gone passed the current screen, but could also be used if the participant was behind the current screen.

6.4.5 Users Wanting to Use Their Own Phones

Several participants wanted to use their own phones for the user test, but had to use the phones belonging to Department of Computer Science (IDI). Participant 3 found it a bit difficult after exiting the app to go back to the app again, this was because he was not used to Samsung phones. He said that he had troubles with the Samsung phone throughout the test session and that the user should use the phone brand they are normally use.

Participant 4 also said that she thought she would get the app on her own phone and was a bit disappointed when learning this was not the case. She early expressed her wish for using an app to increase her level of physical activity and wanted to use the app at home as well.

6.4.6 More Automatic Functions

The participants struggled with the next button, especially in the navigational screens. Caregiver 1 also mentioned the question screen as a place where the next button was a bit difficult and suggest continuing once the participant had answered the question correctly.

Both caregivers think that the app should be more automatic, mentioning the navigational screen as the most important part to become more automatic. Their wish is that the system detects when the user has passed the target location and changes the screen automatically.

6.5 Participant Ending the User Test

One participant decided to stop the user test before reaching the end of the route. This participant clearly expressed her frustration over the next button and not knowing if she was at the correct screen. She understood how the next button work, in the beginning when talking about the next button being difficult, she said “No, it is only each time it says “pling”, click (the button) and nothing more”. When walking around it seems like it was more difficult to remember and the participant got very frustrated. Because of this frustration she is offered to only see the story screens, but declines this offer.

The participant quits the test twice, after the first time starting to ask questions about the app again on her own. She explains her frustration the first time by saying “but I get frustrated by the clicking (of the button) and the beeping”. The participant is then asked if she likes to just walk without doing much else, where the participant answers yes. The participant had before the test expressed her interest in participating in research and her wish to help others through her participation, this could be the reason for giving the user test another try. After walking a bit further the participant is still frustrated by the navigation and gives back the phone she had borrowed. She has then completed about 75% of the route before walking of the trail and the caregiver walks after her. The other participant is then asked if he wants to continue with the test and said yes. The test leader felt it was important to ask again since the caregiver needed to follow the other participant, but also to check that the troubles with the next button had not made him that frustrated as well.

Chapter 7

Discussion

The first section includes a discussion about the literature review and some shortcomings are explained. The choice of participants are talked about in the next section, this includes both possible bias by participants and the chosen participants for the user test. Further some limitations of the user test are described and lastly some ethical concerns are discussed.

7.1 Literature Review

7.1.1 Choice of Literature in Review

The search for articles in the literature review in Chapter 3 could have included more keywords. The search for games and apps promoting physical activity should have included a search for apps as well. The search for navigational systems for people with IDs could also include more keywords like “way finding” and “orientation”.

In the search for navigational systems for people with IDs only used “intellectual disability” in it’s search string, but related disorders and syndromes could have been included. For example being more specific and adding different disorders and syndromes that are an ID, like “Downs Syndrome”. Searching for “developmental disabilities” which is an umbrella term including intellectual disabilities could also give valuable articles. Articles using these keywords was included in the literature review, but adding more keyword could have found more articles.

The literature review only included 10 articles and more articles should have been used. In the navigational system section there was very few article on the subject, but there seemed to be some agreement on how the systems should be designed. For the other sections there was more articles to choose from, but many was not included because they did not include how to design apps for people with IDs or were not general exercise apps or games. To make up for the low number of articles in the literature review five individual interviews with experts was conducted.

The early stage of research on some of these topics also meant that many ideas had not

been researched extensively. The navigation only had one or two studies looking into each of the features and more studies on each of the feature would have given a better insight into what is important for people with IDs when navigating. There also exist little research for people with IDs (The Norwegian National Research Ethics Committees 2019[c]).

7.1.2 No apps or games like this

The low number of articles on apps and games promoting physical activity for people with IDs was very low and I could not find an app where the user would walk outside and navigate around. This meant that literature from the different sub-question for this project had to be gathered separately and be used to develop one set of guidelines and an app. When putting all of these parts together there is a possibility that some of the advice change or other aspects become more or less important. It is also possible that putting all of this into one app does not work and that it is too complicated for people with IDs to use technology and navigate while doing physical activity.

In the user test the user did struggle some with too much happening at the same time and the app being too complex. This could come from a number of reasons; remembering to click on the next button, the story being too difficult or it could be that including navigation, the use of technology and physical activity at the same time is too complex. To determine this new user tests should be conducted and some of the issues found during the user test should be removed.

7.2 Participants

7.2.1 Participants Focus on Nature and Hiking

The choice of participants in this study could have affected the results and created bias. Many of the participants in the expert interviews are very interested in nature and hiking and also suggested walking in nature as opposed to residential areas. Several participants in the focus group and user test also had this interest for nature and hiking, but the percentage of participants with this interest was lower here.

The day center the participants in the user test was from, was recommended as a possible place to contact for the project because their interest in physical activity. This also meant that the participants were somewhat used to physical activity. The day center also had two nature/hiking events each week, so the participants were used to being in nature and doing some physical activity. When talking to some of the participants it became clear that some still struggled to reach the 150 minutes of weekly moderate physical activity recommended by Norwegian Directorate of Health (2019).

7.2.2 Number of Participants in User Test

The user test consisted of 3 users and two caregivers, where the users gave their opinions during the test and the caregivers were interviewed after the user test. This is a very small number and is not enough to be representative for the entire user group. The user test does show interesting points to further research, but is not large enough to make any verdict on this type of app. Empirical investigation on other apps or games for people with IDs often consisted of close to 20 participants (Garcia de Maria, Carro, and Haya 2012; Gomez, Montoro, et al. 2015; Wilson et al. 2016). However Kramer, Covaci, and Augusto (2015) only had 6 participants, but this is still a larger number than this evaluation.

7.2.3 Levels of Intellectual Disabilities

The user test did not test how people with different levels of IDs responded to the game. All of the participants reacted very differently to the app, so further research on using the app and different levels of IDs is required.

People with IDs often struggle more with reading, but all of the participants in the user test was able to read themselves. The app has not been tested for people who cannot read. It is therefore not know if the communication pictures and other pictures in the app is enough to understand the story, navigation and how to use the app.

7.3 User Test

7.3.1 Testing the game longer

This user test evaluated the design of the app, how the navigational assistance system was perceived and how the motivational aspects of the app worked. This evaluation did not however look at whether the app could increase the amount of physical activity or if the long term effects related to motivation. Macvean and Robertson (2013) recommends that the long term effect should be evaluated for exergames. This is important to avoid the plateau effect where the physical activity level goes down to the same level as before the intervention.

During the expert interviews in Chapter 4, some told about the need to learn the notifications and other features for them to be helpful. Because of the limited time during this user test the participants got a short introduction and limited time to learn the app. Giving the users more time to learn the app could make some of the features in the navigational assistance part of the app easier to use.

7.3.2 Including the caregivers in a more central role during the evaluation

Caregivers has a central role in the use of the app and the creation of stories, but the evaluation does not include any data on what they think about their role. During the design phase this was a topic of discussion and the answers varied. The focus on the evaluation in the user test was how the user responded to the app. It was planned to ask some questions about this during the caregiver interviews after the user test, but the time was limited and in the end there was no time for it.

7.3.3 Some problems made it more difficult to test the complete idea

The next button made the app difficult to use for many of the participants in the user test and therefore became the focus of the user test and interviews. This meant that less time was used talking about the other features of the app and how the navigational assistance system worked or what they thought about the story. With this small of a user test this meant that some features was not or barely mentioned and others had to little data collected to be evaluated clearly.

The difficulty with the next button could also make the entire experience of using the app worse. One user in the user test found the next button very difficult and frustrating throughout the user test. It was difficult to evaluate the motivational effect of the story as the frustration of the next button was present in a large part of the user test.

7.3.4 Not Tested Features

Some of the features was not evaluated by the participants in the user test. This included the help button with both texting the location and calling the caregiver. Both of these features depended on a phone with a SIM card, which the phone used in the user test did not have. In the user test the participants did not walk alone, so there was no need to use the help button.

7.3.5 Environment the user test was held in

In the expert interviews from Section 4.4, it was recommended to use this type of apps in an area with few distractions, like other people and sounds. During the user test there were many distractions and several other people were walking on the same hiking trail. Some of these people were also friends of the participants and some participants talked a little with some of them. This create a lot of noise and distractions and made it more difficult for the participants to focus. This could make it more difficult to follow the story and to focus on the navigation.

There were also a large number of other distractions like animals, animal tracks and other marks left from animals. During the user test several dogs walked passed and a squirrel

was also discovered in the woods next to the hiking trail. Several trees also had been cut down by beavers and many tracks from both dogs and horses were visible on the hiking trail. This did not seem to distract the users too much, even though some became a topic of conversation during the user test. It is however possible that these conversations was distracting for some of the participants.

Limiting all distractions will not be possible for both user test and also when using the app outside of a user test. This user test included many distractions, more than you would expect and this probably made it more difficult to focus on the app. For further user test some of these distractions should be limited or removed completely.

7.4 Ethical Responsibilities

7.4.1 Voluntary Participation

It was very important that participation in the user test was voluntary, but this was more difficult to maintain than originally thought. When one participant first expressed her desire to quit the user test, she had already completed half the route. She was not permitted to walk back alone and therefore had to keep walking with the rest of the group, since the caregiver was responsible for both the users.

After telling the caregiver and the test leader that she did not want to participate anymore, this was accepted. The participant then asked for help with the app, this was interpreted as a sign she had changed her mind and still wanted to participate in the user test. This was not explicitly said and the participant should have been asked again to make sure she had changed her mind and wanted to participate again.

The second time the participant quits the user test, she started to walk away from the rest of the group. She was then told that she did not have to participate in the user test, but she had to walk with the rest of us. Because of the safety she was not allowed to walk alone and there was still only one caregiver present. The participant continued to walk away and the caregiver decided to walk after her, but first talked with the test leader and other participant. This left the remaining participant alone with the test leader, which meant that the participant no longer had the support of the caregiver he already knew. It was then decided that because of the new setting for the user test, a new verbal consent should be asked for.

7.4.2 Third Persons

During some of the interviews participants would sometimes share information about third persons. This information was changed to be anonymous or not used during the analysis phase. This information was not asked for, but the participants could have been explicitly told not to share third person information. In some cases a third person consent form could possibly been included.

7.4.3 Loss of Consent Form

One consent form from the user test was lost, but had been signed. We first asked if the participant could sign another consent form, but the participant did not want to sign the consent form. Because we did not have the consent form and the participant had expressed a wish to not participate anymore, we decided the data from this user should not be analyzed.

Chapter 8

Conclusion and Further Work

This chapter includes both the conclusion and some suggestions on further work. The first part presents a conclusion on the app and its motivation to physical activity, the navigational assistance system and the design of the app. The guidelines are then discussed and some revisions and new guidelines are mentioned. Next is a summary of the work that has been done on this project is described.

For the second part suggestions on how to further evaluate the app are described. This is to improve the reliability of the evaluation, but also including a wider selection of participants is mentioned. This section also includes suggestions on how to improve the app.

8.1 Conclusion

The evaluation of this app included few participants and is not enough to make a verdict about this type of apps and whether they are motivating for people with Intellectual Disabilities (IDs). The low number of participants give the result a lower reliability and should be used more as a step in a further development and investigation.

There were some issues with the test setting that could be a threat to the reliability or reason for the lack results on certain topics. This included distractions in the test environment and large issues with switching between navigational screens in the app.

8.1.1 Motivation to Physical Activity

It is not clear how much the app actually motivated people with IDs. Most of the participants in the user test thought the app was fun and it looked like the app was a source of motivation for some as well. Others found the complete app frustrating and did not even finish the whole route, therefore the app was not motivating for this participant. One participants found the navigation exciting and this could possibly be a way to motivate to physical activity.

The reward in the form of a digital medal was not interesting and the medal screen was quickly closed. If this was because getting a medal was not popular or if the participants did not relate the digital medal to a physical one is unclear.

The social interactions when using the app varied a lot, some participants only focused on the app and others talked with the other people present. For the once that did not talk much, the social interactions did not seem like something they were missing. The social interactions was important for the participants that talked a lot, with one participant saying that it was very important for her while walking outside of the user test.

8.1.2 Navigational Assistance System

The participants of the user test said themselves that they understood the navigation and where to go. Clicking on the next button after following each instruction was difficult for several participants and the navigational assistance part of the app should be more automatic.

When it comes to the presentation of the instruction the street level pictures was mentioned as helpful, but the audio instructions was not used. No clear answer was given on how the participant understood the correct direction to walk, it could be either the text or the arrows.

The sound prompts and vibrations at decision points made the app exciting for some participants in the user test. The audio prompts also made it easier for the the people helping with the app to know if the participants were using the app and on the correct screen. These notifications should also work on locked screens, so that the users that are more certain about the navigation can put the phone in their pocket while walking between decision points.

A caregiver expressed her excitement about the use of an custom navigational assistance app for people with IDs after participating in the user test. She had already had a wish of using an app to teach people with IDs to navigate to work or their parents house.

8.1.3 Designing Apps or Games

Having a straightforward user interface was important and the app seemed to not be straightforward enough. This was most clear with the communication pictures during the user test, where the participants clicked on the picture expecting that something would happen. The easy-to-read text was very important. All of the participants could read the text. One participant said that he could read the text quickly, because it was much easier to read this text compared to a newspaper page.

Since all participants could read, the audio was not used much. For many of the users this feature should have been removed as it was just distracting and annoying. This is a good example of the importance of customizing the user interface and the app should have included this more. Also the walking speed should be able to customize, since the app should have a larger notification radius for users walking quickly.

Including stakeholders in the design process was important for the app, but people with IDs should also be included not just the caregivers. A few issues was found during the user test, some these could possibly have been discovered earlier if the design process had include people with IDs as well.

8.1.4 Guidelines

Some of the guidelines should be revised and a few new once should be add. In the focus group one of the guidelines was found to be a bit unclear and should be changed to be clearer that the content of the story should be customized. This guideline is suggested to be changed to “Possible to customize difficulty both with the content of the story and how far to walk”.

A new guideline that should be added is that it should be possible to get notifications from the navigational assistance system also when the phone is locked. Some participants accidentally clicked on buttons between decision points, but could not lock the screen, because then they would not get notifications.

In the design guidelines, something about removing unused features should be added. Many complained about a feature not working correctly, but this was also a feature that was not used or necessary for this user.

There was no certain conclusion if combining physical activity, navigation and the use of apps works for people with IDs. Combining the guidelines for all of these topics could possible be to complex for the user group. The user test showed that some maybe did not follow the story, so it is possible that it was too complex of a task. One participant did not seem to have this problem, so further research looking into different levels of IDs should be conducted.

The evaluation did not look into all of the suggested guidelines as this would require a larger user test, like using more time per user test and testing the app multiple times. There was also features that needed a completely different setting to be tested. This is the case for the help button, that requires the user to be walking alone.

8.1.5 What I have done

For this project I did the planning myself with the support from my supervisors and advice from the course staff for TDT39 - empirical studies of ICT. I recruited most of the participants myself with some participants for the focus group being recruited by a supervisor or two students from a similar master project.

The Norwegian Center for Research Data (NSD) application was made by me and the two students from the similar master project. We also discussed the application with the supervisors and in the end it was approved by our supervisor. I also made the informational letters with consent for people with intellectual disabilities.

I planned and execute the expert interviews and the user test. The focus group was planned together with two students from a similar project with advice from a supervisor.

Us students held the focus group, but a supervisor was there for support and participated in the discussion.

I designed the app myself and also built the prototypes, both the one used for the focus group and the one used in the user test.

Me and my supervisors also wrote a work in progress paper for Interaction Design for Children conference, but the paper was rejected. This paper is included in Appendix H.

8.2 Further Work

Further user tests researching the suggested app and guidelines should be conducted, since the user test conducted here were small. The larger issues from the app used in this user test should also be fixed before further evaluations are conducted.

8.2.1 Measuring Physical Activity

Measuring if the app actually increase physical activity (PA) or if it just replace other physical activity is important. The goal of this project was to see if the app could be used as motivation towards physical activity, but it is also important to see if a game-inspired app could increase physical activity. The evaluation should include both a baseline part and the difference after the intervention.

This evaluation only looks at possibility of using the game-inspired app as motivation in short term use. As Marquet, Alberico, and Hipp (2017) shows the long term use of a game can differ from the short term effect. An long term evaluation of the app should be executed to see if the app is motivating in long term use as well or if the novelty of the app is the motivational factor.

8.2.2 How the App Will Work in Institutions

The app was tested in an institution in Trondheim, but how the app can be used in different institutions should be further researched. Are the intuitions and caregivers willing to use the app in their everyday life? Research can include where the routes should be and what types of stories the users likes the most. The guidelines should be further developed to include how game-inspired apps promoting outdoor physical activity are used in different institutions.

Can the app be used in other types of institutions then day centers? Looking into schools for people with IDs and if they are interested in using the app. It is also possible that some of the organizations hosting hiking trips for people with IDs would use the app.

A mirrored app for caregivers can also be created. This app could make it easier for the caregivers to create and customize routes and stories. The process for adding stories now is very time consuming and adding the values into the database with an app, will save

time and limit the need for knowledge in computer science. This app could also be used to monitor the users physical activity and support the user when playing the game.

8.2.3 Different Levels of Intellectual Disabilities

The user test only included people with mild or moderate IDs, but in the future the app should be tested on people with lower cognitive abilities as well. They would need more assistance from parents or caregivers, but it is possible that they would find the app fun and motivational.

This app was only tested on people with an intellectual disability, but it can possibly be used for people with similar disorders. One example is to test the app on users with autism and maybe especially low functioning autism.

8.2.4 How different social interactions can be included

Social interactions was one of the most mentioned motivational factors for doing physical activity, but this evaluation only looked at playing the game in a group as the social motivation. The app could be further developed to include social interactions in through the app as well. This could be done by adding a mechanism to share pictures and medals or to invite your friends to go on a hiking trip. It is also possible to add competition to the app by having a competition with your friends of who can get the most medals in a given time span, like a week or two.

Further research on different social interactions and who to be social with should also be done. Who it is most fun to do physical activity with varied some and looking at the difference between doing physical activity with family, friends and whether to include a caregiver should be studied.

8.2.5 Further develop the navigational system

The navigational assistance in the app only includes a few features and can be further developed. One way that was mentioned both in the expert interviews and focus group is to detect if someone goes outside of the route and recalculate a new route. The app should also be more automatic when giving instructions, limiting the users need to stress if they are reading the correct instruction.

Another possibility is to change the app from using a fixed route to mapping a area that the user can walk freely around in. The mission of the app could then be to pick up a variety of items. Having the possibility to walk around in a mapped area will make it possible to change up the route and make it less likely to get bored of the route.

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Appendix A

Application to NSD

The application also included the interview guide from Appendices E.1 and F.1. The application is for both this project and another master project at NTNU.

A.1 Application

(Starts on the next page)

Meldeskjema 894552

Sist oppdatert

06.03.2019

Hvilke personopplysninger skal du behandle?

- Navn (også ved signatur/samtykke)
- Fødselsdato
- Adresse eller telefonnummer
- E-postadresse, IP-adresse eller annen nettidifikator
- Bilder eller videoopptak av personer
- Lydopptak av personer
- Gps eller andre lokaliseringsdata (elektroniske spor)
- Bakgrunnsopplysninger som vil kunne identifisere en person

Type opplysninger

Du har svart ja til at du skal behandle bakgrunnsopplysninger, beskriv hvilke

bostedskommune, alder, helseopplysninger

Skal du behandle særlige kategorier personopplysninger eller personopplysninger om straffedommer eller lovovertrедelser?

- Helseopplysninger

Prosjektinformasjon

Prosjekttittel

Gamification impact studies in young adults with intellectual disabilities

Prosjektbeskrivelse

The project consists of research and development of game inspired motivational applications, to encourage an increased level of physical activity in young adults with intellectual disabilities.

Fagfelt

Teknologi

Dersom opplysningene skal behandles til andre formål enn behandlingen for dette prosjektet, beskriv hvilke

Nei

Begrunn behovet for å behandle personopplysningene

Personopplysningene trengs for å kunne opprette brukergrupper til å teste prototyper av applikasjoner. Video/taleopptak vil bli brukt som en del av intervjuprosessen og brukertesting. GPS/lokasjonsdata kan bli brukt som en del av beregningen av fysisk aktivitet i prototypene.

Ekstern finansiering

Type prosjekt

Studentprosjekt, masterstudium

Kontaktinformasjon, student

Ingrid Evensen, ingriev@stud.ntnu.no, tlf: 40885896

Behandlingsansvar

Behandlingsansvarlig institusjon

NTNU Norges teknisk-naturvitenskapelige universitet / Fakultet for informasjonsteknologi og elektroteknikk (IE) / Institutt for datateknologi og informatikk

Prosjektansvarlig (vitenskapelig ansatt/veileder eller stipendiat)

Letizia Jaccheri, letizia.jaccheri@ntnu.no, tlf: 73593469

Skal behandlingsansvaret deles med andre institusjoner (felles behandlingsansvarlige)?

Ja

Felles behandlingsansvarlig

Institusjon

UiT Norges arktiske universitet / Fakultet for naturvitenskap og teknologi / Institutt for informatikk

Prosjektansvarlig (vitenskapelig ansatt/veileder eller stipendiat)

Gunnar Hartvigsen, gunnar.hartvigsen@uit.no, 90657785, Professor

Utvalg 1

Beskriv utvalget

Unge voksne med lettere til moderat psykisk utviklingshemming

Rekruttering eller trekking av utvalget

Rekruttering vil foregå gjennom å kontakte videregående skoler, dagsentere, omsorgsboliger for utviklingshemmede, folkehøyskoler

Alder

16 - 35

Inngår det voksne (18 år +) i utvalget som ikke kan samtykke selv?

Ja

Begrunn hvorfor det er nødvendig å inkludere voksne som ikke kan samtykke.

Personer som ikke kan gi samtykke må inkluderes fordi brukergruppen består av personer med psykiske utviklingshemninger, og mange kan mangle evne til å samtykke. Det er viktig at brukergruppen, altså de med psykisk utviklingshemning, får en stemme i utviklingen av applikasjonene hvor de selv er brukergruppe. De som ikke kan gi samtykke selv, kan fortsatt gi verdifulle resultater til forskningen.

Personopplysninger for utvalg 1

- Navn (også ved signatur/samtykke)
- Adresse eller telefonnummer
- E-postadresse, IP-adresse eller annen nettidentifikator
- Bilder eller videoopptak av personer
- Lydopptak av personer
- Gps eller andre lokaliseringsdata (elektroniske spor)
- Bakgrunnsopplysninger som vil kunne identifisere en person
- Helseopplysninger

Hvordan samler du inn data fra utvalg 1?

Deltakende observasjon

Grunnlag for å behandle alminnelige kategorier av personopplysninger

Allmenn interesse eller offentlig myndighet (art. 6 nr. 1 bokstav e)

Redegjør for valget av behandlingsgrunnlag

Hensikten til prosjektet er å finne måter å oppfordre til mer fysisk aktivitet hos personer med psykisk utviklingshemning, og vil derfor være potensielt nyttig for brukergruppen, da fysisk aktivitet kan gi positive utslag på helse generelt.

Samtykkekompetansen kan variere i utvalget, så det vil bli vurdert i samråd med helsepersonell og eventuelt foreldre/rettslig verge. Andre tiltak for å redusere personvernulempen er å innhente samtykke fra foreldre/rettslig verge ved deltakelse, samt skriftlig fra deltakeren selv, selv om det ikke vil være rettslig bindende. Deltakere som vurderes som samtykkekompetente vil derfor samtykke selv, og være rettslig bindende.

Det er helt frivillig å delta. De deltakende kan når som helst melde seg av, har rett til innsyn i opplysningene som blir lagret, all informasjon vil bli anonymisert og ingen identifiserende informasjon vil bli lagret etter endt prosjekt.

Grunnlag for å behandle særlige kategorier av personopplysninger

Arkivformål i allmenhetens interesse, eller for formål knyttet til vitenskapelig eller historisk forskning eller for statistiske formål (art. 9 nr. 2 bokstav j)

Redegjør for valget av behandlingsgrunnlag

Prosjektet har vitenskaplig interesse pga. viktigheten av fysisk aktivitet særlig i brukergruppen, da økt aktivitet kan forebygge livsstilssykdommer. Denne brukergruppen er særlig utsatt for sykdommer og helseutfordringer knyttet til en stillesittende livsstil

Papirbasert spørreskjema

Grunnlag for å behandle alminnelige kategorier av personopplysninger

Allmenn interesse eller offentlig myndighet (art. 6 nr. 1 bokstav e)

Redegjør for valget av behandlingsgrunnlag

Hensikten til prosjektet er å finne måter å oppfordre til mer fysisk aktivitet hos personer med psykisk utviklingshemning, og vil derfor være potensielt nyttig for brukergruppen, da fysisk aktivitet kan gi positive utslag på helse generelt.

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Grunnlag for å behandle særlige kategorier av personopplysninger

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Redegjør for valget av behandlingsgrunnlag

Prosjektet har vitenskaplig interesse pga. viktigheten av fysisk aktivitet særlig i brukergruppen, da økt aktivitet kan forebygge livsstilssykdommer. Denne brukergruppen er særlig utsatt for sykdommer og helseutfordringer knyttet til en stillesittende livsstil

Gruppeintervju

Grunnlag for å behandle alminnelige kategorier av personopplysninger

Allmenn interesse eller offentlig myndighet (art. 6 nr. 1 bokstav e)

Redegjør for valget av behandlingsgrunnlag

Hensikten til prosjektet er å finne måter å oppfordre til mer fysisk aktivitet hos personer med psykisk utviklingshemning, og vil derfor være potensielt nyttig for brukergruppen, da fysisk aktivitet kan gi positive utslag på helse generelt.

Samtykkekompetansen kan variere i utvalget, så det vil bli vurdert i samråd med helsepersonell og eventuelt foreldre/rettslig verge. Andre tiltak for å redusere personvernulempen er å innhente samtykke fra foreldre/rettslig verge ved deltakelse, samt skriftlig fra deltakeren selv, selv om det ikke vil være rettslig bindende. Deltakere som vurderes som samtykkekompetente vil derfor samtykke selv, og være rettslig bindende.

Det er helt frivillig å delta. De deltakende kan når som helst melde seg av, har rett til innsyn i opplysningene som blir lagret, all informasjon vil bli anonymisert og ingen identifiserende informasjon vil bli lagret etter endt prosjekt.

Grunnlag for å behandle særlige kategorier av personopplysninger

Arkivformål i allmenhetens interesse, eller for formål knyttet til vitenskapelig eller historisk forskning eller for statistiske formål (art. 9 nr. 2 bokstav j)

Redegjør for valget av behandlingsgrunnlag

Prosjektet har vitenskaplig interesse pga. viktigheten av fysisk aktivitet særlig i brukergruppen, da økt aktivitet kan forebygge livsstilssykdommer. Denne brukergruppen er særlig utsatt for sykdommer og helseutfordringer knyttet til en stillesittende livsstil

Informasjon for utvalg 1

Informerer du utvalget om behandlingen av opplysningene?

Ja

Hvordan?

Skriftlig informasjon (papir eller elektronisk)

Mottar personer som ikke kan samtykke tilpasset informasjon om prosjektet?

Ja

Utvalg 2

Beskriv utvalget

Fagpersoner og personer som jobber med/har relasjoner i brukergruppen

Rekruttering eller trekking av utvalget

Rekrutterer selv og prosjektets nettverk

Alder

18 - 70

Inngår det voksne (18 år +) i utvalget som ikke kan samtykke selv?

Nei

Personopplysninger for utvalg 2

- Navn (også ved signatur/samtykke)
- E-postadresse, IP-adresse eller annen nettidentifikator
- Bilder eller videoopptak av personer
- Lydopptak av personer
- Bakgrunnsopplysninger som vil kunne identifisere en person

Hvordan samler du inn data fra utvalg 2?

Personlig intervju

Grunnlag for å behandle alminnelige kategorier av personopplysninger

Samtykke (art. 6 nr. 1 bokstav a)

Informasjon for utvalg 2

Informerer du utvalget om behandlingen av opplysningene?

Ja

Hvordan?

Skriftlig informasjon (papir eller elektronisk)

Tredjepersoner

Skal du behandle personopplysninger om tredjepersoner?

Nei

Dokumentasjon

Hvordan dokumenteres samtykkene?

- Manuelt (papir)

Hvordan kan samtykket trekkes tilbake?

Ved å kontakte prosjektansvarlig

Hvordan kan de registrerte få innsyn, rettet eller slettet opplysninger om seg selv?

Ved å kontakte prosjektansvarlig

Totalt antall registrerte i prosjektet

1-99

Tillatelser

Skal du innhente følgende godkjenninger eller tillatelser for prosjektet?

- Etisk godkjenning fra Regionale komiteer for medisinsk og helsefaglig forskningsetikk (REK)

Behandling

Hvor behandles opplysningene?

- Mobile enheter tilhørende behandlingsansvarlig institusjon
- Maskinvare tilhørende behandlingsansvarlig institusjon

Hvem behandler/har tilgang til opplysningene?

- Prosjektansvarlig
- Student (studentprosjekt)
- Interne medarbeidere

Tilgjengeliggjøres opplysningene utenfor EU/EØS til en tredjestat eller internasjonal organisasjon?

Nei

Sikkerhet

Oppbevares personopplysningene atskilt fra øvrige data (kodenøkkel)?

Ja

Hvilke tekniske og fysiske tiltak sikrer personopplysningene?

- Opplysningene anonymiseres
- Opplysningene krypteres under forsendelse
- Endringslogg
- Adgangslogg
- Opplysningen krypteres under lagring
- Adgangsbegrensning

Varighet

Prosjektperiode

01.11.2018 - 31.12.2019

Skal data med personopplysninger oppbevares utover prosjektperioden?

Nei, data vil bli oppbevart uten personopplysninger

Vil de registrerte kunne identifiseres (direkte eller indirekte) i oppgave/avhandling/øvrige publikasjoner fra prosjektet?

Ja

Begrunn

Utvalg 2 kan bli identifisert basert på kommentarer eller sitat, men alle vil få tilbud om anonymisering.

Tilleggsopplysninger

A.2 Consent Form Users

(Starts on the next page)

Vil du delta i forskningsprosjektet

”Spill-inspirert applikasjon for motivasjon til økt grad av fysisk aktivitet”?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å motivere til økt fysisk aktivitet blant personer med utviklingshemming. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Prosjektet er en del av en masteroppgave i informatikk/datateknologi. Målet med prosjektet er å motivere personer med utviklingshemninger til å være mer fysisk aktive. Får å oppnå dette målet har det blitt laget flere prototyper av spill. Din deltakelse vil gå ut på å teste et eller flere spill, slik at vi kan kartlegge i hvilken grad det bidrar til å motivere deg til å være mer fysisk aktiv.

Hvem er ansvarlig for forskningsprosjektet?

Prosjektet er en del av en masteroppgave skrevet ved NTNU (Norges teknisk-naturvitenskapelige universitet). Prosjektet utføres av Ingrid Evensen, Ida Wold og Jens Brandsgård Omfjord. Veiledere på prosjektet er Letizia Jaccheri og Javier Gomez Escribano.

Hva innebærer det for deg å delta?

Om du velger å delta, vil du bli med på et utvalg av følgende aktiviteter for datainnsamling:

- Et innledende intervju for å kartlegge din nåværende daglige fysiske aktivitet.
- Delta i et eksperiment der du prøver et spill i en kort periode på et par timer.
- Delta i et eksperiment der du tar i bruk spillet i 3-7 dager. Du vil bruke spillet så mye du selv synes er naturlig.
- Til slutt vil du få et nytt spørreskjema slik at du kan dele dine erfaringer med oss.
- Intervju om dine opplevelser og tanker om spillet.

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykke tilbake uten å oppgi noen grunn. Alle opplysninger om deg vil da bli anonymisert. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrevet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket. Det vil bare være studentene og veilederne, nevnt tidligere, som har tilgang til opplysningene.

Navn og kontaktopplysninger om deg vil bli erstattet med en kode som lagres på en egen navneliste adskilt fra øvrige data.

Deltakere vil ikke kunne gjenkjennes i publikasjon.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?

Prosjektet skal etter planen avsluttes 31.12.2019, og etter dette vil datamaterialet bli anonymisert.

Dine rettigheter

Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke personopplysninger som er registrert om deg,
- å få rettet personopplysninger om deg,
- få slettet personopplysninger om deg,
- få utlevert en kopi av dine personopplysninger (dataportabilitet), og
- å sende klage til personvernombudet eller Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?

Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra NTNU har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?

Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:

- NTNU - Norges teknisk-naturvitenskapelige universitet ved Letizia Jaccheri på epost (letizia.jaccheri@ntnu.no) eller telefon: 73 59 34 69
- NTNU - Norges teknisk-naturvitenskapelige universitet ved Ingrid Evensen på epost (ingriev@stud.ntnu.no)
- NTNU - Norges teknisk-naturvitenskapelige universitet ved Ida Wold på epost (idawol@stud.ntnu.no)
- NTNU - Norges teknisk-naturvitenskapelige universitet ved Jens B. Omfjord på epost (jensbom@stud.ntnu.no)
- Vårt personvernombud: Thomas Helgesen på thomas.helgesen@ntnu.no
- NSD – Norsk senter for forskningsdata AS, på epost (personvernombudet@nsd.no) eller telefon: 55 58 21 17.

Med vennlig hilsen

Letizia Jaccheri

Ingrid Evensen, Ida Wold, Jens B. Omfjord

Prosjektansvarlig
(Forsker/veileder)

Prosjektdeltaker
(Studenter)

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet *"Spill-inspirert applikasjon for motivasjon til økt grad av fysisk aktivitet"*, og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ☐ å delta i innledende intervju
- ☐ å delta i eksperiment for testing av spill
- ☐ å svare på avsluttende spørreskjema
- ☐ å delta i avsluttede intervju
- ☐ at foresatt eller støtteperson kan gi opplysninger om meg til prosjektet

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet, ca. 31.12.2019

(Signert av prosjektdeltaker, dato)

A.3 Consent Form Caregivers

(Starts on the next page)

Vil du delta i forskningsprosjektet

”Spill-inspirert applikasjon for motivasjon til økt grad av fysisk aktivitet”?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å motivere til økt fysisk aktivitet blant personer med utviklingshemming. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Prosjektet er en del av en masteroppgave i informatikk/datateknologi. Målet med prosjektet er å motivere personer med utviklingshemninger til å være mer fysisk aktive. Får å oppnå dette målet har det blitt laget flere prototyper av spill. Din deltakelse i prosjektet vil bidra til å forme et eller flere spill som utvikles i prosjektet.

Hvem er ansvarlig for forskningsprosjektet?

Prosjektet er en del av en masteroppgave skrevet ved NTNU (Norges teknisk-naturvitenskapelige universitet). Prosjektet utføres av Ingrid Evensen, Ida Wold og Jens Brandsgård Omfjord. Veiledere på prosjektet er Letizia Jaccheri og Javier Gomez Escribano.

Hva innebærer det for deg å delta?

Om du velger å delta, vil du bli med på følgende:

- Et intervju for hente inn informasjon om domenet og tilbakemeldinger til prototypen av spillet
 - Eventuelt senere intervjuer om ønskelig fra begge parter

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykke tilbake uten å oppgi noen grunn. Alle opplysninger om deg vil da bli anonymisert. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket. Det vil bare være studentene og veilederne, nevnt tidligere, som har tilgang til opplysningene.

Navn og kontaktopplysninger om deg vil bli erstattet med en kode som lagres på en egen navneliste adskilt fra øvrige data.

Deltakere vil ikke kunne gjenkjennes i publikasjon, med mindre samtykke for dette gis i samtykkeerklæringen (nederst i dette dokumentet).

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?

Prosjektet skal etter planen avsluttes 31.12.2019, og etter dette vil datamaterialet bli anonymisert.

Dine rettigheter

Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke personopplysninger som er registrert om deg,
- å få rettet personopplysninger om deg,
- få slettet personopplysninger om deg,
- få utlevert en kopi av dine personopplysninger (dataportabilitet), og
- å sende klage til personvernombudet eller Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?

Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra NTNU har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?

Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:

- NTNU - Norges teknisk-naturvitenskapelige universitet ved Letizia Jaccheri på epost (letizia.jaccheri@ntnu.no) eller telefon: 73 59 34 69
- NTNU - Norges teknisk-naturvitenskapelige universitet ved Ingrid Evensen på epost (ingriev@stud.ntnu.no)
- NTNU - Norges teknisk-naturvitenskapelige universitet ved Ida Wold på epost (idawol@stud.ntnu.no)
- NTNU - Norges teknisk-naturvitenskapelige universitet ved Jens B. Omfjord på epost (jensbom@stud.ntnu.no)
- Vårt personvernombud: Thomas Helgesen på thomas.helgesen@ntnu.no
- NSD – Norsk senter for forskningsdata AS, på epost (personvernombudet@nsd.no) eller telefon: 55 58 21 17.

Med vennlig hilsen

Letizia Jaccheri

Ingrid Evensen, Ida Wold, Jens B. Omfjord

Prosjektansvarlig
(Forsker/veileder)

Prosjektdeltaker
(Studenter)

Svar på spørsmålene under ved å

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet ”*Spill-inspirert applikasjon for motivasjon til økt grad av fysisk aktivitet*”, og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ☐ å delta i ustrukturert intervju
- ☐ at opplysninger om meg publiseres slik at jeg kan gjenkjennes, for å begrunne valgene som er gjort på bakgrunn av intervju(ene).

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet, ca. 31.12.2019

(Signert av prosjektdeltaker, dato)

A.4 Informational Letter about User Test

(Starts on the next page)

Vil du delta i forskning?

Forskningen handler om fysisk aktivitet og spill.

Mål:

Motivere til fysisk aktivitet
Teste et spill

Du må være:

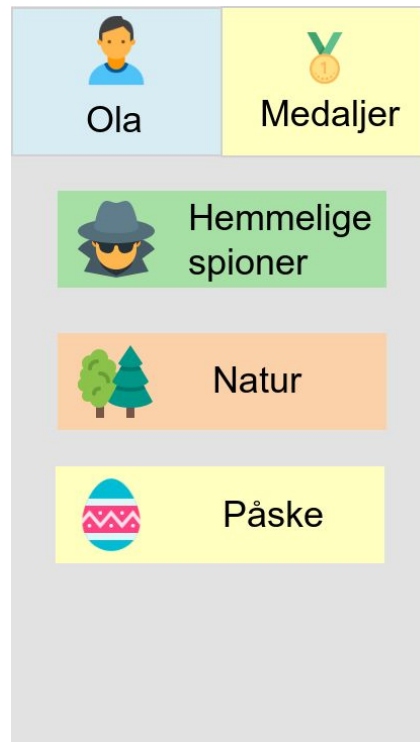
16-35 år
Kunne gå en tur på 1 time
Ha en utviklingshemming

Du vil være med på:

Lære å bruke spillet
Prøve spillet med en venn
En ledsager er også med
Si din mening om spillet

Dine rettigheter:

Du bestemmer selv om du vil være med
Du kan slutte når du vil
Du kan få se informasjonen om deg selv
Informasjonen blir ikke lagret med ditt navn



Data som blir samlet inn:

Hva du gjør når du spiller

Det du sier om spillet

Foreldre eller ledsagere deler informasjon om meg til prosjektet

Kontakter:

Masterstudent fra NTNU

Ida Wold: idawol@stud.ntnu.no

Prosjektansvarlig

Letizia Jaccheri: letizia.jaccheri@ntnu.no

Underskrift

Deltager, dato

Appendix B

Interview with Experts Questions

B.1 Questions in Norwegian

Generelt

1. Hvor mye tenker du at foreldre eller pleier/ledsagere vil være villig til å være med og sette opp spillet?
2. Hvordan tror du opplæring til spillet bør foregå?

Treningsspill

1. Hva er de mest motiverende faktorene for at utviklingshemmede skal delta i fysisk aktivitet?
2. Hvor ofte tenker du utviklingshemmede bør motta ny motivasjon for å fortsette med fysisk aktivitet?
3. Hvor viktig er gruppeaktiviteter for å motivere til fysisk aktivitet for utviklingshemmede?
4. Hvordan tenker du at samarbeid i en gruppe som spiller som er utendørs, navigering og lett trening vil fungere?
5. Finnes det noe spill eller temaer som er populære for flertallet av utviklingshemmede?

Navigering

1. Hvordan tror du utviklingshemmede vil navigere med bruk av mobile kart systemer f.eks. Google Maps på mobilen?
2. Tror du utviklingshemmede vil ha en fordel av en spesialtilpasset app som bruker gatebilder, varslinger, enklere og kortere forklaringer, lyd osv. ?

3. Hvilket utendørs områder tror du passer best til denne typen spill?
4. Hva tror du utviklingshemmede vil føle hvis han/hun er ansvarlig for å navigere for resten av gruppen?
5. Hvilke sikkerhets relaterte problemer tror du utviklingshemmede kan møte på når de går og spiller i byområder?
6. Tror du sikkerhetsvarsler er en god ide og når bør det brukes?

Design

1. Hva er det viktigste å tenke på med brukergrensesnittet på spillet?
2. Er det viktig å tilpasse brukergrensesnittet til den enkelte og hvordan bør det tilpasses?
3. Hvordan bør positive og negative tilbakemeldinger bli gitt?
4. Er det viktig at spillet endrer seg eller at vanskegraden øker og hvordan bør dette gjøres?
5. Bør overvåkning av spillet legges til (både under og etter spilling) og hvilken informasjon er interessant?

B.2 Questions English translation

General

1. To what extent do you think caregivers/parents will want to be involved in the setup of the game?
2. How do you think a training phase for the game should be executed?

Exergame

1. What are the most motivating factors to participate in physical activity?
2. How often do you believe people with intellectual disabilities need new motivation to continue with physical activity?
3. What is the significance of group activities to motivate to physical activity for people with intellectual disabilities?
4. How do you think cooperation in a group playing a location-based outdoor exergame would work?
5. Is there any games or topics that are popular for most people with an intellectual disability?

Navigation

1. How do you believe people with intellectual disabilities will do when using mobile map systems e.g. Google Maps on their smartphones?
2. Do you think people with intellectual disabilities will benefit from customized app using street view, notifications, smaller steps, simpler direction, audio etc.?
3. Which outdoor areas is it best to use in this type of game?
4. How do you think someone with an intellectual disability would feel if he or she was in charge of navigating for the rest of the group?
5. What do you think are the security issues for people with intellectual disabilities when walking and gaming in urban areas?
6. Do you think security notices is a good idea and when would you use it?

Design

1. What do you think is important to remember about the user interface?
2. Is there a need for individual adaptation of the user interface and how should it be individualized?
3. How should positive and negative feedback be given?
4. Is it important that the game changes or that the difficulty increases and how should this be done?
5. Would you add monitoring to the game (both during and after playing) and what is interesting information?

Appendix C

Answers to Interview with Experts

Name1

Jeg er vernepleier, har jobbet mange plasser og de siste 17 årene som høyskolelærer ved Hist/NTNU vernepleierutdanningen før jeg gikk av med AFP i fjor. Er nå bare knyttet til NTNU i forbindelse med at studenter skal ha praksis i Nepal.

Har arrangert større turer for utviklingshemmede. Er for tiden med å arrangere utendørsaktivitet for utviklingshemmede i Trondheim gjennom NFU

Generelt

1. Hvor mye tenker du at foreldre eller pleier vil være villig til å være med og sette opp spillet?

- Noen ville vært med å sette opp spillet. De spesielt interesserte
- I botiltakene er det ikke alle som legger til rette for turer i nærområdet

2. Hvordan tror du opplæring til spillet bør foregå?

- Skolesystemet og gymnlærere kan det tenke seg at ville brukt spillet
- Spesialpedagoger kan bruke det i sammenheng med barne- og videregående skole

Treningsspill

1. Hva er de mest motiverende faktorene for at utviklingshemmede skal delta i fysisk aktivitet?

- Konkurransen og premier
- At ledsagerne også er motiverte og engasjerte selv
- Kjedelig løype, lite som skjer annet enn å gå er lite motiverende
- Være flere sammen
- Ha med mat og tenne bål

2. Hvor ofte tenker du utviklingshemmede bør motta ny motivasjon for å fortsette med fysisk aktivitet?

- Fortløpende motivasjon
- Viktig å kommunisere hva som skal skje
- Ha en klar plan og en forutsigbarhet
- Rett bekledning, slik at du ikke fryser eller blir kliss bløt. Ledsagere er de som må sørge for dette

3. Hvor viktig er gruppeaktiviteter for å motivere til fysisk aktivitet for utviklingshemmede?

- Gruppeaktivitet fungerer bedre enn å trene alene.
- Ledsager er som oftest med på tur. Få som tar initiativet selv
- Møte noen, treffe på kjente når du går på tur er veldig motiverende
- Få nye venner og bekjenskaper

4. Hvordan tenker du at samarbeid i en gruppe som spiller som er utendørs, navigering og lett trening vil fungere?

- Mange utviklingshemmede klarer nok ikke styre et slikt spill selv pga. kognitive vansker og er avhengig av ledsager
- Viktig at aktiviteten på en måte blir ledet og at man får hjelp av ledsager
- De med lett utviklingshemming ville klart det, men de med en mer alvorlig grad mister lettere konsentrasjonen og må ha hjelp til å komme inn i oppgaven på nytt
- Mange har ikke telefoner med internettilgang
- Hvis du får en homogen gruppe kan de gå sammen og styre spillet, men da blir det vanskelig med en tilfeldig gruppe

5. Finnes the noe spill eller temaer som er populære for flertallet av utviklingshemmede?

- Veldig varierende
- Musikk er populært
- Spesialpedagoger vet kanskje mer om det, evt. Habiliteringstjenesten

Navigering

1. Hvordan tror du utviklingshemmede vil navigere med bruk av mobile kart systemer f.eks. Google Maps på mobilen?

- Det vil være vanskelig å bruke Google Maps for utviklingshemmede, men noen med lett utviklingshemming vil få det til med noen justering, forstørrelser osv.
- Veldig variert gruppe. Noen er fullstendig hjelpetrengende og uten verbalt språk

2. Tror du utviklingshemmede vil ha en fordel av en spesialtilpasset app som bruker gatebilder, varslinger, enklere og kortere forklaringer, lyd osv. ?

- Voksne med utviklingshemming kan fort oppleve at det blir for barnslig, hvis det blir for enkelt
- Dataspill er stas for mange
- Grafikken må være enkel, men ikke barnslig
- Spezialtilpasset app (med bilder på gatenivå) vil være enklere for de fleste
- Spillet bør også ha noen overraskelser underveis

3. Hvilket utendørs områder tror du passer best til denne typen spill?

- For de som bor i byen vil det være enklest å gjennomføre i nærområdet (og ikke skogen), men da blir det gjerne bare en helt vanlig kveldstur
- Skogen vil være mer spennende
- Ytre motivatorer: Sosialt, spise kveldsmat med noen
- Noen elsker å gå på tur, så de vil ha den indre motivasjonen
- Noen i gruppen er rullestolbrukere også

4. Hva tror du utviklingshemmede vil føle hvis han/hun er ansvarlig for å navigere for resten av gruppen?

- Å lede kan være en fin utfordring og læring
- Det er mange prosjekter også i Trondheim i forhold til det å ta egne valg. Dette er noe mange ikke har fått muligheter til før
- Det å ta egne valg og si sine meninger kan være vanskelig og hvis de ikke gjør det kan de bli passive
- De må få muligheten til å leve ut sine meninger også da

5. Hvilke sikkerhets relaterte problemer tror du utviklingshemmede kan møte på når de går og spiller i byområder?

- De fleste med utviklingshemming må ha ledsager og da reduseres faremomentet
- De som klarer å gå på butikken selv, må nok ha med ledsager hvis de samtidig skal spille et spill

6. Tror du sikkerhetsvarsler er en god ide og når bør det brukes?

- Sikkerhetsvarsler ved veivalg kan være en god ide for å ikke gå seg bort, også for de uten utviklingshemmede

Design

1. Hva er det viktigste å tenke på med brukergrensesnittet på spillet?

- Enkelt

- Ikke barnslig
- Litt Kult
- Attraktivit sånn designmessig

2. Er det viktig å tilpasse brukergrensesnittet til den enkelte og hvordan bør det tilpasses?

- For utviklingshemmede må det være lettest tekst (ikke mer avansert) og litt stor tekst
- Noen med utviklingshemming kan lese lettest litteratur
- Lese opp tekst kan legges til
- Bilder og tegn kan også legges til

3. Hvordan bør positive og negative tilbakemeldinger bli gitt?

- Viktigst å gi tilbakemelding når noen gjør noe bra
- Korrigering, f.eks. snu og gå tilbake, vil alle tåle

4. Is it important that the game changes or that the difficulty increases and how should this be done?

- Det blir fort kjedelig hvis det er akkurat det samme gang etter gang, så mulighet til å øke vanskelighetsgraden bør eksistere
- Variere med lengde på tur og skog- eller bytur høres bra ut
- Premie å mestre
- Mat, f.eks. gå innom kiosken etter turen bør ikke være en premie
- Legge til en utstyrsliste på starten før du drar ut av huset. Huske å ha riktige sko, drikkeflaske, matpakke som er passende for turen du skal på, sekk, hodelykt, piggsko og sitteunderlag
- Liste basert på årstid høres lurt ut. Vanskelig for utviklingshemmede å kle seg etter årstiden, regn, føre og forhold
- Gi alternativer, spørsmål om trenger du dette

5. Bør overvåkning av spillet legges til (både under og etter spilling) og hvilken informasjon er interessant?

- Liten tro på at de vil kunne gå alene, så da er ikke overvåking så viktig
- Har opplevd at utviklingshemmede har tatt feil vei i et kryss og har hatt problemer med å fortelle hvor de er, så noe som delte posisjonen hadde hjulpet

Name2

Startet initialt FTU i DNT og er lokal FYU turleder 2 steder.

Arbeider og med etablering av fritids- og aktivitets plattform for utviklings-og funksjons-hemmede med bruk av kunstig intelligens.

Bakgrunn som leder i næringslivet. Far til utviklingshemmet datter.

Generelt

1. Hvor mye tenker du at foreldre eller pleier vil være villig til å være med og sette opp spillet?

- Det vil variere veldig hvor mye tid foreldre eller boliger vil bruke på å sette opp et slikt spill
- Når det gjelder turer varierer det om det er foreldre, kommunen, boliger, fritidstilbud osv. som tar initiativet
- Hos den yngre gruppen (opptil 16 år) er foreldre veldig engasjerte
- Hvis det starter som ung med dette kan det bli en vane de tar med seg inn i voksne livet
- Hadde tur nå der de naturlotto med hodelykt og løype merket opp med refleksspray (ble som å leke seg gjennom turen)
- Litt kjedelig å gå tur med foreldre av og til, så å møte flere på tur er mye morsommere
- Å leke seg igjennom turen istedenfor at målet ligger en time fram i tid, blir noe helt annet
- Litt konkurranse aspekt i det også

2. Hvordan tror du opplæring til spillet bør foregå?

- Samle de som er interesserte og ha ferdig opplegg
- Å sørge for at programmet er installert, nøye opplæring og prøve det ut i praksis etterpå
- Ikke ha en større gruppe enn at opplæring og støtte underveis er mulig
- Skal det være på den utviklingshemmedes enhet eller ledsageren sin. Egen profil?
- Ha en god tutorial (skriftlig, video f.eks. på youtube). Det er ofte mange personer knyttet til den utviklingshemmede, så mange som skal ha opplæring

Treningsspill

1. Hva er de mest motiverende faktorene for at utviklingshemmede skal delta i fysisk aktivitet?

- Det viktigste er forutsigbarhet.
- Aktiviteten er kommunisert på en forståelig måte. Symboler eller det språket som den enkelte har

- At den utviklingshemmede har et valg, f.eks. vil du spille et treningsspill eller bare gå på tur? (komparative alternativer)
- Viktig med det sosiale rundt den fysiske aktiviteten, selv for de uten verbalt språk
- Viljen til ledsagerne. Kroppsspråk blir en stor del av kommunikasjonen for de uten verbalt språk

2. Hvor ofte tenker du utviklingshemmede bør motta ny motivasjon for å fortsette med fysisk aktivitet?

- Det vil være variere veldig i forhold til kognitivt nivå
- Noen sier at nå skal vi gå, så går vi bort til lyktestolpen der også er det greit med det, mens andre må motiveres mer eller mindre hele veien da
- Viktig at ledsager leser uttrykket til den utviklingshemmede og gir ny informasjon da
- Utviklingshemmede trenger mer motivasjon enn en samtale for å komme seg ut på tur også gå hele turen uten mer motivasjon
- Men det er lettere hvis de er flere fordi da kan man konsentrere seg om framdriften i flokken

3. Hvor viktig er gruppeaktiviteter for å motivere til fysisk aktivitet for utviklingshemmede?

- Veldig individuelt. 90% liker å være en del av en gruppe.
- Spesielt når de flytter hjemmefra (20-25 år), for da blir det mer isolasjon.
- Samtidig er det mange som har veldig stor glede av å være litt på utsiden av flokken og bare observere

4. Hvordan tenker du at samarbeid i en gruppe som spiller som er utendørs, navigering og lett trening vil fungere?

- Tror det vil fungere super fint, hvis det blir kommunisert på en måte de forstår
- De liker veldig godt å samhandle, gjøre ting sammen og gå sammen
- Konkurransen kan ha varierende suksess

5. Finnes det noe spill eller temaer som er populære for flertallet av utviklingshemmede?

- Paraidrettskvelder, der forskjellige aktiviteter blir presentert gjennom FTU Molde. De vet kanskje mer om dette
- Naturrebus og naturlotto med hodelykter har vært knall moro
- Hinderløyper har vært morsomt
- System som premierer for hvert oppmøte på arrangementer eller antall skritt i løpet av en periode. Skritt er jo litt avhengig av kognitiv funksjon igjen
- Jeg tror på lek og forskjellige rebuser. Både på sommeren og vinteren

- Sette ut barberfeller og se på insektene og smådyrene med forstørrelsesglass dagen etterpå
- Hadde med ornitolog på tur og neste gang var oppgaven og se hvor mange fugler man kunne finne og hvilke lyder de lagde
- Interaktivt skattekart med instruksjoner som gå 500m også 3 skritt til venstre osv.
- I Norge er det jo litt sånn at uansett hvor man er, så er du 5 min unna skogen, en park eller lignende. Mange plasser er det også brede fortau
- Bilder også kan skal man finne det på bildet. F.eks. Nidarosdomen
- Bruke VR og droner
- Bruke droner til å følge med på hvor den utviklingshemmede går og legge til en stemme som forklarer veien og en håndholdt enhet kalibrert til det kognitive nivået til brukeren

Navigering

1. Hvordan tror du utviklingshemmede vil navigere med bruk av mobile kart systemer f.eks. Google Maps på mobilen?

- Datteren min med moderat til tung utviklingshemming fikk en iPad for mange år siden og det tok hun intuitivt hvordan virket veldig raskt. Ble overrasket av det kognitive potensialet hennes gjennom hvordan hun håndterte IPaden. Jeg tror det er store muligheter hvis man har tålmodighet
- Bruk av Google Maps kan være vanskelig, men stemmen hjelper. Beskjeder om å snu hvis du går feil. Så tror det er potensialet i det

2. Tror du utviklingshemmede vil ha en fordel av en spesialtilpasset app som bruker gatebilder, varslinger, enklere og kortere forklaringer, lyd osv. ?

- Ja, jeg tror utviklingshemmede vil ha en fordel av spesialtilpassede apper for navigasjon
- Spesielt street view er viktig
- Bakkemannskapet er igjen viktig og hvis de vil, så for de det til

3. Hvilket utendørs områder tror du passer best til denne typen spill?

- Jeg ville begynt i naturen, fordi der er det mindre forstyrrelser
- Tilrettelagte grusstier som de kjenner fra før og heller introdusere nye steder etter hvert som forståelsen av spillet blir bedre
- 80% av utviklingshemmede er arbeidsledige og har veldig mye fritid. I forhold til trening kan det være viktig og se på muligheten til å lære ferdigheter som de har nytte av i det virkelige livet
- De med lettere utviklingshemming kan fungere som gode veiledere og instruktører for andre med tyngre utviklingshemming.
- Utviklingshemmede har veldig stor tiltro til hverandre

- Personer med lett utviklingshemming kan være gode rollemodeller eller mentorer og ha med i opplæring
4. Hva tror du utviklingshemmede vil føle hvis han/hun er ansvarlig for å navigere for resten av gruppen?
- For de som er i stand til å lede en gruppe vil det være en mestingsfølelse
 - Det å gjøre noe spesielt for flokken er de veldig stolte av
 - Vise at de klarer noe de også
5. Hvilke sikkerhets relaterte problemer tror du utviklingshemmede kan møte på når de går og spiller i byområder?
- Viktig å bruke sunt bondevett i forhold til sikkerhet i byområder
 - De som klarer å gå tur alene kan gå alene og for de som må ha med ledsager, har ledsager ansvaret for
 - Ledsagere må bedømme hvilket ansvar den utviklingshemmede kan få og hvor selvstendige de kan være
6. Tror du sikkerhetsvarsler er en god ide og når bør det brukes?
- Legge aktiviteten i et oversiktlig område
 - Ha en puljeleder som har ansvaret. Viktig at denne personen er kvikk nok til å forstå informasjonen
 - Sikkerhet er viktig for at de skal komme på arrangementer
 - Varsler og alarmknapp vil være bra hvis det virker
 - Alarmknappen kan bli morsom hvis mange kommer springende til deg hvis man trykker på den.
 - Alarmknapp fungerer nok best hvis de er kognitive velfungerende, for mange vil det nok være unyttig informasjon
 - Hvis personen kommer alene på arrangement klarer han å gå alene og hvis personen har med ledsager, så er det ledsagerens oppgave å passe på sikkerheten

Design

1. Hva er det viktigste å tenke på med brukergrensesnittet på spillet?
- Bruk mye symboler. F.eks. de til Tobii Dynavox. Ta kontakt med Gisle Dimmen og referer til meg
 - Flere nivå med kommunikasjon. Vi bruker symboler, lett tekst, mer komplisert tekst (til ledsagere) og syntetisk tale
 - Vi har også mulighet til å fjerne noen av nivåene siden det vil være forstyrende. F.eks. fjerne teksten hvis man ikke kan lese
2. Er det viktig å tilpasse brukergrensesnittet til den enkelte og hvordan bør det tilpasses?

- En fordel å kunne tilpasses den enkeltes kognitive nivå
- Å starte med noe enkelt, slik at opplærings- og iverksettelsesbarrieren blir for stor
- Utvikle det med tilpasninger etter hvert

3. Hvordan bør positive og negative tilbakemeldinger bli gitt?

- Positiv kognitiv coaching fungerer bra
- Negativ kognitiv coaching (nei, nei, nei eller uff og uff) fungerer veldig dårlig
- Det var veldig bra, men kanskje vi kan prøve noe annet
- Jeg ville ikke brukt fysiske forsterkere, f.eks. potetgull, godteri, osv.
- En stjerne eller rose i enheten
- Digitalt stemplingskort som du får nytt stemple per samling du er med på. Klappe for de som har nådd en milepæl

4. Is it important that the game changes or that the difficulty increases and how should this be done?

- Jeg tror ikke det er viktig at det endrer seg
- Setter pris på gjentakelser av ting de mestrer
- Å justere etter ferdighetsnivået vil være en fordel
- De som er veldig flinke kan fungere som turledere

5. Bør overvåkning av spillet legges til (både under og etter spilling) og hvilken informasjon er interessant?

- Kjempe god ide og ha med en overvåkning av lokasjonen med tanke på navigasjonen
- Se på områder som var vanskelige og prøve igjen senere. Skaper mestring
- Kommunikasjon om turen. Skjedde det noe spennende her. Var det et tre som hadde veltet

Nevnt på slutten av intervjuet

- Muligheten til å printe ut informasjon om turer/kommunikasjon og ha det med på turene.

Name3

Professor ved UiT Norges arktiske universitet og veileder for prosjektet om effekt av fysisk aktivitet med e-helse-støtte hos personer med utviklingshemming

Generelt

1. Hvor mye tenker du at foreldre eller pleier vil være villig til å være med og sette opp spillet?

- Foreldre er veldig hjelpelige hvis spillet er bra
- Hos støttepersonell er det mer individuelt (hvor mye de hjelper til med digitale verktøy)
- Foresatte er ofte flinkere på de digitale verktøyene
- Unge vil antageligvis være mer kompetente med spill

2. Hvordan tror du opplæring til spillet bør foregå?

- I en opplærings-prosess bør det være: rolige forhold, lystbetont, ikke lange økter og till de mestrer det
- Viktig for utviklingshemmede å føle at de kan mestre dette
- Støtte hvis det blir vanskelig og se om de klarer mer selv senere en gang

Treningspill

1. Hva er de mest motiverende faktorene for at utviklingshemmede skal delta i fysisk aktivitet?

- Veldig individuelt (hva som motiverer til fysisk aktivitet)
- Motiverende faktorer: Gode beskjeder om hva som skal skje, Mange setter pris på det sosiale, Mange sier det med mestring er viktig, Det at du føler at du får det til, sånn at det ofte er det med gjentakelse kan være bra og Noen som sier at det at det kommer noe nytt og spennende er motiverende
- Veldig avhengig av de som er rundt (når det kommer til motivasjon for fysisk aktivitet). At de støttepersonene også er: motivert, liker fysisk aktivitet og at det skjer ting underveis (snakke sammen, ha det hyggelig). Rett og slett en hyggelig setting

2. Hvor ofte tenker du utviklingshemmede bør motta ny motivasjon for å fortsette med fysisk aktivitet?

- Når det er et klart mål, sette seg ned å spise, se på noen som holder på med uteaktivitet, så er det ofte nok motivasjon
- Kan kreves ytterligere motivasjon undervies, slik som snakking og synging underveis, spesielt når hun var yngre
- Når en rute er kjent, trengs det mindre ytterligere motivasjon

- Det vil være individuelt. For noen vil det være nok å vite hvor de skal og noe som skjer når de kommer fram. For de som ikke er så glad i fysisk aktivitet kan det være nyttig at det skjer noe mer underveis
- Personalet kan si “kom nå så går vi på tur” (uten å kommunisere et mål for turen)
- Aktiviteter hvor man skal finne poster underveis, f.eks. noe som ligner på Pokemon Go

3. Hvor viktig er gruppeaktiviteter for å motivere til fysisk aktivitet for utviklingshemmede?

- I intervju har det kommet fram at en stor andel sier har sagt at det ikke er så viktig med gruppeaktiviteter. Gruppeaktivitet kan være mindre viktig med mer komplisert utviklingshemming, f.eks. i kombinasjon med autisme
- Den store gruppen uten kompliserte former og lett til moderat grad av utviklingshemming setter ofte pris på det

4. Hvordan tenker du at samarbeid i en gruppe som spiller som er utendørs, navigering og lett trening vil fungere?

- Det vil være litt krevende (med samarbeid, utendørsaktivitet og navigering), så må være personer med moderat eller lett utviklingshemming
- De som kan være med på lagidrett vil mestre det (samarbeid, utendørsaktivitet og navigering)
- Tenk at det en skal utvikle skal kunne mestres av aldersgruppen 3-10år, eller kanskje riktigere funksjonsmessig opp til 6 år.
- Det er viktig at det ikke er for barnslig. De er ungdom/voksne. De identifiserer seg med andre ungsommer og voksne, men mange ser fortsatt op barnefilmer og leser barnebøker. Kompetansemessig er de ikke på nivå med personer uten utviklingshemming med samme alder

5. Finnes the noe spill eller temaer som er populære for flertallet av utviklingshemmede?

- Vet egentlig ikke om noen spill som er veldig populære blant utviklingshemmede
- Ved moderat og alvorlig utviklingshemming brukes ofte Ipad til å finne, filmer, musikk og bilder
- Ved alvorlig utviklingshemming kan det være problemer med å flytte, slippe og bevege rundt ting på skjermen
- Andre kan klare ganske avanserte spill, eksempelvis sette figurer rett på en Ipad og så utløser det handlinger.
- Musikk og film blir mye brukt blant utviklingshemmede. Også erfart at musikkvideoer og dans kan være populært
- Lotto med bilder brukes mye er en aktivitet som mange liker og kan gjøre sammen.

Navigering

1. Hvordan tror du utviklingshemmede vil navigere med bruk av mobile kart systemer f.eks. Google Maps på mobilen?

- Jeg synes det høres komplisert ut (med navigering ved hjelp av Google Maps). Høyre/Venstre. Sti su skal følge
- Du kan teste det på barn i 5-6 års alderen og hvis de klarer det bør personer med moderat utviklingshemming også klare
- Hvis noe er enkelt for normalfungerende kan du tenke deg at de med lett utviklingshemming vil klare det
- Jeg er ganske usikker på hvordan de vil klare å navigere med Google Maps

2. Tror du utviklingshemmede vil ha en fordel av en spesialtilpasset app som bruker gatebilder, varslinger, enklere og kortere forklaringer, lyd osv. ?

- Enkle systemer til å begynne med og heller avansere etter hvert
- De færreste kan å lese, så og høre er bedre

3. Hvilket utendørs områder tror du passer best til denne typen spill?

- Helst ikke trafikkerte områder
- Fortau i boligstrøk med lite trykk og trafikk
- De går vanligvis ikke alene og må ha med ledsager
- Skogsområder og stier er velegnet. F.eks. lysløyper
- I byområder vil det være mye trafikk, bygninger og folk og derfor være mindre egnet

4. Hva tror du utviklingshemmede vil føle hvis han/hun er ansvarlig for å navigere for resten av gruppen?

- Noen vil fungere som ledere (for en gruppe)
- De som får det til (og være ansvarlig for å navigere for resten av gruppa) vil føle mestring og bli stolt

5. Hvilke sikkerhets relaterte problemer tror du utviklingshemmede kan møte på når de går og spiller i byområder?

- Først og fremst trafikken (som er et sikkerhetsrelatert problem ved å spille i et byområde). Lett å miste oppmerksomheten

6. Tror du sikkerhetsvarsler er en god ide og når bør det brukes?

- Varsler ved gangfelt må læres først og det kan ta litt tid
- Alarmknapp kan være nyttig hvis man er ute alene. Personvern kan være underordnet i denne settingen, sikkerhet er viktigere

Design

1. Hva er det viktigste å tenke på med brukergrensesnittet på spillet?

- Det vil være individuelt (hvordan brukergrensesnittet bør designes)
 - Hvis du har en mer alvorlig grad av utviklingshemming så bør brukergrensesnittet være: enkelt, tiltalende, tydelig og noe de kjenner igjen
 - For litt mer avanserte spillbrukere bør brukergrensesnittet være: tydelig og gjenkjennbart
2. Er det viktig å tilpasse brukergrensesnittet til den enkelte og hvordan bør det tilpasses?
- Bør tenke på hvem spillet blir laget til og at det ikke trenger å passe til alle
 - Avansere etter hvert (vanskelighetsgrad i spillet)
 - Hvis spillet skal passe til flest mulig bør du lage det så enkelt som mulig
3. Hvordan bør positive og negative tilbakemeldinger bli gitt?
- Negative tilbakemeldinger bør du ikke gi. Heller si gå en annen vei
 - Noe de kjenner igjen som kan være positivt, smilefjes, musikk eller lyd eller stemme som sier bra
4. Is it important that the game changes or that the difficulty increases and how should this be done?
- Utviklingshemmede jobber i lang tid for små framskritt
 - Morsomt å bare klare
 - I idrettslag er det ofte de samme oppgavene år etter år. Endringene som blir lagt inn er det ikke så sikkert at deltagerne er så begeistret for
 - Gjentakelse og gjenkjennbart er ofte bra og avansering er ikke så viktig
 - Små endringer (bildet endrer seg), øker det motivasjonen
 - Pokemon Go var jo kjempe populært i en periode også avtar det etter hvert
 - Ikke tenk så mye på økende vanskelighetsgrad
5. Bør overvåkning av spillet legges til (både under og etter spilling) og hvilken informasjon er interessant?
- De fleste har med seg noen, men hvis de kommer bort fra hverandre kan det være lurt (med overvåking av lokasjonen til brukeren)
 - Sikkerhet kan være viktigere enn personvernet for denne gruppa. Sjeldent at ingen vet hvor de er eller hva de gjør
 - Ta opp det som har skjedd på turen etterpå, f.eks. med bilder underveis kan jeg tenke at er morsomt

Name4

Utdannet psykolog

Holder på å ta doktorgrad om effekt av fysisk aktivitet med e-helse-støtte hos personer med utviklingshemming

Generelt

1. Hvor mye tenker du at foreldre eller pleier vil være villig til å være med og sette opp spillet?

- Det har jeg både fått bekreftet både i intervju og erfart at de er ganske villige til å bidra
- Enkelt og lettvint oppsett og administrasjon
- Mangel eller komplekse bruksanvisninger, mangel på helpdesk har gjort at annen velferdsteknologi ikke har blitt brukt
- UiT vil koble inn et firma som kan hjelpe med drift og tilby hjelp i deres prosjekt

2. Hvordan tror du opplæring til spillet bør foregå?

- Det optimale er at noen er tilstede ved opplæringen den første gangen
- Stegvis brukermanualen med visuell støtte og lett språk som både den utviklingshemmede og helperne kan bruke
- Hvis det ikke er mulig å være fysisk tilstede bør det være en enkel instruksjonsvideo i tillegg til brukermanualen

Treningsspill

1. Hva er de mest motiverende faktorene for at utviklingshemmede skal delta i fysisk aktivitet?

- Å være sosial i den fysiske aktiviteten er veldig motiverende. Det går på tvers av type utviklingshemming og interesser
- Vi har enda ikke fått tak i den optimale belønningen for deltakelse i fysisk aktivitet
- For personer uten utviklingshemming er det mang som har en indre motivasjon for å være fysisk aktiv, den får man ikke helt tak i hos utviklingshemmede
- Fysisk aktivitet har et annet formål. Treffe venner, gå tur med hund, spise matpakke på når man kommer fram øker sjansen for deltakelse på fysisk aktivitet
- At personen rundt den utviklingshemmede er interessert i fysisk aktivitet øker sannsynligheten for deltakelse mer i fysisk aktivitet. Både deres motivasjon og støtte med det praktisk
- Håper at ytre motivasjon (belønning f.eks. smilefjes) etter hvert blir indre motivasjon
- Det er ikke alltid de selv skjønner sammenhengen mellom fysisk aktivitet og de positive effektene. Den fysiske aktiviteten pleier å ha positiv ringvirkning på kosthold, søvn, osv.

2. Hvor ofte tenker du utviklingshemmede bør motta ny motivasjon for å fortsette med fysisk aktivitet?

- Daglig påminnelse/belønning fungerer best for utviklingshemmede, spesielt de med mer alvorlig utviklingshemming. De er veldig tilstede her og nå og er veldig opptatt av det som skjer i øyeblikket
- Progresjon trenger ikke skje før etter 2-3 måneder og kanskje enda lengre
- Ofte liker utviklingshemmede det som er trygt, forutsigbart og en slags rutine
- Det å lære nye ting er svært vanskelig for utviklingshemmede
- Programmet bør (uten at de merker det) bli vanskeligere etter hvert, men trenger ikke skje like fort som hos de med normal kognitiv funksjon
- Feedback eller belønning underveis ca. hvert 5 min kanskje. Visuelt – en tommel opp, smilefjes. Auditivt
- Tror ikke de har behov for at det blir vanskeligere underveis eller at de får nye oppgaver før de når det nevnte målet etter ca. 15 min
- Individuell tilpasning er ønsket pga. vanskelig å finne noe som er belønnende for de aller fleste. En Karakter, type musikk
- Oppmerksomheten pleier ofte også å være en utfordring. Ofte er det nok med blinking, vibrasjon eller lyd
- Det å vise fram prestasjonene til noen er også motiverende. Få medaljer som man kan vise fram

3. Hvor viktig er gruppeaktiviteter for å motivere til fysisk aktivitet for utviklingshemmede?

- Det er veldig viktig å være sosial
- Mange bor i egne leilighet og kan være ganske ensomme
- Noen har utviklingshemming med autisme og har da ikke det behovet for å være sosial, men ofte er det fint å være litt på siden av gruppen

4. Hvordan tenker du at samarbeid i en gruppe som spiller som er utendørs, navigering og lett trening vil fungere?

- Mange er ikke så flinke til å navigere pga. redusert visuospatiale evner
- Fin utfordring å prøve å finne poster så lenge de ikke er for avanserte, men de må nok ha med en ledsager til å hjelpe med kart, høyre/venstre og trafikken
- Har ikke vært så mye innom samarbeid i intervjuene
- Fotball kan bli for komplekst og gå for fort for mange, slik at det blir skummelt
- Jeg tror at mange vil synes det er fint å være et lag og gjøre ting sammen

- 2-3 personer som blir enige om hvor de skal gå med hjelp av en ledsager kan absolutt fungere. Kanskje en fordel om noen bestemmer hvem som skal jobbe sammen. Oppgaven skal løses på et litt større område, fotballbane eller park.
- Tydelig mål, enkelt eller noe de kjenner fra før. Ikke bildet av et tre som man skal finne i en park med mange trær

5. Finnes the noe spill eller temaer som er populære for flertallet av utviklingshemmede?

- Jeg er veldig usikker. Har ikke vært så mye innom det
- Det er veldig forskjellig når det gjelder funksjonsnivå
- De med lett utviklingshemming hadde sikkert klart å spille Pokemon Go
- De litt enkle spillene som finnes, slik som stigespillet (for de med litt lettere grad av utviklingshemming)
- Dyreyatzy har vært mye brukt i litt sånn pedagogiske sammenhenger. Terningene har ikke prikker for det blir for komplisert
- Kan finne fellesnevneren eller hva som er belønnende og overføre det til digitale spill

Navigering

1. Hvordan tror du utviklingshemmede vil navigere med bruk av mobile kart systemer f.eks. Google Maps på mobilen?

- Det tror jeg vil bli vanskelig og mange vil slite med
- Mange sliter med å forstå klokke og penger. Kart er også ganske abstrakt og krever ofte litt høyere mentale ferdigheter
- Har hørt at personer uten et verbalt språk synes det er vanskelig å gå til en nabo selv om foreldrene har tegnet opp noen enkle tegninger

2. Tror du utviklingshemmede vil ha en fordel av en spesialtilpasset app som bruker gatebilder, varslinger, enklere og kortere forklaringer, lyd osv. ?

- Absolutt ja. Det vil de ha mye mer utbytte av enn å lese kart selv
- Det bør inkludere street view og noen som peker veien de skal gå
- Støtte med verbale beskjeder
- Konstant feedback og beskjeder om hva som skal skje akkurat nå

3. Hvilket utendørs områder tror du passer best til denne typen spill?

- Stier i naturen
- Park eller grønt områder med stier eller åpne områder
- Park på toppen av øya i Tromsø som er mye brukt. Akebakke og bål plass, Ikke så mye folk der, Åpen og stort, sånn at ingen går seg vil
- I Tromsdalen bruker de mye lysløypa

- Viktig at de ikke har så mye folk rundt. Noen har utfordringer med utagering, blir lett distraherert eller liker best når det er stille rundt
- Kan være litt vanskeligere å finne et passende område i naturen i større byer, i hvert fall hvis det er en gruppe som gjør aktiviteten sammen

4. Hva tror du utviklingshemmede vil føle hvis han/hun er ansvarlig for å navigere for resten av gruppen?

- Jeg har hørt at noen synes er litt artig å være den som leder turen
- Føler seg stolt
- Artig å være den som er ansvarlig
- Hvis det legges til rette for det, så tror jeg mange vil få det til
- Jeg synes det er en kjempe ide at en for ansvaret for å være gruppeleder og få litt støtte fra noen med normal kognitiv funksjon.
- Man har hver sin tur å være gruppeleder også ruller det

5. Hvilke sikkerhets relaterte problemer tror du utviklingshemmede kan møte på når de går og spiller i byområder?

- Først og fremst trafikken. Mange har utfordringer med impulsivitet og ikke klarer å se konsekvensene av å gå ut i trafikken.
- Mange har utfordringer med å skjønne høyre og venstre og hvor bilene kommer fra
- Være nært vann, f.eks. brygger
- Noen kan bli stresset av mange folk, mye lyder og bråk

6. Tror du sikkerhetsvarsler er en god ide og når bør det brukes?

- Det kan hende det er hensiktsmessig med påminnelser i trafikkerte områder, hvis de skal gå alene i en by
- Det er mange som bruker flere år å lære seg og ta bussen og finne veien. En slik sikkerhetskompis kunne vært en app i seg selv
- En alarmknapp kan være en sikkerhet både for den utviklingshemmede og foreldrene hvis de skal gå alene
- Ved alarm blir koordinatene sendt til foreldre eller bolig eller at det kobles opp en samtale automatisk
- Jeg er litt usikker på om de kommer til å skjønne at de har gått seg bort
- Trykker på knappen først når de blir redde og kanskje noen har full kontroll på hvor de er

Design

1. Hva er det viktigste å tenke på med brukergrensesnittet på spillet?

- Enkelt

- Visuelt stimulerende. Farger, ansikter og noe spennende å se på
- Store ikoner og knapper
- Veldig lite andre forstyrrende elementer og få knapper
- Individuell tilpasning etter interesse. Hva slags figur man skal være eller omgivelsene man går i
- Funksjonene er selvforklarende

2. Er det viktig å tilpasse brukergrensesnittet til den enkelte og hvordan bør det tilpasses?

- Kan hende de med lett utviklingshemming har mer forutsetninger får å bruke en app som er mer avansert og at det kan bli kjedelig hvis det blir for enkelt
- Forskjellig modus i forhold til både type utviklingshemming og interesse. Velge alternativet som passer best til den enkelte
- Noen har litt sære interesser som blir litt altoppslukende
- Variasjon er ofte ikke så viktig, så interesser endrer seg ofte ikke over tid
- Å velge den avataren man synes er mest interessant. Det er ikke det optimale

3. Hvordan bør positive og negative tilbakemeldinger bli gitt?

- Ikke gi belønning eller korrigering i form av tekst, for det er ikke alle som kan lese
- Symboler. Alternativt supplerende kommunikasjon ASK. Ofte vant til det fra barnehagen av og kjenner igjen
- Lyd. Fortelles veldig enkelt og konkret. Noen har hørselsvansker, men bruker da høreapparat
- Du er flink, kom igjen. Ikke bare 10 min igjen
- Visuelt stimuli. Symbol eller smilefjes
- Viktigste er å forsterke det de holder på med framfor å korrigere

4. Is it important that the game changes or that the difficulty increases and how should this be done?

- Behovet for at det skal endres og bli vanskeligere er ikke like uttalt hos denne gruppen som hos de uten utviklingshemming
- Det tar tid å lære noe nytt, så når de først har lært det, så er det fint å ha det sånn
- Hvis det skal skje endring bør det være en liten endring
- Ikke sikkert de skjønner at de har kommet opp i level, kommet seg lengre i spillet eller nærmer seg en boss
- Kanskje at det etter 2-3 måneder kommer et annet element, men at de som ikke ønsker det ikke trenger å bruke det. Viktig å sørge for at de har lært seg det før det endrer seg

- Hvis det skal gjøres daglig eller flere ganger i uka, så er det greit å ha litt variasjon, men den trenger ikke være stor
- Etter hvert som de kommer i bedre form kan det utvides i tid, men trenger ikke bli mer kompleks

5. Bør overvåkning av spillet legges til (både under og etter spilling) og hvilken informasjon er interessant?

- Nyttig at foresatte kan se hva slags utvikling de har
- Følge med på hvor ofte og hvor lenge det brukes
- Foreldre kan legge inn målsetting og tilpasse det etter barnet sitt

Name5

Er utdannet dataingeniør

Jobber for smart cognition som har utviklet FTU app og holder på å utvikle digital plattform for formidling av tilrettelagt informasjon om fritidsaktiviteter i hele landet

Generelt

1. Hvor mye tenker du at foreldre eller pleier vil være villig til å være med og sette opp spillet?

- Foreldre vil være interessert i å hjelpe med å laste ned, konfigurere og legge til rette for spillet

2. Hvordan tror du opplæring til spillet bør foregå?

- Bruker bør være sammen med foreldre eller pårørende under opplæringen.
- Opplæring på en samling sammen med andre

Treningsspill

1. Hva er de mest motiverende faktorene for at utviklingshemmede skal delta i fysisk aktivitet?

-

2. Hvor ofte tenker du utviklingshemmede bør motta ny motivasjon for å fortsette med fysisk aktivitet?

- Treffe venner
- Være sammen med familie, spesielt når de ikke bor hjemme lengre
- Treffe familie og venner er det viktigst
- Tenne bål, enkel og sunn mat
- Ikke materielle belønninger

3. Hvor viktig er gruppeaktiviteter for å motivere til fysisk aktivitet for utviklingshemmede?

- Ukentlig påminnelser om fysisk aktivitet
- Behov for delmål underveis på turen er mindre viktig
- Det viktigste er å motivere på starten for å komme seg ut på turen
- Det vil være litt forskjellig fra person til person hvor mye motivasjon de trenger i løpet av turen

4. Hvordan tenker du at samarbeid i en gruppe som spiller som er utendørs, navigering og lett trening vil fungere?

- Det er viktig med det sosiale for utviklingshemmede
- Gjøre det samme som resten av gruppa

5. Finnes the noe spill eller temaer som er populære for flertallet av utviklingshemmede?

- Ikke helt sikker på hvordan det vil fungere (i forhold til navigering)
- Har spilt stolpejakten med sønnen: Morsomt å følge med på markøren på kartet, Bruke kartet til å forklare om området rundt, Sønnen liker spillet
- Litt usikker på hvordan samarbeid ville fungert. De bør være fysisk i nærheten av hverandre, slik at de kan snakke med hverandre
- Det har fungert veldig bra å spille stolpejakten med bare meg og sønnen min

Navigering

1. Hvordan tror du utviklingshemmede vil navigere med bruk av mobile kart systemer f.eks. Google Maps på mobilen?

- Litt fasinende med stolpespillet og navigasjon
- Stolpespillet motivere litt, det å forstå hvordan ting henger sammen

2. Tror du utviklingshemmede vil ha en fordel av en spesialtilpasset app som bruker gatebilder, varslinger, enklere og kortere forklaringer, lyd osv. ?

- Jeg tror absolutt at spesialtilpassede navigasjonsapper (og apper generelt) vil være nyttig
- Spesial tilpasning inkluderer: Bilder og symboler, enkel tekst, kombinasjon av flere virkemidler
- Noen kan lese litt, andre ikke i det hele tatt

3. Hvilket utendørs områder tror du passer best til denne typen spill?

- Varierer litt på hvilket område som er best. Begge deler fungerer bra
- Noen har dårlig balanse og trenger slett underlag

4. Hva tror du utviklingshemmede vil føle hvis han/hun er ansvarlig for å navigere for resten av gruppen?

- Ikke alle vil klare å lede
- Det vil være veldig stas for de som leder og også for de som følger etter

5. Hvilke sikkerhets relaterte problemer tror du utviklingshemmede kan møte på når de går og spiller i byområder?

- Først og fremst trafikken som vil være et sikkerhetsproblem i byområder
- Både gangfelt og gå ved siden av veien

6. Tror du sikkerhetsvarsler er en god ide og når bør det brukes?

- Alarmknapp høres fornuftig
- Litt mer usikker på varslinger. Kan hende de ikke følger med på de

Design

1. Hva er det viktigste å tenke på med brukergrensesnittet på spillet?
 - Ikke for mange ting å forholde seg til
 - Store knapper eller flater man skal trykke på
 - God kontrast på farger. En del har litt problemer med nedsatt syn
2. Er det viktig å tilpasse brukergrensesnittet til den enkelte og hvordan bør det tilpasses?
 - Individuell tilpasning er svært viktig
 - Er enig med at følgende områder bør tilpasses: språknivå, vanskegrader i forhold til navigering, temaer i spillet
3. Hvordan bør positive og negative tilbakemeldinger bli gitt?
 - Riktig/positiv – smilefjes og glad låt/positiv lyd
 - Feil/negativ – surfjes, varsler om du er i ferd med å gjøre noe galt, syntetisk stemme som sier hva du bør gjøre nå
4. Is it important that the game changes or that the difficulty increases and how should this be done?
 - Over tid bør vanskegraden øke, slik at de føler at de strekker seg etter noe
 - Må samtidig være varsom med å forandre på ting for ofte
 - Veldig mange er mer fornøyde med ting de kjenner fra før
5. Bør overvåkning av spillet legges til (både under og etter spilling) og hvilken informasjon er interessant?
 - Repetere
 - Dialog i etterkant
 - Fin opplevelse etter selve turen og se tilbake på turen
 - Dele bilder, dialog om arrangementer
 - Å snakke om det man har vært med på i etterkant

Appendix D

Focus Group

D.1 Program

The focus group has a very strict schedule, which can be seen in Table D.1.

Topic	Time
Introduction	15 minutes
Presentation project 1	45 minutes
Break	5 minutes
Presentation project 2	45 minutes
Thank participants for coming	10 minutes

Table D.1: The schedule for the focus group

D.1.1 Introduction

The introduction started with a introduction round of all the participants and the hosts of the focus group. Followed by a short introduction to the larger project consisting of the the two smaller projects hosting this focus group.

D.1.2 Presentation Project 1

The presentation of this project consist of two sub presentations and discussions. The schedule for this presentation can be seen in Table D.2.

The presentation of the guidelines consist of the guidelines found in Section 5.1 and the game idea presentation consist of the app idea from Sections 5.2 - 5.5.

D.1.3 Questions

After each presentation a couple of questions was asked to guide the discussion.

Topic	Time
Presentation of the guidelines	5 minutes
Discussion	10 minutes
Presentation of the idea	10 minutes
Discussion	20 minutes

Table D.2: The schedule for the presentation

The Questions related to the guidelines are:

- What are the most important guidelines?
- Is there any guidelines you disagree with?

The questions related to the app idea are:

- Will the app be motivating?
- Is the navigation screen straightforward enough?
- Is there any problems with the user interface?

D.2 Discussion

D.2.1 Guidelines

Name1

- The motivation is the most important.
- To have a reward is also very important.
- “To nail that (the motivation), I think that’s the success factor”

Name4

- The reward settings can be customized based on personal choice. Having one world where you collect Pokémons, one berries and one animals.

Name1

- In some cases, the reward might have to be physical. Some might not be able to understand what the abstract medal in the game is.

Name2

- Not too many choices are important
- “The game has to be fun and catchy”

Name1

- I think you have made a good suggestion of guidelines

Name2

- It's important to use symbols and it has to be self-instructional
- I don't know if taking all these three (guidelines) together

Name4

- Is the difficulty the difficulty of instructions or the physical activity?

Name6

- "Maybe he is right about, in terms of the guidelines, we should be clear about what it means to be difficult. Difficult that is the activities and difficult that is the visual interface"

Name3

- How did you come up with the age group? Is not the cognitive level more important than the age group?

Moderator

- School is the place where adolescents get most of their physical activity and having something to promote physical activity in the transition is important.

Name2

- "The cognitive ability level is more important, and you see people 50 years who is using technology"

Name4

- "I think it is also important not only to say my biologic age group is 16-35, but also what kind of cognitive disability you are targeting. Because I don't think there is one solution fits all kind of"

Name2

- People with moderate intellectual disability have quite low cognitive levels.
- It is also a scale
- You don't know if it's only the cognitive level that is important for the user to enjoy the game.
- "A lot of these people uses Facebook and Snapchat and, but they really don't understand how to use it"

Name1

- That's (being able to use it themselves) is a reward

D.2.2 App Idea

Name3

- Is there a mirrored copy for the caregiver?

Moderator

- No. It might be added in the future, but for now it is not included

Name4

- Why do you want a quiz?

Moderator

- It will be something different
- Can be used by people with higher cognitive abilities
- During interviews some said they used quizzes for people with IDs

Name3

- Where does the stories come from? Are they built into the app or is it a platform?

Moderator

- For now, it's just an app. In the future, it could be changed to a platform

Name1

- How do you create the fixed route?
- Is it from Google Maps?
- Does the caretaker have to create the map?

Moderator

- It does not use Google Maps
- Caregivers can create maps
- The caregivers having to create the route is one of the negative sides

Name4

- "I don't think it's a negative point, if caregiver makes these routes"
- The caregivers know the route and knows the places you can get lost

Name1

- The caregiver knows their abilities when making the route

Name6

- In the navigational app I made for my master thesis, we discovered some issues with the non-permanent part of the picture. Some did not recognize some places, because the parked cars were different colors

Name3

- How are the pictures added?

Moderator

- The caregivers (or person creating the route) must take the pictures

Name3

- What happens if the user doesn't go the correct way and goes of the route?

Moderator

- Most people (with ID) are not allowed to go on these trips alone, so the caregiver will be responsible.
- If they can walk alone, they usually know what to do if they are lost

Name2

- They (people with IDs) are routine people and will walk the same route multiple times
- For some that does not have such a low cognitive level, I think they need a challenge of different routes in a known area

Name4

- "I think one way to reduce the risk of hitting the saturation point is to have a reward system"
- Change the reward system every time the user is not motivated to do the same route again
- Do you think it's a good idea for the caregiver to have such a central role?

Moderator

- I think it might be a bit too much dependent on the caregiver
- The caregiver brings the safety and support

Name1

- I think it's important to focus the app on the motivation and not the caregivers, because then why should they use the app
- In the healthcare you have a lot of devices and if it's make us do more so it's not been used at all

Name2

- "I was very happy when heard of this project, because the biggest problem among these people with disabilities is increasing weight"
- If it can be used with just some support, then it may be used
- Quiz, text and learning is difficult
- Abilia is a system of symbols we use

Appendix E

User Test

E.1 Plan and Questions

Before starting a user test session, there was a quick tutorial. This was very similar to the tutorial in Appendix G.1, but only included the parts of the game they will use.

The interviews are unstructured group interviews with 2-3 people with intellectual disabilities. A caregiver is also present to support the participants.

E.1.1 Norsk versjon

Intervjuene vil gå inn på de følgende temaene:

1. Den generelle opplevelsen av å spille spillet
2. De sosiale forholdene i spillet inkludert samarbeid og sosial samhandling med andre utviklingshemmede, ledsagere og familie
3. Spilleets motivasjon til trening og hvordan den kan passe inn i deres hverdagen
4. Brukervennlig av spillet; Hvordan informasjon blir formidlet, "Kulhetsfaktorentil spillet
5. Hvordan utendørs navigeringen i spillet oppleves
6. Hvilken målgruppe passer spillet til, spesielt hvilke grader av utviklingshemming

Deltagerne ble også spurt om de synes spillet var morsomt og om de kunne tenke seg å bruke spillet igjen.

E.1.2 English Translation

The interviews will talk about the following topics:

1. The overall experience of playing the game

2. The social parts of the game including cooperation and social interactions with other people with intellectual disabilities, caregivers and family
3. The game motivation to get the user to do physical activity and how the game can fit into the users everyday life
4. The usability of the game, how information is conveyed and the “coolness” of the app
5. How the outdoor navigation in the game is experienced
6. The target group for the game, specifically the level of intellectual disability.

The participants were asked if they thought the game was fun and if they would play the game again.

E.2 Data for User Test

For the summary the codes for the participants have been shortened, see Table E.1.

Codes	Short Code
Participant 1	1
Participant 3	3
Participant 4	4
Caregiver 1	L1
Caregiver 2	L2
Test Leader	TL

Table E.1: Codes and short codes for the participants in the user test

E.2.1 User Test 1

E.2.2 Motivasjon

- TL: Synes du det er litt spennende når det piper på nytt igjen og sånn? 1: ja
- L1: Synes du det var litt artig eller 1? 1: Ja det var litt artig. L1: Ja jeg ser det på deg. Latter. (Etter et par navigeringsskjermer)
- Mellom postene snakkes det litt, blant annet om beveren som har vært i området. Samtalene er mest mellom TL og L1
- Deltageren gikk fort og ble tydelig slitene. Kort pust og litt svett I pannen
- Deltageren var veldig konsentrerte om skjermen
- Deltageren viser ikke så stor interesse til historien

- TL: Har du greid å gjette det? Er det venninna eller gartneren? 1: venninna. TL: Skal vi se om det er rett da. Vet du hvorfor du tror det da? 1: Samme hårfarge nesten. TL: På bildene? 1: Ja
- Liten interesse/respons for medaljene
- TL: synes dere det var morsomt? 1: Synes det var litt artig og morsomt
- TL: Eller liksom sånn, synes du det var så morsomt at du ville ha spilt det igjen? Eller var det litt mer sånn en gang var nok? 1: Tror kanskje en gang var nok

E.2.3 Navigasjon

- Må ofte si i fra at hun må trykke på neste knappen
- TL: Synes dere navigeringen så langt har vært greit eller? Og skjønne hvor dere skal gå? ... Så bra
- L1: Kjenner du deg igjen på bildet? 1: Ja. L1: Ser du på bildet, så ser du akkurat hvor du skal gå. 1: Oj ja
- Å snu og fortsette etter å ha tatt bilde gikk bra
- L1: For det her. Tenkt på det her kunne jo. Hvis det er noen som kunne tenkt seg å lære seg å gå til og fra jobb.
- L1: Hva tror du 1 du som fær og går med, hvis du hadde hatt den her, hadde du turt og gått i bymarka? 1: er ikke sikker. L1: har du turt å gå alene eller ville du hatt med noen? 1: hatt med noen

E.2.4 Design

- L1: Kan dere trykke på den grønne. 1: Hvilken grønne? (samtale når deltager 1 er på ta bilde skjermen)
- Noen problemer med å ta bilde. Deltageren måtte ta bilde igjen. Hun prøvde å ta bilde liggende og det er ikke skjermen laget for
- Deltageren kan lese skjermen. Leser av og til høyt.
- Spill av lyd blir lite brukt (kun etter forslag fra ledsager eller test leder)
- Lett å komme borti neste knappen for mange ganger. Trykkes på når deltageren går mellom postene
- Skjermen måtte settes tilbake manuelt et par ganger
- Virker greit at neste alltid er grønn.
- L1: For noen kanskje, men det kan jo være veldig individuelt. Det er mange i gruppa her som er veldig opptatt av bilder.

E.2.5 Annet

- Vanskelig å høre lyden ute
- Litt vanskelig å se skjermen når man er ute
- Deltagerne er litt nervøse

E.3 User Test 2

E.3.1 Motivasjon

- Deltagerne gikk hurtig og de gikk forbi noen av punktene før appen kunne varsle fra om at de hadde kommet til et punkt. 4: Ja men da må man gå sneglefart kanskje da. ... 4: jeg går egentlig dobbelt så raskt som det her når jeg går på tur. For meg blir det litt sakte nå.
- 3: Det hadde vært en genial app for turistene som er på byvandring å ha på telefonen. Det var genialt da
- Ei av deltagerne hadde tydelig lite tålmodighet til spillet og hadde mer lyst til å bare gå på tur uten å måtte stoppe for å lese på skjermen
- 4: jaja. Det kan jo de ha, men jeg har den der. På mobilen min, den der hvor mange skritt jeg har gått det stimulerer meg nok. TL: Ja, så du har et sånn mål du skal gå hver dag også. 4: 10 000. TL: ja. 4: men jeg går ikke 10 000
- Deltager 3 trykker raskt forbi medaljen
- Deltager 3 svarer ja på spørsmål om han synes det var morsomt og om han kunne tenkt å spille igjen

E.3.2 Navigasjon

- Deltager 4 spør ofte hvorfor hennes mobil ikke piper, men det var ofte fordi hun gikk et par meter lengre bak
- En av deltagerne viste hvilken vei hun skulle ta i krysset og så ikke poenget i å bruke appen. Hun sliter også med å se fotsporene på bildet
- Problemer med å trykke på videre knappen, men Deltager 3 svarer nei på om neste knappen var irriterende
- (pling) 4: stopp og vent. TL: det er når den piper nå så skal du stopp og vent. 4: ja, den har pepet. Nå er det stopp og vent. TL: Når den piper igjen, fordi du trykket akkurat på neste. 4: jaja. TL: Etter at den pep, så neste gang den pip, så skal du stopp og vent.
- Deltager 4 synes stopp og vent var vanskelig å forstå. Hvor lenge skulle man vente? 4: vente og hvor lenge og hva? L2 foreslår "stopp og trykk videre"

- Deltager 3 skjønner hvor han skal gå på hver post og bruker bildene og pilene. TL: Synes du det var lett å finne ut hvor du skulle gå videre med bildene og pilene? 3: Ja bildene. TL: Å, pilene, er det den du bruker for å se hvor du skal hen? Pilen der? 3: Ja pilene også bildene
- Deltager 3 foreslår å gå en snarvei tilbake til hytta
- Deltager 3 svarer ja på spørsmål om han forsto hvilken vei han skulle gå

E.3.3 Design

- Deltagerne hadde litt problemer med å ta bilder. Deltager 4 lurte på hvor man skulle trykke
- Deltager 3 tok bilde med sin egen mobil. TL: Tok du bilde med din egen mobil og? 3: ja
- Lett og komme borti knappen når du går. 4: men han snakker til meg den uansett den, fordi den sa. TL: da kommer du sikkert borti knappen. 4: Nei, jeg har ikke. Jeg holder den sånn, ja også begynte den å snakke. TL: oj. 4: også sa den. Gå rett frem, når du trykket på den der, jeg har ikke trykket på den
- Deltager 4 sliter kanskje litt med å skille bildene på mobilen (som er bilder fra området med påtegnede fotspor og en diamant) og virkeligheten. 4: det er en diamant på bakken. Kanskje den er fra smykket. Hvor er det hende da. Hvor. Skal man finne det nå da?
- TL: Vil du ikke les historien? 3: Jo, jeg leser fort. Når det er sånne små korte ord. TL: Ja Ok. 3: Hadde det vært en avis side, så hadde det tatt en halv time. ... så hadde det tatt en halvtime, men når det er så små ord, så går det bra
- Deltager 3 svarer ja på spørsmål om historien var lett å forstå

E.3.4 Avslutter brukertesten

- Hun startet med å skjønne hvordan neste knappen virket. 4: nei det er jo bare hver gang det sier pling, trykk og ikke noe mer
- Hun sier at hun ikke orker mer og går litt føre
- Hun kommer tilbake selv og spør om hun er på rett skjerm
- Hun får tilbud om å bare se på historien, men ønsker å fortsette og bruke hele spillet
- 4 men jeg blir frustrert av å trykke og det plinger og. I: så du liker egentlig bare å gå tur uten så mye annet. 4 ja
- Deltager 4 kommer seg ca 0,75% av turen da hun gir fra seg mobilen når hennes mobil ikke piper på en av postene

E.3.5 Annet

- Lite tålmodighet til å se igjennom tutorial. (Vil heller lære underveis)
- En deltager sier hun synes det er irriterende at andre leser høyt. 4: Jeg blir irritert når dere skal stå og lese den høyt.
- Noen problemer med at det fortsatt var litt snø og is
- Flere av deltagerne trodde/ønsket å bruke sin egen mobil. 4: Jeg trodde jeg kunne legge den på denne her (peker på sin mobil)
- Deltager 4 hadde tenkt at hun kunne bruke appen hjemme
- 3: jeg sa til L2 i stad at hvis de har forskjellige merker på mobilen Samsung, iPhone, HTC som folk er vant til å bruke. Jeg har fått sånt trøbbel med Samsung hele turen.

Appendix F

Interviews with Caregivers

F.1 Questions

This interview was a individual interview with the caregiver participating in the user test. The interview was a unstructured interview.

F.1.1 Norsk versjon

Intervjuene snakker om de følgende temaene:

1. Tanker om spillet i sin helhet
2. Brukervennlig av spillet
 - Hvordan informasjon blir formidlet
 - Fargevalg og kontraster
 - Knapper og flyten i spillet
3. Motivasjonen til fysisk aktivitet i spillet og hvordan spillet kan brukes i utviklingshemmedes hverdag
4. Hvordan utendørs navigering i spillet vil oppleves
5. De sosiale forholdene i spillet inkludert samarbeid og sosial samhandling med andre utviklingshemmede, ledsagere og familie

F.1.2 English Translation

The interviews talk about the following topics:

1. Thoughts about the overall experience of the game
2. The usability of the game

- How information is conveyed
 - Color choice and contrasts
 - Buttons and the flow of the game
3. How the games motivates to physical activity and how the game can be used in people with intellectual disabilities everyday life
 4. How the outdoor navigation in the game is experienced
 5. The social parts of the game including cooperation and social interactions with other people with intellectual disabilities, caregivers and family

F.2 Answers

F.3 Interview with Caregiver 1

- Å gå turen en gang er kanskje nok, slik det er for 1.
- Utvalget i den byen man er i blir lite
- Mange er avhengige av å ha med seg noen på turen også
- “Men det var veldig bra, for jeg har sett for meg at det der går an å bruke sånne system for å lære de ei rute for eksempel fra eller til jobb”
- Vanskelig å motivere denne gruppen her (de på dagsenteret) til å gå tur alene kan være vanskelig
- Hun som var med på denne turen kan å lese
- “Ja de var veldig enkle og fin de bildene der”
- Lesingen gikk fint, men å trykke neste etter hver gang hun hadde lest var vanskelig
- Oppgavene/teksten underveis kunne vært enda enklere for disse brukerne. For eksempel finne bilde av beveren, etc.
- Kanskje burde svar også automatisk videre, ikke svar også trykke på neste (Hvis du svarer riktig går du videre)
- Hun var mer opptatt av bildene enn historien
- “så det ble liksom mer spennende det med og komme seg til krysset” (enn historien)
- “så konseptet er veldig bra”

F.4 Interview with Caregiver 2

- De to personen som var med oss nå, ja kanskje den ene ble veldig fort frustrert over ehh og måtte stoppe og vente og det der. TL: ja L2: skjønte ikke helt gangen I det tror jeg. Kanskje det skulle vært enda enklere og, eller mere automatisk da
- For noen hadde egentlig denne historien vært fengende igjen. Det kommer jo helt an på hvem du går sammen med.
- L2 kanskje kunne man ha lagt inn sånn som hun sa at du kunne fått vite hvor mange skritt man hadde gått. Hun synes sånne ting motiverende. Kanskje man kunne lagt inn det også.
- jeg vet at det er veldig mange som sliter med høyre og venstre da og her var det jo veldig mye høyre og venstre.
- Hun tror at mange kommer til å trykke seg raskt igjen historien
- Mange av bildene på denne runden var ganske like, så det var litt vanskelig å være sikker på

Appendix G

User Manual

G.1 How to Play the Game

In this section a short tutorial for the game is given.

Note that it is important to give permission for the app to use location and camera. GPS also needs to be on when playing.

G.1.1 Log In

The app starts with a login screen. If you already have a user, then write your name in the input field and click on the login button. If you do not have a user, then click on the new user button. See Figure G.1.

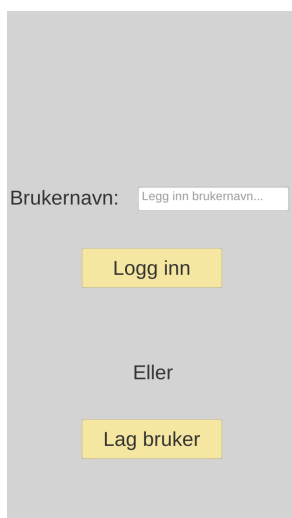


Figure G.1: Login screen

G.1.2 Create New User

To create a new user, you need to write your name in the input field and click on either the male or female button. When the information is correct you click on the OK button. See Figure G.2.

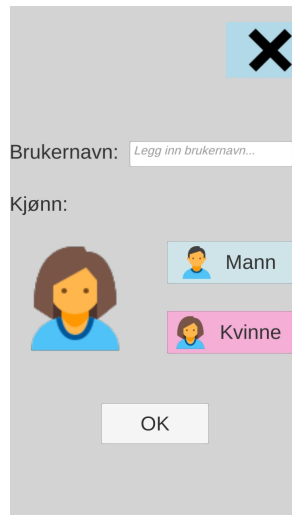


Figure G.2: User setting screen

G.1.3 Start to Play

When you have logged in, you go to the main screen. From here you can the user settings, show the users medals or start a story. See Figure G.3.

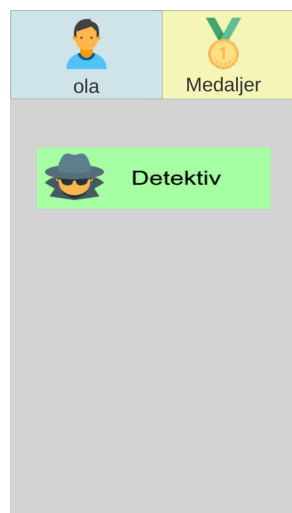


Figure G.3: Main screen

G.1.4 Navigation

The navigation screens include a picture of the intersection and three different ways to communicate the directions. First you have an arrow pointing the way you should walk, secondly a text explaining where you should walk and lastly playing a audio clip of the directions.G.4.

When you are close to the intersection, the phone will vibrate and beep. When you are ready for the next direction, click on the green button with an arrow pointing to the right.

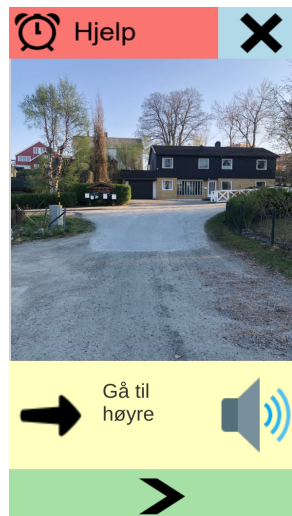


Figure G.4: Navigation screen

G.1.5 Get Help

If you are lost and need help, you can click on the red help button. You then come to a help screen and get the option of sending a message or calling. See Figure G.5. When sending a message, you are transferred to the sms application on your phone. A message containing your coordinates is already made and all you need to do is press send. When Calling you are sent to the call application on your phone. The number is already added and you only need to click on the call button.

G.1.6 Text screens

The text screen and the text and image screen includes three levels of communication; text, communications images and audio. To play the audio you need to click on the play button. To continue to the next screen, click on the green next button. See Figures G.6a and G.6b.

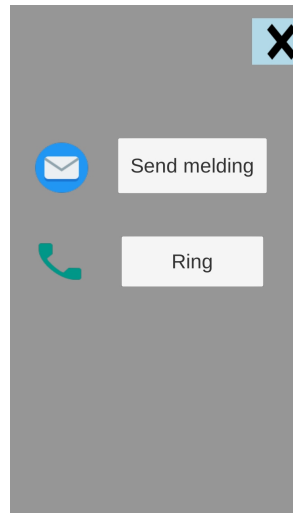
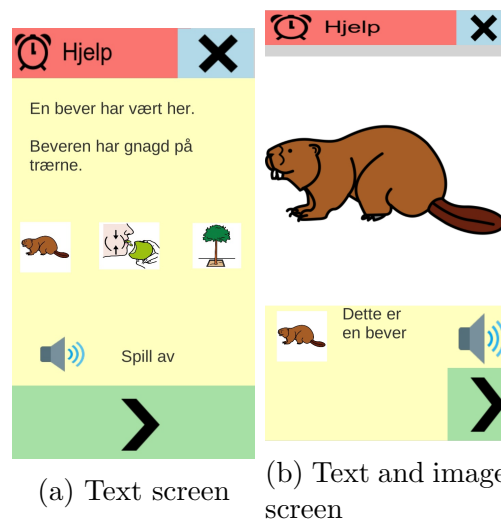


Figure G.5: Get help screen



(a) Text screen

(b) Text and image screen

G.1.7 Camera

In the camera screen you can take a picture. The screen shows the image the camera catch. To take a picture you click on the take picture button. See Figure G.7a.

After the camera screen you can see the picture. If you are happy with the picture you click on the green next button. If you want to take a new picture click on the red previous button and you go back to the camera screen. See Figure G.7b.

G.1.8 Question

The questions screen includes a question text and audio of the question plus the choices. The choices are yellow buttons and include a communications image and some text. See

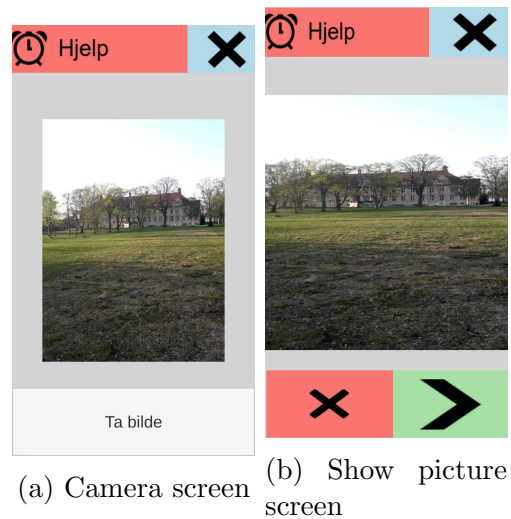
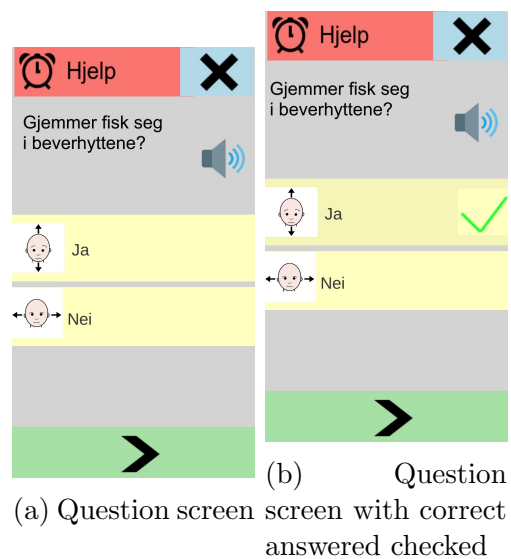


Figure G.8a.

To answer the question click on that choice. The correct answer will get a green checkers mark. See Figure G.8b.

To switch to the next question, click on the green next button.



G.1.9 Medals

The medal screen show your name on the top of the screen to make it clear who has earned the medals. A medal includes a medal icon and the name and icon of the story you have finished. See Figure G.9.

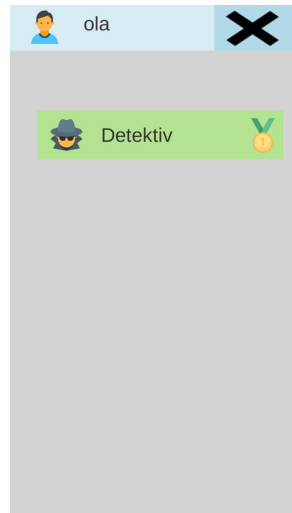


Figure G.9: Medals screen

G.1.10 User Settings and Log Out

The user settings include your name and gender. It is also possible to log out and update info. This uses the same screen as creating a user, see G.2.

G.2 How to Create a Route and Story

G.2.1 Adding a Screen

All screens needs to be added to the database in the table Screens. The screens needs to have a screen ID, integer value from the screenTypes enum and the story ID. The screenTypes enum values can be seen in Table G.1. Some screen types also need some additional values for the database, that needs to be added to different tables. How to add these additional values for some of the different screen type can be seen in the following subsections.

1	Text
2	Text and Image
3	Camera
4	Question
5	Navigation
6	Go to Medal

Table G.1: Enum for types of screens

G.2.2 Adding Text Screen

To add a text screen you need to add the screenID, the text, the name of sound file and the name of one to three communications images to the text table. The sound file and communications images needs to be added to the streaming assets folder. The sound file should be in mp3 format and communications images in png or jpg format.

G.2.3 Adding Text and Image Screen

For each text and image screen created, the screenID, text, name of main picture, name of sound and the name the communications images needs to be added to the textAndImage table. The main image, sound file and communications images must be added to the streaming assets folder. This type of screen can include one or two communications images.

G.2.4 Adding Question Screen

The question screen needs the screenID, the questions, two or three choices including a text and the name of a communications image, the name of the audio file. To set the correct answer you add the number of the correct choice to the correct column. The communications images and audio file needs to be added to the streaming assets folder.

G.2.5 Adding Navigational Screens

Each navigational screen needs to be manually added into the database with the screen ID as primary key. For all screens a picture of the intersection needs to be taken, added to the streaming assets folder and the name added to the database. The latitude and longitude of the intersection must be added in a format like 63.567. The direction in the intersection must be a integer value from the directions enum, these values can be found in Table G.2.

1	Right
2	Left
3	Straight
4	Diagonally Right
5	Diagonally Left
6	Turn Around
7	Stop

Table G.2: Enum of available directions

G.2.6 Adding Users

Users can be added both in the app and the values can be inserted directly into the database. In the app a user is created by pressing the create user button from the login screen, there you can choose a name and gender. A user can also be directly added to the database by adding a user ID, name and the enum integer value of the gender, see Table G.3.

1	Male
2	Female

Table G.3: Enum of genders

Appendix H

IDC Paper

(Start on the next page)

Game-Inspired App as Motivation for People with Intellectual Disabilities to do Physical Activity

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ABSTRACT

People with intellectual disabilities (ID) often have a sedentary lifestyle. A game-inspired app is proposed as a method to motivate people with ID to exercise. The app is a location-based and tell a story throughout the route. Outdoor navigation can be difficult for people with intellectual disabilities and many find maps too abstract and complicated. Due to this navigational assistance adapted to people with IDs is included in the app, by means of street level pictures and arrows. The design of the app is straightforward and based on visual resources, such as figures, pictograms and icons.

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During the design process of the app interviews with experts on technology, people with IDs and hiking/nature events for people with IDs was conducted. These interviews was used to develop guidelines for the app. Additionally, a focus group consisting of experts on people with IDs and technology for people with cognitive disabilities discussing the proposed guidelines and prototype will be held. We propose an evaluation methodology for this system that consist of a user test with people with IDs and caregivers using observations and group interviews. Interviews with the caregivers will also be held after the user test to discuss the test session and app.

KEYWORDS

Intellectual Disability, Physical Activity, Walking, Game-Inspired Application

INTRODUCTION

Intellectual Disabilities (ID) consist of a variety of different diagnosis and have three criteria; reduced mental capacity, lack of adaptation and the condition needs to be visible before age 18 [10]. People with IDs will have different levels of challenges regarding motor skills, language understanding, social competence and ability to do everyday tasks. Often abstract concepts can be difficult to understand. Some are able to read, but can struggle to understand the meaning of what they are reading.

Many adults with IDs have a sedentary lifestyle [13]. The Norwegian Directory of Health recommends that adults should be in moderate physical activity (PA) for at least 150 minutes every week [5]. They define moderate PA as activities that leads to quicker breathing than usual, like walking quickly.

This project will look into how game-inspired apps for people with IDs should be designed. The focuses is on people with a mild or moderate level of ID and are 16 - 35 years old. Adolescents gets most of their physical activity during their time at school [11], it is therefore important to introduce new methods that motivate to physical activity in the transition between school and adult life. The research questions are:

- (1) How should game-inspired applications motivate adolescents and young adults with intellectual disabilities to do outdoor physical activity?
 - (a) How to design navigational assistance systems for young adults with intellectual disabilities
 - (b) What is important when designing games and applications for young adults with intellectual disabilities?



Figure 1: Different stories the user can play

RELATED WORKS

Games and Apps Promoting PA

The ideas for games and apps promoting PA are very different. The challenges can be complex and require cognitively challenging problem solving. This is the case in O-Mopsi by [2]. O-Mopsi is a

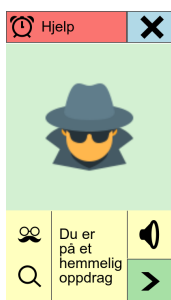


Figure 2: Text and picture story point screen explaining the mission for a route where the user goes on a secret mission

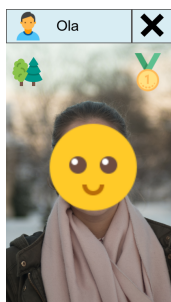


Figure 3: Photo taken during a trip can be shared and can include icons

digital orienteering game used in urban areas. The tasks in this game is first to find the shortest route, walk to the correct area and then locate the target based on a photo.

In Stickers for Steps suggested by [9] the goal is to collect all of the stickers and new stickers are received based on the number of steps. The game also contains a social part, where players meet face-to-face and can exchange stickers. This is a easy game, that also include some social aspects.

In Gemini Redux by [12] the challenge for physical activity is not a part of the main game play and not required to play the game. The main game is designed as a Massive Multiplayer Online Role-Playing Game (MMORPG). The physical activity is used to strengthen an animal companion, which can be used in the game play.

Stickers For Steps [9] and Gemini Redux [12] rely on step counting. Some games do not track the amount of physical activity, but use reaching locations as the physical activity, this is what O-Mopsi [2] use.

Navigational Systems for People with IDs

Navigational systems not specifically designed for people with IDs, like Google Maps, are often to complicated and difficult to use for people with IDs [4]. The use of maps in a system can also be too complicated and difficult to use [7]. Street level pictures are important and makes it easier for people with IDs to navigate [3, 4, 7]. Audio is also useful for navigational assistance systems and was enjoyed by individuals with less cognitive limitations because of less time looking at the screen [3]. When it comes to safety, one mentioned issue is traffic and knowing when to cross the street. One suggestion for this problem is to notify the user before crossing the street [7]. Another issue is that the user gets lost. For this issue a help button starting a call to a caregiver is suggested [4].

System Design for People with IDs

When designing systems for people with IDs it is important to include the stakeholders in the design process, both educators [14] and co-design including people with IDs [15]. The caregivers are also important in the use of the system to focus the users on the goal of the session [15]. The user interface should be straightforward and clear, and text, color [1, 14], language selection [10, 15], difficulty level [1, 14] and socialization aspects [15] must consider cognitive accessibility.

DESCRIPTION

The goal is to motivate the user to do outdoor physical activity. Moreover, the game should be fun and not too childish. It should be straightforward and give the user a feeling of accomplishment.

The idea is that the game should be a story or a quest the user joins. This story or quest will be told on various places and the user has to walk between the points, thus promoting physical activity.

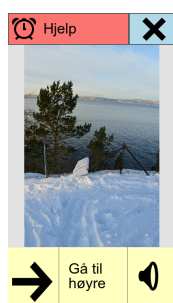


Figure 4: The navigational assistance in the app

These stories will vary in themes, difficulty and type of story points. See Figure 1 for examples of story themes.

A story point consist of one or more story screens and can be four different types; 1) text; 2)text and image; 3) questions; 4) taking a picture, see Figure 2. Different use of the story points can create different stories. For the planned evaluation caregivers will be asked for input on creating the stories. In the final version caregivers will create and customized the stories for each user or group of users.

Taking pictures during the trip can be included in the story and sharing pictures after a hiking trip can make it more social. It can be a way for people with IDs to communicate what they have done this day and for users not living with their family, it is a way to include their family in their everyday life. Research on sharing photos for people with IDs have shown that sharing photos using Flickr can be a useful tool to decrease loneliness for people with IDs [8]. Using Flickr was found to be a way for the participant to express themselves. A screenshot of a photo the user can share after completing a hiking trip is shown in Figure 3.

After finishing a story the user earns a reward, consisting of a medal icon, the icon for the story and the name of the story. All of the users rewards can be viewed in the medal screen. This can be shown to others, so that the user can show how many routes they have completed. This can add some competition to the social interaction as well.

The app will also include navigational assistance suitable for people with IDs between the points. It will consist of street level pictures, arrows, easy-to-read text and spoken instructions. Additionally, an alarm button is suggested that calls a caregiver if the user gets lost. A picture of the navigational assistance part can be found in Figure 4.

The app will have a straightforward design, the text will be large and the contrast between colors will be high. It will use several pictures and icons and be possible to use without needing to read any text. A easy-to-read text following the standard from Inclusion Europe [6] will be included and a audio version of the text will also be available.

EVALUATION PLAN

Initial interviews have been conducted for developing the first guidelines. The participants for these interviews include people with experience with nature, physical activity and/or technology for people with IDs. This included work as an ID nurse ("vernepleier" in Norwegian), The Norwegian Trekking Association's group for people with IDs and their app or The Arctic University of Norway's project on physical activity for people with IDs with e-health support. The interviews were semi-structured and included questions related to the research questions.

A game idea and a simple prototype were developed based on the information gathered. It will be evaluated with the found guidelines by people with experience in the use of technology for physical activity and/or people with cognitive limitations or assisting people with intellectual disability. This

evaluation will be assessed by means of a focus group: first presenting the guidelines and the game idea, and then followed by a discussion.

A working prototype will also be developed and a user test of the system will be conducted. The participants will be found through day centers or housing for people with IDs. The participants will be 16-35 years old with ID and they need to be able to walk for about an hour. The participants will get a brief tutorial of the game, and then they will test it. During the session, both observations and an unstructured interview will be conducted. The caregivers will be included in this session, both as players and interviewees. This is done because the participants already know the caregivers and the caregivers know how to interpret some of the users opinions and feelings towards the game. Some caregivers will be interviewed after the session about how they felt the game worked and their thoughts on the guidelines.

An application to The Norwegian Center for Research Data have been sent and approved. This application address the ethical considerations related to gathering and storing data. In the user test a consent form will be signed by parents/guardians, the user will also sign a consent form if they are considered to be able to give consent. A letter consisting of information about the project, the user test and their rights related to privacy will be given out or read to the participants. This letter will follow the standard for easy-to-read text by Inclusion Europe [6]. Participation will be voluntary, the participants have a right to know what data is gathered about them, the data will be anonymous and the participants can quit the project if they wish.

CONCLUSION

In order to motivate the user to go on a hike, the user joins a story using our application. This story can be adjusted to match what the user finds motivating and the cognitive level of the user. This story is told through a fixed route, which the user has to walk. A navigational assistance system is developed for people with IDs and included in the app. This relays heavily on street level pictures and non written communication.

The app is simple and uses several figures, icons and pictures, it also has easy-to-read text and spoken instructions to give the user options on communication method. The user group are adolescents or young adults, so the app is not too childish and gender neutral to fit the whole user group.

The app will be evaluated by caregivers, experts and people with IDs through different evaluation methods during the project. In the end, a user test including people with intellectual disabilities and their caregivers will be conducted.

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