# CAT - A tool for support and evaluation of children with social behavioural problems

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#### Abstract:

This report contains a 10<sup>th</sup> semester project from a group of Medialogy students at Aalborg University. The project aims to develop an interactive program, that can support the treatment of children with social behavioural problems. In this case a teenager diagnosed with the ADHD disorder. By analyzing the disorder, and other research areas related to emotions and interactive applications, the project creates a program structure based on a redesign of the psychological OCC model.

The program is tested through two iterations, the first is a one week test and the second over the course of two weeks of focused testing. The test results shows a significant interest in the product from the social workers supervising the user, and positive results in mapping the correct emotional states to the user's mood at the relevant time.

## Preface

The following report presents a 10<sup>th</sup> semester project from group 111037. The project aims to develop an interactive application for a mobile device, to support the psychological treatment of children diagnosed with social behavioural problems. These children often have issues with explaining their situation and emotional status to the people helping them, and as such the project may help levitate these issues, or support the communication between children and adults.

It should be noted that the initial problem originates from a specific social situation, presented to the project authors. Therefore the goal is to design, develop and iterate any solution to one situation but it is the hope of the authors that the design may be used in other, similar situations. The project will focus on the interaction with one person, and the support of the social workers to that individual. The feedback given by these social workers and the person in question are therefore also the main focus of the project results and any conclusions that follow.

[Appendix A] includes a list of terminology used in the report.

The project group would like to thank the following:

Our test person (whom shall remain anonymous) for being willing to help and being a great source of information throughout the project.

All the social workers working at Kernen. For the help in organizing and running the tests, and also for the time spent answering our questions.

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# **1. Iteration One**

## **1.1 Introduction**

The initial idea for the report arrived from contacts within the child social care system. They have extensive experience about the treatment of children/young adults with social behavioural problems, including the lack of communication between children and social workers or more specifically problems in finding the correct words for an emotion or situation.

The request was to provide them with a tool that could be used in the communication with the children. Since they often respond well to graphics and pictures it was believed that an interactive application could work well as such a tool. The goal was to provide the children with an application that was able to ask questions in such a way that it could derive the correct emotional states.

With this information the social workers would then be able to better plan the treatment which hopefully would result in a better development of the children.

The goal was then to help the social workers to better understand the children which in turn would help the children since their treatment could be planned better.

The report is divided into three main sections. First the aspects of the physiological diagnosis, the current status of the participating person, the social workers and her environment, the design and development possibilities and any related subject with particular interest is analyzed and described. This section is in place to give the reader the necessary background knowledge of the environment and problem in question, and any information on decisions made in regards to platform and design choices. The first iteration will consist of an initial prototype, a test of this and a conclusion on the initial project hypothesis.

The second iteration focuses on interaction with the user. Here a second prototype will be developed and presented both to the subject and supervisors, and tested for a certain time period. Before testing, the section will describe development choices and the idea behind the prototype concept, as well as any theory related. The section will conclude with a summary of the test process and results.

In the last chapter the project will discuss further development on the prototype where problem solutions from the second iteration are developed upon. This section will focus on issues related to the development of this version, any new concepts included in the design and the testing of the new version. This section will round off the project report with the feedback provided at the end of the second test, and feature a main conclusion, discussion and thoughts on further progression of the product.

The feedback given by the girl and social workers could pose an ethical dilemma. There could be issues concerning the use of the information both in regard to this project but also on a day to day basis at the institution. E.g. placing information in the program the user does not want the social workers to see.

This should however not be a problem since the test subject agreed to participate, and allowed the use of the information in the project. However it is important to note that this permission was given under the understanding that her identity would not be made public and the information gathered during the project would be handled respectfully.

## **1.2 Initial Hypothesis**

The following section describes the hypothesis set up before any analysis have been done, and forms an initial viewpoint on the task at hand as well as the idea behind the project.

As described by the contact, the main issue lies in the problem for the child/young adult to explain their current emotional state or reason for their response. Not because they do not know, but because they lack the proper words. To solve this, the person needs an alternate way of either expressing their emotions or a tool that can help the social workers understand the situation better.

This led to the following ideas/thoughts:

- A person lacking the proper words, but understanding their own feelings can express them through other means than vocal communication
- It would be easier expressing emotions to something non-personal, for example a interactive application
- Young people/children suffering from social behavioural problems have (in general) an interest in getting better themselves
- Social workers have an interest in understanding these emotions/situations better

The idea of channelling emotion- or self-awareness of social situations into interactive media applications, comes mainly from the project authors own experience with such platforms. It is often easy to view such applications as communication channels or extensions of one's persona. To mention a popular example, websites such as Facebook [1] offers increased communication between friends and colleagues, with no immediate goal other than the heightened awareness of others social states.

The process in the project should be similar in build, but with a different focus. Create an interactive application that can help the person in question to get an increased awareness of their own social situation, as well as support the social workers to understand it.

The initial hypothesis for the project then follows:

- By developing and presenting an interactive application we can support the treatment of social behavioural problems in children/young adults

While quite general and unspecified, this hypothesis serves mainly to get the project idea up and running. At the end of this iteration several hypotheses will be presented, that are more specific and includes the work done in the analysis section leading up to it. First and foremost the project will continue with an interview for the specific case study, to which this project will be tailored.

## **1.3 Preliminary interview**

As part of this project cooperation with an institution was initiated. An interview was arranged to get to know the basic workings of this institution, and to specify in what way they could use help.

This institution is named "Kernen" and is a 24 hour institution, which means that the children live under 24 hour supervision. A typical day for the children involves going to school at 8am until 3pm. When they arrive back at the institution there is typically a group meeting with the children and the social workers, and events of the day is discussed.

Currently there are three girls living at Kernen ranging in ages from 15 to 19. The institution is authorized to house up to eight girls at once. There is currently four social workers employed there, and more can be added when additional children arrive.

## 1.3.1 The social environment

The girls living there can suffer from multiple conditions [see section 1.4]. This means they are not able to handle frustration or setbacks very well and often have trouble with social interactions. When something does not play out according to the plan they had, they get upset. When this happens they are not able to explain why they react like this. Often it is not the actual situation alone, but it is combined with a deeper frustration which they are not able to put into words.

One example of this was when one of the girls was going horseback riding, which she does every week, and the initial plan was for one of the social workers to drive her there. Instead there was a change in the plan and she had to take the bus instead, because another problem had come up. This resulted in the girl getting extremely angry because her plans changed, and she ended up trashing her entire room and breaking several things in there.

For people not familiar with these conditions a reaction, like the one explained in the example, seems very extreme and disproportional with the problem. However it is important to keep in mind that it is very difficult for these girls to understand the varying degrees of a problem. For them things are often either good, meaning they are going according to plan and they have things under control, or bad which they cannot handle because they feel like they are no longer in control. They cannot think far enough ahead to find a simple solution or to understand that the problem is not so severe. All they know is that there is a problem and they react the only way they know how.

The way the supervisors handle these situations now is by trying to remain calm and talking to them, also known as the "relation method" [2, Cp.10]. By staying calm themselves they try to show the girls that the situation is not that bad and there is no need to be upset. Other institutions sometimes make use of a no tolerance system which means there is a penalty every time the child loses control, which is known as the "consequence method" [2,Cp.10]. There is currently no research showing which method works best, but at Kernen they try to make use of the relation method instead of issuing a penalty.

#### **1.3.2 Design requests**

After having talked about the basic workings of the institution the next step was to figure out how best to help them and thereby help the children. These girls are often medicated but since they are not able to express how they feel it is often hard to judge how well the medicine works. The social workers requested a way to track the effect of their medicine, and emotional state. For example by an application asking questions.

These questions should be quite simple since presenting the girl with complex questions would most likely result in her not being able to answer. This means simple yes and no questions, or using a 1-10 scale to measure how they feel. They should be asked a set number of times each day so it later on would be possible to look at the answers and see if anything went wrong. This way they should notice if there is a pattern to the loss of control. That way they can adjust the medicine if this should be the problem, or they can prepare the girl if there is current situations that seems to result in problems on a regular basis.

The social workers also mentioned that a diary function could be a good idea. This way the girl would have the possibility to write about her day. However since the girl often has a problem expressing her emotions the diary might not be something that can be used to measure the results of medication etc. But it could be a training tool for the girl so she gets more used to putting words on her emotions and thereby help her in the long run.

The young teenage girl, in question, is 15 years old. She has a history of parental neglect, and is diagnosed with the condition ADHD [see section 1.4.2]. She receives a medication prescribed by her doctor, and issued by the social workers at the institution.

The initial interview focused on the ability to follow the current state of the teenage girl, both on the emotional front but also medication wise. To find out exactly what use of the prescribed medication means for young people, the next step will be to research current treatment of the disorder.

## 1.4 Diagnosis and treatment of conditions

The following section describes the various conditions that have been classified for children with behavioural issues. While not a complete picture, the most common information is included in this chapter. For more knowledge visit the ICD or American Psychiatric Association homepages [5][3]. The chapter includes practical terminology and sources for local and international data concerning psychological and medical treatment of behavioural problems.

The study of children with social behavioural problems is a large research area that covers many psychological conditions. This chapter focuses on providing background information for the project development. Some local definitions that do not exist on an international plan have been included, as the project focuses on treatment support in a Danish institution. Any other disorder can be found on the International Classification of Diseases (ICD) webpage [5], more specifically chapter 4 regarding to Mental and Behavioural Disorders [6].

## 1.4.1 Hyperkinetic Disorders (DAMP / ADHD / MBD)

According to [7] these definitions are closely related, covering nearly the same disorders when relating to children and adolescents. Some children tend to have more concentration or attention disorders, where others have hyperactivity or over-impulsive disorders.

DAMP is a primarily Scandinavian terminology that stands for Deficits in Attention, Motor Control and Perception. As almost the same disorder as ADHD, children with DAMP also has problems with motor-perceptual control. As such the details for ADHD will apply to DAMP as well.

ADHD stands for Attention Deficit Hyperactivity Disorder and is the main international term for children with attention problems, hyperactivity or a combination of both. With a prevalence of 3-7% (3-6% according to [13], 3-5% in [10]) of every school children, the main segment group lies with boys who has a 2-3 times greater occurrence than girls [7]. The relatively inaccurate number is due to the fact that some children live in social conditions that predispose aggressive or otherwise improper behaviour, and as such can be viewed as suffering with a disorder when the social conditions are the real reason behind the problem. While the social environment and relations to parents have a big impact on the development of this disorder, there is a general consent that ADHD primarily is a genetic or biological determined illness [9,Cp.2.4]. Only 10-15% of the risk is due to relationship disturbances. One acknowledged theory states that ADHD is mainly a problem with reduced ability to intentionally control attention levels [8]. Historically ADHD stems from the Minimal Brain Dysfunction (MBD) diagnosis from the 1920's encephalitis pandemic [9,Cp.2.1], but is now a outdated term since it often led to over diagnosis [7].

To diagnose ADHD there are two criteria systems, which is commonly used. One from the Diagnostic and Statistical Manual of Mental Disorders (DSM) [10], released by the American Psychiatric Association (APA) [3], and the other from the ICD [5] which is released by the World Health Organization (WHO) [11]. The DSM system treats the ADHD condition as a combined diagnosis of two subgroups, inattentive ADHD (ADHD-I) and hyperactive-impulsive ADHD (ADHD-H) [9,Cp.2.2]. To be diagnosed with the combined form of ADHD, six of the nine symptoms for each subgroup must be present, else the person will be diagnosed within the subcategories. In addition the symptoms must meet certain time or behavioural constrains, for

example chronic (present for more than 6 months) or functionality impairing across two or more contexts [see table 2 of [9,Cp.2.2]]. The ICD system does not diverse the diagnosis into subgroups, so to get diagnosed both inattention, hyperactivity and impulsivity must be present [see table 3 of [9,Cp.2.2]]. In addition it provides a more restricted set of criteria for the diagnosis, where symptoms must all be met in several contexts. Opposite the DSM, the ICD also excludes the coexisting of additional psychiatric disorders unless it is plain that these do not fall under the hyperkinetic disorder diagnostic. The ICD hyperkinetic disorder can therefore serve as a parent group, in which the combined ADHD subgroup of DSM exist, as well as hyperkinetic disorders with and without conduct disorder [9,Cp.2.2]. Conduct disorder itself however is a separate category, as is Anxiety disorder.

For a full assessment of the ADHD disorder one must go through a full medical examination, clinical interview and a rating scale administration of parent or teachers [see chapter 2.2.6 of [9,Cp.2.2]].

#### 1.4.2 Treatment

The interventions and treatment for ADHD takes place in a variety of places such as clinics and health care facilities, and can make use of medication, psychological therapies, dietary measures, parent training or other support [9,Cp.2.5]. While according to [7], treatment of ADHD using amphetamine compounds leads to a reduction in symptoms for three quarters of the affected children, but not with the last quarter. And there is no evidence that the use of these drugs provides an improvement when connected to performance in schools. In the European union treatment using medication is not done as extensively as in the US, where usage of amphetamine compounds have increased by 8 times, from 1990 to 2000 [7].

In the UK, the licensed drugs used for treatment of ADHD in children and adolescents are Atomoxetine, Dexamfetamine and Methylphenidate, which are determined as effective towards controlling symptoms by the National Institute for Health and Clinical Excellence (NICE) technology appraisal [12]. Atomoxetine is a noradrenaline reuptake inhibitor and licensed for children the age of 6 or older and adolescents. Dexamfetamine is a sympathomimetic amine with a central stimulant and anorectic activity for children as young as 3 years old. And methylphenidate is a central nervous system (CNS) stimulant which is used on children over the age of 6 [9,Cp.2.5].

For psychological therapy treatment can consist of the following forms of therapy:

- Behaviour therapy
- Cognitive behavioural therapy (CBT)
- Individual and group therapy
- Family therapy
- Interpersonal psychotherapy (IPT)
- School based interventions
- Social skill training
- Psycho educational input

As well as other therapies such as speech and language support, home and family support by social health care services, and parent management training [9,Cp.2.5]. Dietary measures are not commonly

recommended in the treatment of ADHD, but are nevertheless used by many families and can involve the advice of paediatric dieticians when more strict dietary measures are taken.

The above section provides insight into the current status of children suffering from ADHD, and provides general information about the disorder. In regards to the subject it is known that the diagnosis communes with attention problems, and as such should focus on keeping whatever information is presented to the user short and precise. The focus is on social or dietary situations may be a strong starting point, and from the information about the effect of the medicine that works (in the words of a social worker) "like a gentle hand on the shoulder", that a calm and polite choice of wording is important.

## 1.4.3Child neglect

There are two types of child neglect either physically or psychologically neglect. Both types can be in active or passive form [14]. E.g. with the physical neglect, the child could be denied food. It could also be the child's daily hygiene that is not taking care of. An example of the psychologically neglect could be the child's mental state is not corresponding to the child's age, due to the parents or environment not providing the proper education.

In both the passive physically and psychologically neglect it is the daily needs that is not fulfilled by the care giver. In the active form in both cases it could be violence from the care giver that leads to the neglect of the child. All the different types of neglect could result in a bad behavioural pattern, which eventually might lead to the child being placed at an institution.

With this background knowledge about the institution, the girl (user) and the disorder she is suffering from, the theories and research areas that relates to analyzing emotional states and implemented technical solutions can be looked into.

## **1.5 Affective Computing**

As this project revolves around getting information about a state of mind from a user, the following analytical section examines research areas focused on retrieving and working with such information in human-computer relations. One of these areas is known as Affective Computing. This section will shortly explain the key topics included when designing affective computers, and mention some example of articles providing interesting research on the area. The section will conclude by analyzing how these areas may be incorporated into the project.

Affective Computing (AC) is a term mainly developed by the author of the book of the same name, Rosalind Picard [15]. The book has inspired many articles and discussions around the topic since its release in 1997, and therefore it will also serve as the main reference for the terminology and key aspects. According to Picard, AC revolves mainly around providing computer with the ability to recognize, express and "have" emotions. To "have" emotions however is a loosely defined term, as one can always argue that computers will never have emotions, but simply a set of reactions to various scenarios upon which they then have the

ability to choose freely from. For example if you yell at a computer with such "emotions", it may choose to get angry and yell back, get scared and be silent or some other choice. Picard refers to this prospect closely with both recognizing and expressing emotions, which may be easier to comprehend coming from a computer, as she points out that once computers can perform recognition and emotional expression better, "having" emotional states may follow close behind. However it can also be argued that having emotions as a computer is an illusion, since it will never perform some unexpected like a person could, it can only have the option of choice. To choose which emotion to express based on what it recognizes.

Picard's implementation is divided into building blocks: representing input and output signals, recognizing patterns of signals, synthesizing expressions, generating states, analyzing situations, influencing cognition and perception etc. [15, Cp.5]. These blocks overlap and can be used to set up systems that can either recognize emotions, express emotions or a combination of both. Information regarding a user's emotional state can be gathered using input devices such as cameras, microphones and sensors and then plotted, analyzed and expressed using signal analysis, pattern recognition or other methods. Mainly Picard talks about the automation of such processes, how the computer automatically can recognize emotional triggers and develop humanlike responses to certain emotional states.

#### 1.5.1 OCC model

The Ortony, Clore and Collins (OCC) model [Appendix B] is used in the AC book but comes from psychology work by these authors named "The Cognitive Structure of Emotions" [16]. It describes a structure of cognitive appraisal of emotions, which is known as the OCC model. As a key piece in the AC framework, the book uses this model for computers to explain how emotions are generated. It defines a structure to 22 distinct emotions such as pity, distress, love, relief and others by segmenting these emotions by their positive or negative reaction to situations consisting of events, agents and objects. For example a negative reaction to the consequences of events, focusing on one self with irrelevant prospects would be the path for the emotion distress, through the model.

The model becomes interesting because of the ability to group emotions into positive or negative responses to events, and to map these emotions to a certain reaction. While the AC book uses a more specific mathematical expressions to explain their implementation, the model could also be used in a more hands-on approach such as mapping emotions to emotional states, or explaining emotional states based on descriptions of events.

#### **1.5.2 The Affective Diary**

Anna Ståhl et al. writes in their article "Experiencing the affective diary" [17] about using input from skin sensors combined with phone data and direct input to create a diary that helps users understand their own emotional states during a longer period. By mapping coloured figures to the input from a sensor placed on a user during a day, and combining this with data such as a text and pictures taken via a phone, a background for a diary system is created on a tablet pc, on which the user can then add comments.

This approach to emotional mapping is interesting because it offers several other ways to describe emotional states, than the automatic input that is described in the AC book. For example, it would also support the idea of describing emotional state of a user, by using coloured figures or other imagery.

For the current project however, a more passive solution is preferred where automation or attaching sensors to the body is not required. The project should also aim to design a product that supports the social workers that helps the people with problems. The use of colour representation is interesting though, as are the symbolism involved in the program they use. As they have successfully represented an emotional state, by using these theories.

## **1.6 Colour Psychology**

To get an idea about the emotional state of the user, the following chapter will look into colour psychology. In this field of study colours are mapped to emotions or used as metaphors for emotional events/states. This chapter will analyze theories and uses of colour psychology that are relevant to the project development.

Colour psychology is a wide spread phenomenon, which tries to relate people's initial emotional reaction to specific colours. For example the colour red often symbolizes aggression but also love, where blue colours can represent calm or cold [18]. There are many sources and deviations of the specific emotions and their relations to various colour schemes. According to a paper by Anna Ståhl et al. [19] there is a debate to how these colour theories are actually applicable and cultural dependent, but as they deal with initial reactions to colour, they should precede culture influences. To alleviate any cultural influence the project is analyzing multicultural sources of colour psychology, and using the generally accepted mapping.

In the article [19] they use the emotional colour theory by Karl Ryberg [20] which mainly revolves around the energy of colours, where red and orange colours have a high energy and blue colours have the lowest energy rating. Fitted to original colour theory such as that by Goethe [21] and Itten [22], these colours are then placed in a colour circle "starting" with red and ending in blue/purple, and going towards white in the middle [see figure 1]. In the article the colour wheel are the used in conjunction with James Russels "circumplex model of affect" [22][23] such that the high energy red colours correspond to high arousal part of the model. Colours such as deep blue then becomes representative of the sad emotion, and yellow colours aims towards the happy/pleased emotional state.



Figure 1: The transformed colour circle of Itten (left) and Russells circumplex model of affect (right) [19]

In an independent study by two Ph.D. students in Georgia (USA) [24], several college student where inquired on their emotional response to colours and the reason why. Here the authors tested what they call five principal hues (red, yellow, green, blue and purple), five intermediate hues (yellow-red, green-yellow, blue-green, purple-blue and red-purple) and three achromatic colours (white, gray and black). The students expressed in general a positive reply of 80% to the principle hues, where the colour green where highest with 96% positive replies, followed closely by yellow (93%).

The various sources of emotional colour psychology are important to include, in order to get a general affiliation with colour associations. However one could argue that in this case international research are less important than the Danish work done, despite the cultural precedence mentioned [19]. As the project aims to analyze an individual's emotional state, colours can help specify this state, not only to the person in question, but to others looking from the outside in. However the colours must represent a meaningful relation to the individual. Although this project works with one specific person, the emotional mapping should apply to a broader audience. That said, it would be interesting to analyze the current participant against the general opinion found through the sources mentioned above. These research sources have been compiled into a general table, representing colour mapping across the board [Appendix C]. Another approach to using images to represent emotions are analysed in the next section.

## **1.7 IAPS**

The following section explains the International Affective Picture system, and the use of it in this report. IAPS is a catalogue that can only be accessed by directly contacting the authors to apply for a download.

The international Affective Picture System [25] is a research system from the NIMH center for the study of emotion and attention in Florida, USA. As mentioned by the center themselves:

"The International Affective Picture System (IAPS) is being developed to provide a set of normative emotional stimuli for experimental investigations of emotion and attention. The goal is to develop a large set of standardized, emotionally-evocative, internationally-accessible, colour photographs that includes contents across a wide range of semantic categories." Basically IAPS provides a large collection of pictures with technical manuals that explain how to use them for studies, and which emotional response each individual picture is supposed to bring out. The "emotionally-evocative" part of the above quotation is important, because the collection of photographs is designed to invoke emotional responses. That means that there are rarely common pictures among the collection, or in another term always extreme situations. For example there are not just pictures of a shark or snake, but a shark jumping into the camera with the mouth wide open or the snake in the process of devouring a toad.

The IAPS collection is very interesting though, as it provides plans for mapping of complete images to the emotional state of a user. By using IAPS it is possible to create or manipulate images to represent these emotions. For example if the user had expressed a general negative emotion, a selection between images could further provide information about the reason for said negative emotion. It could also be used to narrow down the specific emotion, i.e. is the negative emotion jealousy, rage, fear etc.

As the authors behind the IAPS system are very firm in their non-profit involvement policy, the system should mainly be used for this project as visual indicators. Meaning that the pictures from the collection could be beneficial as a basic sketch for a project created picture, then providing a reasonable starting point for affective image creation.

## **1.8 Likert Scales**

In 1932 Rensis Likert wrote an article to provide a method of scoring the Thurstone Attitude Scales. These scales are used to evaluate an individual's score by the median of scale values, of the statements to which an individual agrees.

Likert 's scale provide an easier way to perform this evaluation, by setting up a five point scale. This attitude scale is as follows [26]:

- If you strongly agree with a statement, put a plus with a circle around it.
- If you agree with the statement, put a plus.
- If you are undecided, put a question mark.
- If you disagree with a statement, put a minus.
- If you strongly disagree with a statement, put a minus with a circle around it.

The Likert scale provides a good starting point for implementation of a program in the project. The scale is easy to understand, and can evaluate attitude towards a subject. As long as the scale includes a medium "neither or" option, it can be used with 5 or e.g. 7 points.

## **1.9 Platform**

In this section the selection of the development platform will be explained, along with the reason behind this choice. The possibilities are a desktop computer, a smartphone and a tablet.

There are several platforms available to choose from when it comes to running the application. The first, and most obvious one, is a desktop computer.

This has the advantage of being easily accessible and most people already know how to operate one. Another advantage is the capability of running almost every programming language there is. This eliminates potential problems later on.

However using the desktop computer as the platform can have the drawback that the children in question might not have their own computer. This means when they are to complete the application they will have to use either a public computer or a borrowed one which can give privacy problems. Considering that the point of the program is to ask personal and private questions this is a potential problem. Because of this the computer will not be the primary platform used in this project. However it will be possible to use it as a back-up if problems should arise.

The next platform in question is the smartphone. The smartphone is a broad term used to cover all brands of smartphones. These phones run different operating systems which need to be taken into consideration if the application is to run on any of them. The advantages of using a smartphone platform are many. The first one being the privacy issue. By using a smartphone the person in question is able to answer questions without having to worry about others watching. It can be done in her own room and does not require the use of a shared machine.

The drawback then is the limited power of the smartphone compared to the other platforms. At the same time using the mobile keyboard might be a drawback when adding comments in the program. That coupled with the small screen compared to a computer and tablet makes the smartphone a less desirable choice.

The final platform is the tablet. This platform holds the same possibilities as the smartphone, however it provides the user with a larger screen and keyboard which were the major drawbacks of the phone. As with the phones the tablets makes use of different operating systems which needs to be taken into consideration when making the choice of tablet.



#### Figure 2: Picture showing the Samsung galaxy tab [www.samsung.dk]

The final choice was to use a Samsung galaxy tab [see figure 2] as the platform in this project. It was decided to use a tablet due to the size and power compared with the smartphone, and the mobility compared to the desktop. The reason for using the Galaxy tab was due to the operating system. It uses Android and can also run Flash. This means it is possible to create the application in Flash which lets the computer remain as a back-up should any problems arise.

## 1.10 Concept design

Based on the knowledge gained it is now time to create the concept design from which the prototype will be created. This section explains design choices and input suggested by the social workers.

The main goal of this program is to provide the social workers with information about the girl that they have difficulty getting too as it is now. By asking the girl simple questions throughout the day, they will hopefully be able to assess how the girl is doing. This can then be used to decide if anything needs to be changed in the treatment of the girl. They already ask the girl these questions of course, however the hope is that she might be more willing to share this information if she can be alone and take her time with it without somebody watching her.

There are some important aspects about the design that needs to be taken into consideration. First it has to be simple and easy to use, since presenting the test person with an advanced program could cause her to get frustrated and be unwilling to use the program. Secondly the program has to be quick to use, meaning that it should not require hours of use each day. Preferably it should take somewhere from 5 to 10 minutes to use unless the need to add additional comments should arise. The questions asked by the program should all be simple and easy to understand according to one of the social workers. The girl has difficulty

responding to questions that are too broad and open like "How did you sleep last night?" instead the question should be along the lines of "When did you fall asleep?" and "How many times did you wake up in the night?".

Even though she might not use it, it was early on decided to implement a comment box. In this box she would be able to add additional comments. According to the social workers this is unlikely since she finds it difficult to put her feelings into words. However it was decided that it is better to add this feature on the off chance she might use it, rather than not have it and miss out on information she might be willing to share.

Four designs were created based on these guidelines. They were:

- The 1 10 scale
- The slider scale
- The picture design
- Smiley's

#### 1.10.1 The 1 – 10 scale

This design offers a simple way for the test person to grade different parts of her day. The program asks her a question which she then answers by giving it a grade from 1 to 10. The advantages gained by using this design is that it is quick for the test person to complete the daily questions and it is very easy for the social workers to compare the results. This way they are able to decide if the treatment is working as intended or if things need a change.

The drawback of this design however is the fact that she has difficulties grading her answers, the scale is simply too long for her to understand the difference between say 6 and 7. This can lead to inaccurate results which then would be useless for the social workers.

#### 1.10.2 The slider scale

This concept was based upon using a slider instead of a set scale.



#### Figure 3: An example of the slider scale

As figure 3 shows, she would be presented with a picture representing a part of her day and she should then adjust the slider so it represents how that part of the day was. As with the 1 - 10 scale design this

design offers a quick and easy way for her to let the social workers know how her day was. Again it is easily comparable for the social workers so they can decide how to continue her treatment.

However the same problem turns up with this design as with the 1 - 10 design. She will not be able to distinguish the differences on the scale. This means that two identical days might not end up with the same grade. This again would leave the results useless.

### 1.10.3 Picture design

Based on the information, gained from the social workers, it is known that the test person responds well to pictures and figures. This design shows the girl graphical illustrations representing different parts of the day.



Figure 4: A picture showing an example of how pictures could represent parts of the day

When clicking one of the pictures it is possible to grade that part of the day. Due to the fact that she responds well to pictures this design should work well with the girl. It is easy and quick to use, which means she should not get frustrated or bored when using it [see figure 4].

The drawbacks are the lack of depth in the information gathered from this design. There is no way of telling why she for example slept poorly. This means this would just be a tool to show the social workers that something might be wrong in this area. They would then still have to sit her down and try to put it into words with her, which is the exact thing they are having trouble with as it is now.

## 1.10.4 Smiley's

This design is based upon the Likert scale explained earlier [see section 1.8]. Instead of using numbers to grade each question it uses smiley's. The scale consists of five smiley's ranging from very happy to very sad. This gives the social workers a scale from which they can interpret and compare results clearly. It also

allows the program to ask specific questions so in depth information can be gathered. It also makes use of graphical icons which should make the scale more understandable to the girl.

The downside to this design is the short scale. There are only five different possibilities which do not leave much room for differences.

#### 1.10.5 Final design

The choice for the final concept design was the smiley solution. This is due to the combination of a scale which the social workers can use on a daily bases to compare different days, which at the same time is not too large a scale for the girl to work with. It also uses graphical icons which should work well with the test person. Finally it offers a way of asking a number of questions in different categories but at the same time it can use the same scale so the program remains easy to use.

To determine what questions to ask, a copy of the treatment plan they use at the institution was used as inspiration [Appendix D]. This plan holds all the questions the social workers have to answer regarding the residents at the institution. This is in order to keep track of the progress being done by the girl. Based on this plan a series of questions was created. These questions were then discussed with one of the social workers in order to phrase the questions correctly so the girl would be able to answer them. The questions focus on the areas of sleep, school, food and friends. Each area holds 2-3 questions and should be quick to answer. Every question has the possibility to add additional comments should she feel the need.

#### 1.11 First prototype

In this section the design of the first prototype was created. The design is based upon the guidelines from the concept design section. It takes into account the information gathered from the social workers and was created in such a way as to accommodate the test subject in the best possible way.

Before creating the application (app.) itself it is important to determine how to create the best design for the test subject. In this case the test subject is a 15 year old girl suffering from ADHD and neglect. She is very visual and, according to the social workers, she therefore responds well to pictures, icons and drawings etc. On the downside she can have trouble dealing with large amounts of text and choices. This means that the app., which needs to ask her questions, should do so in a simple and if possible graphical way.

It was decided, in the concept design section [see section 1.10], to make use of smiley's as the indicators for the five point Likert scale. This should hopefully make it easier for her to understand and use the scale to answer questions. Along with the scale there is a comment box where she can add information.

There are four categories of questions divided into sleep, school, food and friends. Each category will have 3-4 sub-questions in order to elaborate on the subject. The categories appear in this order, so they cover the entire day.

10-11	Hvornår faldt du i søvn?
11-12	Tilføj noget selv
12-01	
01-02	
Senere	

Figure 5: Screenshot of one of the sleep questions, asking when the girl fell asleep

After answering the question and adding additional comments, the girl hits the arrow button to advance to the next question [see figure 5]. The order of the questions cannot be changed by her since giving her too many options and possibilities would possibly give her difficulties according to the social workers. Also it might result in her skipping certain questions if she had the choice.

The smiley's remain the same all trough the program, however the informational text next to them change in order to give the best possible understanding of the scale for her.



Figure 6: Picture showing the change in the question followed by the change in the smiley text

Figure 6 shows how the main design of each question page remains the same but as the question changes the scale adapts. The comment box does not change throughout the program since she should always have the option to add additional comments.

At the end of the program there is a finishing page to show her you have now completed the questions for today [see figure 7].



Figure 7: The final page of the program letting her know that there is no more questions today

This program should then be completed once each day. The results are saved in a file on the tablet. This file can then be accessed by the social workers in order to see all the answers. As mentioned before, this should not pose any ethical problems [see section 1.1].

#### 1.11.1 The application icon

As part of the prototype an icon was developed to represent the program on the tablet. The icon was created based on the rules and guidelines stated at androids developer website [27].

These guidelines state the following:

"Android Launcher icons are caricatural in nature; your icons should be highly simplified and exaggerated, so that they are appropriate for use at small sizes. Your icons should not be overly complicated."

"Try featuring a single part of an application as a symbolic representation of the whole (for example, the Music icon features a speaker)."

*"Consider using natural outlines and shapes, both geometric and organic, with a realistic (but never photorealistic) rendering."* 

"Your icons should not present a cropped view of a larger image."



Figure 8: Picture showing the icon created for the program

Figure 8 shows the final icon developed for this program. It represents a person and the possible mood swing that can occur. Since to goal of the program is to gather input regarding how a person is feeling, this icon is a good representation.

The size of the icon was 72x72 pixels, which is the standard for an icon when used on a high resolution screen. Had a Smartphone been used instead it would have been smaller, which could have influenced the design.

Along with the icon a name for the program was created. It was decided to call it CAT. This is short for Child Assessment Tool. This seemed to be a name that represented the program well, since it the name tells exactly what the program is trying to obtain.

Once the design of the first prototype is completed, the next step the project process is to set up the test plan and method details.

## 1.12 Test setup

After creating the first prototype the next step is to plan the first test. The program is designed in such a way that it asks her questions about her day in the order she should experience them. This first test will run for five days from Thursday to Monday. This way it covers both normal days and a weekend, but due to insurance reason the tablet must remain at the institution at all times.

During this test she will not be attending school due to holiday which leaves her with time to get to know the program and the tablet. Also one of the social workers will be present at all times during the test period to answer any questions she might have.

The primary goal for this initial test is to find out if the program is too complicated for her or if she would even use the program without additional motivation.

The secondary goal is to get a feel for the questions. Are they easy enough for her to answer? Should there be more or less? Are there certain questions she avoids or refuse to answer? Also an important aspect of the test is to find out if she is comfortable with the tablet or if she is having a hard time operating it.

The information gathered from the girl during this test will not be used or handed over to the social workers. The girl and social workers will be informed about this. Reason for this is to make the girl feel completely safe during this test. She needs to know there will be no consequences no matter how she answers the questions throughout this test. What will be used are the comments made by her in the program and any information gathered in the interview following the test period.

## 1.12.1 Test results

The results from the first test were very positive according to both the test person and the social workers. There was of course some comments made and new ideas presented to improve the program.

The first comment made was if it was possible to remove or skip some of the school questions on the weekend since it did not make sense to answer these on non-school days. This makes sense for obvious reasons. There should be a possibility to skip certain questions or add different questions on the weekend.

A very specific request from the girl was to add a diary feature. This should be in addition to, but not instead of any of the existing features. This was part of the original plan but it was decided to skip this since the comments boxes were added instead. However after receiving the results the diary function should be added along with the comment boxes.

To make the program easier and maybe quicker it was requested to create more yes and no questions. This is a bit more difficult to accommodate since this type of question has it limits when it comes to the amount of information gathered from it. This means it would be necessary to ask a larger amount of questions in order to gather the same information as the questions now do. It will however be taken into consideration when creating the next prototype.

The goal for the test was primarily to find out if she was able and willing to use the program. The answer to this was yes, she was more than willing to use it. In fact she found it both fun and interesting to do so. The program was not too complicated however as explained above some of the questions might need some work to accommodate which day of the week it is. Having the program on a tablet seemed to be plenty of motivation in itself. She showed no signs of getting bored. In fact she downloaded several additional programs and games to the tablet so she got familiar with it very quickly.

The secondary goal of the test was to get information about the questions asked. The questions covered the areas needed, but they could use a bit more variation. Also the depth of the questions should be improved. Right now it is hard to determine exactly what is wrong unless the comment box is used. The program cannot rely on comments being made every time so the questions need to cover a larger area of investigation.

It was mentioned that the graphical interface was easy to understand and the smiley's was a great support for the text. According to the design [see section 1.11], these smiley's was used as indicators for the five point Likert scale.

As a conclusion the test was very successful and provided useful information which can be used in the development of the next prototype. The test showed that as a whole the program is on the right track so

the next step will be to further develop the questions used, the interface, add weekend questions and finally add the diary function.

## **1.13 Final Hypotheses**

To recap, our initial hypothesis was:

- By developing and presenting an interactive application we can support the treatment of social behavioural problems in children/young adults

The first section of the report gives the relevant information needed to create this interactive application. The status of both the institution, the girl (user) and her condition as well as its implications has been established. With it the hypotheses can be focused on one specific person, one age group (teenagers) and the ADHD disorder. This summarizes in the first hypothesis which relates to the condition:

- The psychological treatment of the ADHD disorder in a teenage girl, can be supported by using an interactive application to facilitate emotional awareness

Here the aim is to discover if the application has any effect as a support tool for the treatment of ADHD. In order to assess this, the report will go through an interview with the social workers that are present during the second test of the application. As they are close to the girl during the testing period and have a professional eye for changes in her behaviour, they can establish if any change have appeared and provide information on the involvement of these changes were due to the application.

The analysis of the current research areas provides information about exciting applications and projects that aims to incorporate emotions into computing and applications. While this project is not aiming to do the same, the use of psychological models to provide the foundation for a program structure leads to the second hypothesis:

- Existing emotional states of a user can be deducted by following a psychological model structure in a program framework

This hypothesis relates directly to the viability of the redesigned psychological model [see section 2.2.1]. The evaluation have to rely on the interview with the social workers to find out if there has been any noticeable emotional situations during the test period, and if so which emotional states where active. It is off course also possible to ask the girl directly, however as communication about emotional awareness is one of the problems, it is not expected to provide relevant insight. If the social workers can provide information about this, it can be checked against the results of the program, to see if the results match the information.

By testing the program and its viability on the user, the project has established a successful base for further development. The girl in question is willing to answer questions about her own situation, and has shown an interest in help for support of her condition. The social workers are very interested in first and foremost supporting her, but also any information they can get about her current emotional state. Our last hypothesis will refer to this problem and the report issue in general.

# - Information about the emotional state of a user provides a base for better communication between users and social workers

The final hypothesis relates less to the actual use of the application, and more to the situation at the institution. Both the girl and social workers should be able to provide information to the status between them, and in some case to whether or not the application had any help in this.

These hypotheses will be concluded upon at the end of the third chapter, along with a discussion of the report process and results. Before that the second iteration will work closer with the theories analyzed and implement a design that support these theories and the results from the first prototype test.

## 2. Iteration Two

## **2.1 Introduction**

The following section of the report features the second iteration, which covers the second part of the project process. Describing the work done in the last part of the project, this section uses information from the first iteration to design a second prototype.

Initially the second iteration presents results from the last prototype test, and will include changes made to the program based on these results. Implementation of theories from the analysis part of iteration one will follow, to work out the design of the next prototype. This design section will also feature any important considerations concerning the implementation of the prototype, as the report does not include a specific implementation section afterwards.

Immediately following the design section, the report will feature the testing process of iteration two and go to results and conclusions of the test.

## 2.2 Design

The following section features the design choices done in the second part of the project process. This includes everything changed in the program from the time the first test concluded, to the beginning of the second prototype test. The section will also include a few specific comments related to the implementation process of the program. The design is divided into three main sections: structure, input and output. The structure section features the model on which the program is outlined. Input contains the features of the design that the user interacts with and output explains what the user sees at the end, as well as any information for the social workers from the program.

To begin the design of the second prototype the project creates a program framework that can support both the girl and the institution, based upon the results of the first iteration. As mentioned in the analysis section of the report [see section 1.3] the disorder that the girl is diagnosed with is ADHD. A psychological illness that can originate from neglect and manifest as attention or hyperactivity problems. In this case the user has a history of parental neglect and as such need different treatment and supervision than other teenagers of similar age. In relation to the design of the program, knowledge of this disorder enables the project authors to structure the framework with this specific user in mind.

From the disorder section [see section 1.4] it is known that ADHD manifest as a problem with controlling attention levels, and the social workers have informed about the girls inability to express the reason for her emotional states. It can be deducted that in order to heighten this emotional awareness, the project authors must act to focus her mind and attention on the event related to any emotional state. A mental revisit may not only help the girl understand her own emotions better, but if such information concerning the path (or origin) of the emotional state can be shared with the social workers in charge of her, it could support their treatment of the girl.

In order to design a program framework around such an emotional path, a model is needed that informs about the influences leading up to the outcome of an emotional state.

#### 2.2.1 Structure of the program

In the first section of the report, it is discussed if it is possible to use a psychological model to determine program structure. In the second iteration of the report this possibility is further evaluated upon, in order to combine the model with other psychological theories, to find a suitable framework that can help the social workers at the institution to understand their residents better.

The OCC model explains the path to certain emotional states, by branching the influences or triggers of situations into different categories [see figure 9]. In this model a tree structure starts with a positive/negative reaction at the top, and then branches off until it reaches the emotion in question at the bottom. To explain one path, e.g. the emotional state of "hope" would be from a positive/pleased reaction to a consequence of an event, with relevant prospects for one self.



#### Figure 9: The original OCC model [16]. This image can also be viewed in larger scale in Appendix A.

To explain each step in the model, the term "tiers" are used. Each tier corresponds to a level in the model, starting from the top. So the forth tier would be the fourth row in the model.

With the OCC model there exist a specific way of finding a users current emotional state, or at least a possible reason for their emotional behaviour. E.g. you could say that a user is in an emotional state, because certain events or agents contributed to a situation in a certain way, in which the user agree/disagree or in which the outcome of the event has a relevant or irrelevant impact on the user.

However, the OCC model is its current state provides a very complex level of emotional states, based on very specific opinions on both outcome and cause of certain situations. In the environment that the project program has to operate, the user already have problems with putting words on such specific situations and is also of a young age and may not understand the full spectrum of the model and its implications. For the current project, the original model is too complex. It is therefore remade to match the different domain constraints.

This is done first by combining the two main threads of event/agent interaction, into one [see figure 10]. The primary reason for this is that the user should focus on one subject at a time. The main branch of the model, or tier one, will then focus on events only. The agent part of the model is then relocated into the branching where the user is determining if him/herself is the cause of the emotional state, or if it is others. It is then assumed that if others are involved, the emotional branch of "agents" can be supplemented.



Figure 10: First part of the sketch of the redesigned OCC model

The second tier of the new model will define what was originally the initial starting point of the OCC model. Namely the valenced reaction to a situation. It may be easier for a user to determine if they are positively or negatively influenced by an event, if they know which event they are referring too. The original model included an additional step to define if the user was pleased/displeased to events, approving/disapproving to agents or liking/disliking to aspects of objects. These influences are mainly positive/negative, and are treated as such in this second tier without the need for additional confusing words.

In the third tier, the user must define if the event (or emotional state) is due to their own actions, or those of another person (agent). This may be the hardest choice for the user, since the question in the program is kept general here. If the program asks about a specific scenario, it would most likely make the question biased towards a certain answer. E.g. if you ask "was it because others made noise you slept poorly" instead of "was it because of you or others you slept poorly".

If the user selects him/herself in the third tier, the model will then reconvene into the original model using the option of relevance to the user. However if the user selects "others" in the third tier, the forth tier will move into the option of desirable/undesirable outcome of an action. To implement this, the program should branch off at this point into separate parts. Because the self/others choice would not lead to the same situational problem, the two branch options should also be separated [see figure 11].



Figure 11: The second part of the redesigned OCC model sketch. Some compound emotions are included in brackets

The last part of the model will operate with the emotional states. It should be noted that in this version of the model, the so-called "compound" emotional behaviours are excluded. That means emotions such as remorse, hate, love, gratitude, relief and so on are not included. Since they are compound emotions, their origin or current role may be described using the "prime" states, so to speak. E.g. if the user selects a path through the program that leads to the admiration part, existing knowledge from the supervisors may prove that "liking" is a part of the emotional state, and as such "love" would be a more fitting term for the current state of the user, even though both can apply.

In this part of the program framework, the questions related to specific events are developed and there are mainly two ways to proceed. Either ask directly to the emotional state, or ask to the event. Seeing as the program should be as easily understandable as possible for a fifteen year old girl, it was chosen to hypothesize that by asking general questions the answer would reveal the emotional state, both by knowledge of context, but also partly by choice of wording.

E.g. say that the user is on the event "sleep". Here she will answer questions to the progress of her sleep. If she answers negative in the second tier, and "others" in the third, the program could next ask her questions involving other people, such as "where you sleeping poorly because others made noise". This would initially assume that resentment or reproach was the emotional state if the consequence for the parties involved were desirable, or pity if undesirable. And in such a case, it can be assumed that the social workers will know the answer to that. They can thereby deduct which emotional state the user is experiencing, and help the user understand this. In other situations the questions may be harder to formulate while still keeping a relevance to the emotional state and path of the model, but this is off course a point in which experience in testing will also provide valuable feedback, both from the user but also the social workers.



Figure 12: The complete redesigned OCC model and the equivalent program icons. The emotions in the red box are some of the compound emotions and their lines represent the connection. The rest in tier 5 are prime emotions

The redesigned model now includes five tiers, which in the program is three main sections. The fourth and fifth tier are combined in the program, by asking specific questions. The first tier has no icon listed in figure 12, because the program goes through each event after another. The valenced reaction of tier 2 to the event the user is currently on, is answered by the smiley icons. Tier 3 is answered by the self/other icon, and tier 4 by the questions. Tier 5 is then comprised of the resulting emotional states. The next section explains the design of these icons and how the user gives input to the program.

## 2.2.2 Input

In iteration one the psychological colour theory was discussed [see section 1.6]. Here the article authors describe testing projects, where people have linked certain colours to emotional states. As one of the immediate comments from the user during the first test, was "use of more graphics", colour theory has remained high on the list for implementation in the second prototype.

There are several possible ways to design the framework, so that the OCC model choices are supplemented by colours that represent emotions or emotional states, when the user is navigating the program. The first option which is implemented into the second prototype is using the second tier of positive/negative choice, with the smiley system also used in the first prototype. New graphics are implemented, where a forced valance response are represented by four distinct smiley's.


Figure 13: An example of the second tier of the model, presented in the program. It reads "how have you slept". The smiley's are referred to as "very sad", "sad", "happy and "very happy" from left to right

When the user selects a smiley, the program goes to the next page. Instead of just having one positive and one negative choice, several positive and negative choices are made to give the social workers more information about the user. Both the negative choices lead down the same path, as does both the positive. Not only do the multiple choices give more information, but in the part of the original OCC model that deals with steps of valenced reactions in tier one and three (which is left out of the redesigned model) the above choice can provide insight into the final tier of our OCC model. For example a "sad" vs. "very sad" [see figure 13] reaction to sleep might point more "reproach" than "resentment", if the outcome is desirable for the involved parties.



Figure 14: Here the program ask "was it because of you or others" to the sleep question

After the user have selected a smiley, the program will continue to the page featuring the "me" or "others" icons [see figure 14]. Here the user can select one option as well, and the program will branch off to different questions depending on the selected option. This corresponds to the third tier of the redesigned OCC model [see section 2.2.1]. The icon is coloured by what the research describes as a "cool" or "refreshing" colour [18].

The second option for implementing colour theory into the framework is to use it directly in conjunction with the last tier of the program, where specific questions are answered. For example, it might be possible finding colours that represent shame or pride, and link them to the choices that the questions offer. That way the impact of the colours could be studied, when testing the program and interviewing users. However for several reasons, this is not implemented into the second prototype. Firstly because many of the questions as mentioned before as very general, and may not be interpreted in the same order by the user as is it by the program authors. And secondly because it has not been possible finding research that links some of the more controversial emotional states (such as "gloating") to a colour. In many cases, the emotional states included in psychological research using colour theory, are more general such as anger, hope, sorrow, joy and so on. The next section looks closer on the third choice and the output of the program.

## 2.2.3 Output

The Affective Picture System (IAPS) [see section 1.7] features pictures which are intended to awake certain emotional states in users. While the IAPS system itself is not included in the second prototype, mainly because the project tries to explore current emotional states and not invoke new ones, the system has inspired some changes to the program.

The most noticeable ones is the implementation of pictures as a "reward" for completion of an event, for example completion of the questions related to the event "school" following the new OCC model structure. These pictures are "built" by completing steps in the program, four for each event.





The first building block is the event itself, which is represented by an icon in the middle of the picture. The icon features the name of the event, and a small graphic showing one or more items typically associated with this kind of event. In figure 15 for example, the icons shows a desk, ruler and paper. The second building block is the positive/negative choice of the second tier in new OCC model. If the user answer very happy, the background of the picture will be yellow, the same colour as the smiley. If the user answers "sad", it will be blue. The third block is an icon overlapping the first, showing either one or three silhouettes of people. This represents the third tier of the model, where the user selects between "self" or "others".

The frame of the icon in the middle was to be used for differentiating between the relevant/irrelevant or desirable/undesirable options of the forth tier in the model, however this has not been implemented in the current prototype, and must be saved for later developments. The idea was to use colour theory to colour the frame according to the answered questions, for example relevant/irrelevant would become

cyan/magenta respectively, and desirable/undesirable would colour the frame white or black. In the current prototype the frame is left gray, as research pointed this to a "passive" colour [see Appendix C].

In the program the diary feature [see figure 16], that was explicitly requested from the user during the first prototype test, was implemented. In the first prototype the user could only comment on each page or question, but in the second prototype there is a separate feature in which the user can enter "pages" with a title and text.



Figure 16: The diary feature in the program. The user can type a title and content, and use the save button in the lower part of the screen to save it

The user can save diary entries made, and read them later by opening the diary feature in another program. However she is unable to write in the diary until she has completed the daily questions. This way the diary feature becomes not only an extended view of the person's emotional state, but also a reward for completing the initial program. It should be noted however, that due to a technical error the program could only write entries, not read them at the time of the second prototype test.

### 2.2.4 Summary

With the design of the second prototype there are also parts of the analysis in the first iteration which is not directly included. For example the Likert Scale system did not make a lot of sense to implement, as asking the user to rate an event on a scale from say 1-10, would provide little information as to the emotional state of the participant. The Likert system did however inspire the use of smiley's, and as such has supported the development of the project. As mentioned the IAPS system was not included directly either.

The design framework features around 16 questions a day, with an extra feature that skips the school event on weekends (this is implemented in the code of the program), so only 12 remains there. The event order: sleep, school, food and spare time. Initially the program design was featured to have a menu from which the user could select an event they would complete, e.g. "sleep". However after counselling with the social workers, it became clear that it would be a better option to have each event follows another, so the user would be forced to complete them in a chronological order. Else it was highly possible she would skip certain events on purpose.

Following the redesigned OCC model, each event starts with the forced positive/negative choice of smiley's, then comes the self/others choice and lastly comes the specific questions related to the event. At the end of the event, the user can enter additional comments and is presented with the "event picture". The diary feature follows when all events are answered.

The program will also print to its internal memory a code for each event picture, which can be viewed in the program file. If the program is used once a day, during the week, it will be four codes per day. These codes are used for communication with the social workers more on this in the test section [see section 2.4].

## 2.3 Program changes based upon first prototype test

This section summarizes the results of the first prototype test, and describes the changes made both technically and visually to the program based on the feedback gathered.

The results from the first prototype test shows that the idea of using smiley's as graphical indications for the Lickert scale was a great idea because they help to make the interface easier to understand [see section 1.12.1]. In the second prototype the smiley's are changed in the layout but the meaning of them are kept the same. They are changed from the five point scale to four so they fit the new OCC model.

In the first test it was asked if it was possible to skip the school questions in the weekend. So in the new prototype it has been implemented.

The request for a diary from the first test is fulfilled and added in the second prototype. It had been added to obtain some motivation for the girl to use the program.

The request about more yes and no questions is not fulfilled because the structure of the program is changed so the yes and no questions are not supported by the new OCC model.

To find out if these changes to the program will improve or make it worse, they would be tested in the second test along with the hypotheses.

## 2.4 Second Test

The following section will include the changes made from the first test to the second. It will also describe the purpose of the test and the timeframe the test is being carrying out.

The purpose for the first test was to find out if she used the tablet and program and how often she used it, [see section 1.12]. The purpose was also to find out if the questions were too complicated and if the number of questions was acceptable. The second test will focus on the problem that the social workers would like some information on how the girl is experiencing the day from her own point of view. The reason why the social workers need this information is because they need to fill in a daily report for each child on the institution. With this information the report will not only be the social workers point of view but also with the child's view on the day.

To provide this information to the social workers the program has been changed based upon the results from the first test, and with the things such as the OOC model and the colour feedback that is described in the design section [see section 2.2].

An important thing that is changed from the first test to the second test is that social workers this time have access to the girl's answers, which they did not have in the first test. The girl knows this so it could bias the answers which will be taking into consideration when the results are analyzed.

The data that the social workers will be able to see is date and time stamped, so they can see when she answered the questions. They will be able to see the titles of the questions and what she answered. They can also see the resulting picture code and if she add any comments. They will be given an introduction and a paper guide to read the data and understand the picture code that is inside the file, the guide can be seen in [Appendix E].

The time frame for the test is also changed compared to the first test. This test will be around fourteen days. The reason why this test is extended compared with the first test, is to give a more detailed picture of the use of the program, and to find out if the social workers can use the information the program provides. A second reason is to see if the girl will use it every day in a longer period, or if she eventually gets bored. This way it is possible to tell if the program needs additional motivational factors in the further development of the program.

After the test is over the social workers and the girl will be interviewed about the progress and according to hypotheses [see section 1.13]. The results of the test and the interviews will be present in the following section.

#### 2.4.1 Post-Test Interview

Following the second prototype test an interview was conducted at the institution Kernen with both the social workers and the user, in order to get feedback on the test process and any suggestions concerning the program. The following section describes this interview, which were carried out immediately after the testing phase was completed.

### 2.4.1.1 Interview with the social workers

The first part of the interview was with the social workers at the institution after their weekly meeting. This way all the relevant parties were gathered in this location at the same time. The interview was then set up as a standard focus group, where the five social workers could provide input at their will to various points raised by the test leader. In this case one of the project authors. The other two group members took notes and pitched in with any comments if needed. The interview started off by the project authors summarizing the test process and project aim to the new social workers, who have recently joined the institution and only been there for the second test.

The first feedback presented by the social workers related to the general test process. Overall they stated that the girl (user) had been very grateful to have the tablet (galaxy tab), not only for the program but also the functionality and the "bragging" rights to the other girls at the institution. Having a new and high-tech gadget gave a heightened attention level to the girl, which in turn seemed to help on her general mood. As an unconsidered side effect of the testing process, it appeared to be a positive influence in the case of this specific user, however it is worth considering if this impact will resonate well with other testing candidates.

One social worker, referred to as "Anne" (to keep it anonymous), commented that the girl had been very cautious in her use of the tablet. She has kept it at the institution at all times, and had only let one other girl that she trusted use it in her room. Anne mentioned that while the social workers off course had checked that she did not bring it to school or other places, mostly this behaviour had been on her (the girls) own accord. This clearly shows that the knowledge of the tablet not being her own and only for loan, played a crucial role in how the girl approached the situation.

When inquired about the emotional state of the girl during the testing process, the social workers said that there had been some up's and down's, but unfortunately they could not pin point exactly which days these episodes had occurred. This situation arises from several influences. First of all it should have been mentioned by the project authors at the beginning of the test. The social workers could then have written down any specific emotional episodes, such that they could be connected to the data on the tablet. However since this was not done, the large number of different social workers supervising the girl during the process also leaves less knowledge of an overall picture of the emotional state during the test. The knowledge of certain emotional high and low days gives valuable insight into the project problem. With permission from the girl and access to the diary, these days can be pinpointed and compared to the input from the program. If they correspond, there is a reasonable foundation for answering part of the project hypotheses.

In the beginning of the second prototype test, the project authors handed the social workers a guide that among the catalogue of pictures presented as feedback in the program, also included a guide to viewing

the file with the codes for these pictures on a normal computer. The social workers commented that they did not have a chance to view this file, but were grateful for the opportunity to view this information regarding the emotional state of the girl. They commented that this type of information was very useful, but it would be easier if they were able to view it on the tablet itself directly, without the need for a complicated technical access. In response to a suggestion made by the project authors, concerning a separate program that were able to view the affective pictures on a daily basis, the social workers agreed that this would be preferable to the current implementation.

As an important note from the social workers, they mentioned that they could see a real benefit in allowing the use of the program outside the institution as well. E.g. if they were able to view these affective pictures when the girl arrived back at the institution from say a weekend stay at home, they could discuss any bad or good episodes that had occurred. This present an interesting problem, as any development of a system to view the affective pictures, would then have to include several days of use and a meaningful way of representing this data.

Lastly, the interview went on to discuss the motivational factors of these pictures. The social workers mentioned that the diary had been the biggest motivation to complete the program, and during a longer session the use of the same repeated questions would most likely end up being boring. One suggestion that was raised, were to implement new content if longer test had to be conducted. In addition one social worker commented that while the test had a big influence on the current user, testing the system on e.g. a boy that was more introvert would, in a psychological way be "worth gold", as he would be even more difficult to "reach" than the current user.

### 2.4.1.2 Interview with the user

The second part of the interview was moved from the dinner room, to a smaller more comfortable room with couches on a request from the social workers. Besides Anne and the girl, the only other people present were the test leader, and one of the project authors to take notes. Mainly this was done in order to make the girl more at ease with the situation and not have nine people staring at her.

In general the girl stated she was happy to participate and that it had been fun to have the tablet during the test process, although it was a bit sad to have to let it go. She also mentioned that she had mostly used the diary, because the questions got a bit repetitious and boring at the end. When the test leader asked if new questions would help on this if she were to use it again, she plainly answered no, and stated that she would use the diary still, but new content would be preferred. She also mentioned that overall the program was very easy to use, and could be a bit more challenging.

As a very specific example she stated that at some days, she missed an option between the sad and happy smiley (a neutral option) as she was not sure which one to pick. This off course presents a key dilemma, when considering the redesigned OCC model. Here the forced positive/negative choice is needed to determine which path the user is going to take through the model and thereby which emotional state the user is in. This dilemma will be discussed further in section 3.2.

Before the interview session with the girl, the social workers were asked if they understood the composition of the affective pictures by the test leader. While they understood the reason, they had not

grasped that the pictures were built from the various steps through the program. Surprisingly the girl understood this perfectly, and could without any help from the test leader explain exactly which components in the program added to which part of the picture. She even proceeded to give her own example of a picture composition. The immediate reasoning for this could be that extended usage of the program would give a clearer picture of how it is structured. The social workers, who had little or no actual use of the program, were not clear on its structure but only the purpose, while the girl understood the structure better than the actual reason for the program existence.

In addition to the fact that she was clearly more excited about the diary feature than the questions, the girl also mentioned that use of the diary actually helped on her mood on some days. While she did not specify which mood, it could be assumed by that she was referring to the days she had been less happy, mostly due to the way she stated this. It appears that this diary feature, or just the concept of diary use, have more of an impact than originally expected.

In the last part of the interview the test leader asked if the girl would have used the program in the same manner, had it been placed on e.g. the institution computer in the common room. To this she said plainly no, as she saw it as a private matter and would not be comfortable using it when others were present or could see what she wrote. This again exemplifies the need for dividing the program clearly into a private diary feature, and the program questions/affective pictures that can be shared with the social workers.

Before the report gets to any further development though, the next section will discuss the results of the program use during the second prototype test.

## 2.4.2 Second Test Results

The primary objective of this test was to see if the program was able to record the mood of the user, and if the program then was able to pass on this information to the social workers.

To answer these objectives the input from the test was analyzed. According to the interview [see section 2.4.1.2] she had several mood swings during the test period. So to determine if the program was able to record this, the data was put into charts. This showed how the mood altered within the four different categories. Comparing this data with the comments made within the program and in the dairy, it was possible to determine if the program in fact reflects the correct mood, or if the user made her inputs at random. The input made in the program and dairy will not be published in this report since it is private information and would also not comply with the anonymous preposition. However the test person has given her permission to use the information, so that these results can be compared.

It should be noted that not all days were recorded in the program, during the two week test period. This was due to her being away from the institution on some days. As the project authors insisted that the tablet remained at the institution for insurance reasons, the user has off course not completed the program in that period.

When looking at the results all the days are compared within their category. This way it was possible to see the development of each category and to see if a pattern emerged.



Figure 17: Chart showing the development of the sleep and food category. The chart goes from very sad (1), sad (2), happy (3), to very happy (4)

When looking at the first chart [see figure 17] it shows that the test person apparently slept well throughout the test period. When looking at the comments made there is no reason to doubt this. According to the information gathered from the social workers [see section 2.4.1.1], there had not been any situations in regard to her sleep. So there is reason to believe this information gathered from the program is correct.

In regards to the food category there is several up's and down's. Out of the nine days recorded three of them are negative. There are no comments made why this is, but looking at the input from the program she has selected that it was because she ate to much/little on these days. This does not provide enough information to determine if the information can be trusted. The user had her birthday on the one day she pressed the very happy option. Because of this it is fairly certain she enjoyed the meal this day, which the results also reflect. Therefore there is reason to believe the results are valid and can be trusted.

When comparing the revised OCC model [see figure 12] for food, and the input the user have selected on this day, the path through the model is "very happy" (positive), because of others and desirable. The desirable here comes from the option "I liked the food" that she selected on this day. As she has entered "others" before, it can be assumed that the outcome of the event is desirable for those in mind.

This should then lead to the emotions "happy for" or "admiration" when looking at the prime states. Admiration is probably the closest possible prime state to describe this event, however looking at a compound emotion such as "gratitude" may be more precise. The authors of the original OCC model describes gratitude as admiration ("approving of someone else's praiseworthy action") + joy ("pleased about a desirable event"), which in this case hits the situation spot on. In this specific example the revised OCC model resulted provides a proper indicator of the girl's current emotional state.



The next chart [see figure 18] shows the last two categories which is School and Spare time.

Figure 18: Chart showing the development of the School and Spare time category. The chart goes from very sad (1), sad (2), happy (3), to very happy (4)

When looking at the School category, it shows a steady result. However the second to last day of input shows a big drop in mood. According to comments made she had some personal issues this day, which resulted in her not having the required energy reserves to deal with school that day. This is commented both in the program and in the dairy, which confirms the data. If this day is compared to the OCC model with the information of Negative, Self and Relevant it shows the prime states of Fear and Shame. This corresponds exactly with the comments made in the dairy, which confirms that the information is valid.

The spare time category shows more variation in the results. It is primarily positive but there are 2 negative answers. The first entry shows a result of very happy. When looking at the comments it tells us she was out participating in sports that day and she really enjoyed it. This matches the program entry very well. On Thursday the 12<sup>Th</sup> it shows a negative entry. According to the comments she had some troubles with a roommate which influenced her spare time. On Wednesday the 18<sup>Th</sup> there is another negative entry. According to the comments she wasted it. Because of this there is a negative entry which match well with what actually happened. The second to last entry shows a very happy entry, the comments show she spent time with a friend and they had a good time. This corresponds well with the entries, as the emotional state described by them matches the result of the program.

In order to determine if the program worked as intended a summary of all the entries in the program was created. Each entry was compared to the revised OCC model to decide if the result matched the emotion state the model suggested. As with the examples made earlier in this section this could be within the school

category where she entered that she was sad, it was due to herself and it was relevant. This translates into fear and shame. In this case this would be considered a valid result. Had the entries been the same but the comments suggested she had a great day in school, the results would be considered false. It is important to note that there is a certain margin of error in these results since they cannot be confirmed unless she made a comment or an entry in the diary. However since the program entries made with added comments expressed the correct emotional state, there is no reason to believe the entries made without comments are wrong.

This means if the path of the entry in the revised OCC model ends up in an emotional state that makes sense compared to her situation at that time it was considered valid. And vice versa if the entry showed an emotional state that did not match her situation it was considered false. If she did not give any reason for her entry, meaning she did not choose one of the options provided, it was considered unusable.

36 entries were recorded out of a possible of 56. The missing entries were due to her not being present at the institution at all times.

Out of 36 entries 25 were considered valid when compared to the revised OCC model. 5 were considered false and 6 considered unusable. This leaves the test with an error margin of 13,9%. The unusable results are not considered in the error margin, as they consist of entries where the girl has pushed the comment box, but made no comment. It can therefore not be stated if these results are correct or incorrect, compared to the model. App. 14% may seem like a large margin of error however considering that the program is still a prototype, and there is room for improvement, the results are certainly acceptable.

## **3. Evaluation**

## **3.1 Discussion**

In the following section the project will be presented as a discussion between the authors, and as such also focuses on our thoughts concerning the overall process of the project. The first part of the section will try and cover the entire project length until the second test, and will focus mainly on the these test results as the final outcome of the project.

## 3.1.1 The project in general

As the main focus point in this project, the case study with the girl has been the primary "user group" for developing the program. Before any specific contact had been establish with the institution, the authors had hoped for several persons to be included in the tests. This may have given several benefits, but in some cases it might also have negatively impacted the development.

Developing for several people would demand the need for a general approach, and while this have still been conducted in e.g. the colour theory, areas such as the implementation of specific events would have had to be either tailored to each user, or create so that the included events would cover all users. With only one person to test upon, there is a higher chance that included events have proper meaning for the user, and it is possible to tailor the questions in the last part of the model, so that the user can understand them properly. The questions in the first and second prototype went over many reviews both internally and externally (with social workers) to insure they were understandable for our user, and matched the criteria needed for the model. This process would certainly have been more difficult, if the prototype should be used by several people. Seeing as it is a prototype, it made more sense getting the structure right for one user, before focusing on several.

The test process worked better than expected, despite some unexpected hindrances. The matter of insurance and the use of the tablet was initially a big concern, since the project authors had no coverage on their end, and the institution only had some basic house coverage which probably did not cover the university hardware. The user was thankfully very careful when handling the tablet, and no issues arrived. If several users should be included in the test, an insurance solution would be needed.

A critical issue was the presentation of the test process to the social workers. Here the project authors should have asked them to note down any emotional event the girl went through during the testing process. While we still have the comments and diary entries to determine some of these and the comments made during the interview, the external viewpoint and experience of the social workers during the testing phase could have been an immense help for validation of the results. Additionally there is also some concern relating to this in the change in the staff of the institution during the test. While it is not certain that this had an impact on the result, it could in a worst case scenario have directly influenced the mood of the girl, and thereby the results of the test.

Initially the second prototype was only scheduled for ten days, however the institution called and rescheduled the pick-up of the tablet after the first week, and as such it was arranged to extend the test

process for a few more days. This turned out to be to the benefit of the project, since more day added more results for the test. As the girl pointed out in the interview after the test however, in the end of the testing phase the questions started feeling homogeneous and boring. So two weeks seemed like a reasonable testing period.

#### 3.1.2 The results

During the interview that followed the second prototype test, the girl mentioned directly that she at some days missed an option between happy and sad versions of the smiley's. While this option is easy enough to implement, it present an interesting dilemma, as doing so would make the OCC model somewhat invalid. Both the original and redesigned model assumes that a valenced choice can be made, to define the path through the model. Even if the model is changed so that the positive/negative aspect is moved to a tier further down, the choice between the two is still needed in order to determine the outcome. However one could argue that seeing as the user had no problem making the choice the majority of the time, the issue is not pressing enough to invalidate the structural basis of the program.

The tier of the model that deals with relevance and desirability has been one of the more complicated areas to implement in the program. As external information confirmed, the problem remains in the fact that the user would not understand if the outcome of an event is desirable or undesirable for others, or relevant/irrelevant for herself. Even the project authors had difficulty determining this factor, when discussing some path choices. In order to keep this element simple in the implementation, it was chosen to combine it with the last tier in the model, and rely on the comments made by the user or the external knowledge of the supervisors. If the model had to go through a third iteration, it would be worth conducting a separate test to examining if another method could be used to represent this tier.

In relations to the results of the test, we have chosen to set up some basis numbers for the error margin and overall data during the test period, without going into detailed statistical representations. The reason for this is mainly that as this project is bordering the humanistic and psychological research areas, there are never clear cut results to hang on to. When a result is presented as correct, is it determined to be so in accordance with our own perception of the emotional state, and relevance to the model. However as the project authors are not the users, this perception may be inaccurate.

That said the model mapped a majority of emotional states to event outcomes that seemed reasonably correct. As such we can determine that as a program structure the model have proven to work, and makes a good base for defining the emotional states of a user.

One critical point of the test results are the lack of use of the program output by the social workers, which can be boiled down to a fault in the test setup and implementation. First the test setup should have exemplified the need to test this function, by viewing the codes in the file on the tablet. However it must be noted that most of the social workers had little experience in using PCs besides the common program, and as such it may have served as a deterrence. In addition the implementation should have considered this possibility and taken into account that another option was needed, in order for the affective pictures to be used in a significant way for the social workers. This could have been done by making a small separate

program, which could reach the output codes from the file on the tablet, and present the images corresponding to that code when the program was opened.

## **3.2 Conclusion**

This conclusion will attempt to answer the hypotheses stated at the end of iteration one. The results from test two will be the primary source of information used to do this.

The first of the three hypotheses made was:

# The psychological treatment of the ADHD disorder in a teenage girl can be supported by using an interactive application to facilitate emotional awareness.

In order to determine if this statement was correct we looked at the interview conducted at the end of test two. The social workers were asked if the information was useful in their day to day work with the girl. To this it was clearly stated that it would be a huge benefit if a program such as this were to be available to them permanently. It would help them develop a better understanding of the girl which in turn would benefit her greatly since they would be better suited to assist her. Also with information such as this they would be able to keep track of her progress and document this effectively which would benefit them greatly when doing their semi annual reports on the girl.

This means that the first hypothesis can be confirmed based upon the input from the social workers. They must be considered experts and therefore they are ideal to determine this.

As a side effect it was noted that trusting the girl with a tablet resulted in her showing great responsibility and respect for it. This in itself supports the girl and lets her prove herself which in turn helps her develop herself image. This is potentially very beneficial for her and combined with the information from the social workers the first hypothesis is confirmed.

The second hypothesis stated the following:

# Existing emotional states of a user can be deducted by following a psychological model structure in a program framework

To answer this hypothesis a comparison of the data, comments, diary and the information gathered from the social workers must be conducted. The important thing was to determine if the data corresponded with the comments made. If this was the case then there was reason to believe that the hypothesis could be confirmed.

As explained in the test result section of test two [see section 2.4.2] the social workers did not keep track of the exact times when mood swings occurred. However they informed that mood swings did occur, which means if the data and comments confirm this the results should be positive.

As the test results showed the application had an approximate error rate of 14%, which if confirmed is very acceptable. However it is important to take in consideration that this project only had one test person. In

order to confirm these results and determine if the hypothesis is valid additional testing must be conducted.

That being said looking at the information gathered from the interview with both social workers and user, and comparing this with the results from the application there is reason to be optimistic. It seemed that the program was able to plot the correct route through the revised OCC model, but as stated before this cannot be confirmed without additional testing on several users.

The final hypothesis stated:

# Information about the emotional state of a user provides a base for better communication between users and supervisors

The interview following the final test clearly stated that the sort of information gathered from this application can be used in the assessment of the children. It is fair to assume that with added information about the child's emotional state the social workers have a better foundation for communicating with the child.

According to the interview the program can help them figure out where the problem is instead of having to ask her multiple questions in order to locate the problem. This should hopefully lead to a better treatment of the girl since their time spent together will be used more effectively.

This means that the hypothesis can be confirmed as long as the program is able to collect the correct information.

The conclusion then of this project must be that as a prototype the program was able to fulfil the desired goals to a satisfactory extent. The results were good however further testing must be conducted in order to confirm the results.

## **3.3 Further Development**

In the discussion in was mentioned that the redesigned OCC model could use some re-evaluation. As noted it did not make sense to include the Likert Scale option over a valenced choice, however there are other parts of the model that could. It would be interesting looking at a way to include the compound emotions that we have excluded from the new model. While these emotional states are based on the so called prime states, they still cover an emotional area, where the prime states may lack sufficient relevance. E.g. as an situation where "love" may be more accurate than "admiration".

The simple solution to this would be to include questions that are specifically designed to draw out these compound emotions, in the last tier of the program. E.g. if the user is already on the "admiration" path, then additional questions could lead towards "gratitude" (admiration + joy) or "love" (admiration + liking). However the problem with this example (and other paths) is that "liking" for example is not considered an emotional state in the original OCC model, but a positive path choice tied to the "aspects of objects" branch of the model. So any re-evaluation of the model would have to deal with both compound emotional states

and also the inclusion of the positive/negative path choice in the original models third tier [see Appendix B].

To develop the program further, it could be interesting looking at a better way to get the information regarding the user's current state, to the social workers on a daily basis. As we found out they have limited knowledge of computer use, and as such the solution needs to be simple and easy to use. One option is to create a separate program on the tablet, that can be opened and then display the affective pictures to the social workers. As established in the interview with the girl, these pictures should be easy enough to understand once the users get some experience with them.

Another option is to create a system in the application that can upload the data to a server on the internet, and create a webpage where the social workers can see the information about the user. With this solution the social workers can see the information as soon as the user completes the event, if the tablet is connected to the internet. Compared to the idea with a separate program on the tablet, this solution does not require the user to hand over the tablet, which might lower the privacy element of the tablet.

Making a website also enables managing several users at once, should this be preferable. E.g. if the program is used by several people, the website could feature a system that could manage information from many programs at once. This way the social workers could keep updated with several of their residents' status at the same time. To keep the privacy of the diary intact, the system could only feature the affective pictures of each event, for each user, along with input from the questions of the events.

Including more people for future testing would be a good idea. As the social workers mentioned in the interview, it might be interesting finding a subject that is more homogenous and maybe also of the opposite sex, to see if it has any influence on the results. If further test were conducted, the content would also need to be renewed in some way during the process, to avoid the users growing bored with answering the same questions.

For a third iteration the project should either:

- a) Focus on making a system solution with the network implementation and a single user, and then test the influence on the social workers. Looking at how the program could support their treatment of the user, and how and when they would use the webpage information. E.g. would they only use it when there was a specific emotional state in the user, or continually throughout the test period.
- b) Focus on several users and less on the network part. Here the focus could be placed on conducting the test with several different people, and comparing results against another. It could also feature longer testing periods, to analyze the need for content updates.

For the project authors solution A would be more attractive. Mainly because there is a big interest in getting more precise information about how exactly the program can support the social workers in their treatment of the users.

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## Appendix A

## **Project Terminology**

A list of terms and abbreviations used throughout the project report.

24 hour institution: A institution where children lives under constant supervision

ADHD: Attention Deficit Hyperactivity Disorder.

Aetiology: Why the disorder occurs or what precedes the disorder.

APA: American Psychiatric Association.

CAMHS: Child and adolescent mental health services

(Child) neglect: Psychical or psychological neglect of a child

Comorbidity: A disorder can have comorbidity with another, meaning there is a higher chance one disorder will affect the person if the other is already doing so.

DSM: Diagnostic and Statistical Manual of Mental Disorders.

ICD: International Classification of Diseases.

NICE: National Institute for Health and Clinical Excellence

NOS: Not Otherwise Specified – A subsystem of disorders that does not fit the official specified diagnoses.

Prevalence: The frequency of the problem occurring.

Social worker = The pedagog in charge of supervising the girls

Valenced choice = positive or negative choice

WPA: World Psychiatric Association.

## **Appendix B**

## The OCC model



Grey		z(XX)	(z)	(z)XX		(x)	XX							
Black		X(z)	(y)z			×					y			
White										XX			XX	
Pink	Z													
Rosa									X(y)					
Cyan	(x)				((XX))									
Orange	۷											XX		
Brown				Z	(y)						×			
Purple	(z)	y												
Blue		y			XX									Z
Green								λx		(x)				(z)
Yellow	x(y)											Z		
Red			XX						y			(XZ)		
						_								

Depressed

Innocent

Excited

Sick

Strong

Peaceful

Fearful Hopeful

Loved

information from surveys including many people in a certain category. In this case teenagers and children. In the articles these are included as E.g. the emotion "happy" are in article X primarily linked to the colour yellow, but have a second highest percentage in cyan. For Y, orange is The above table present the data from research articles concerning the mapping of colours to emotional states. The articles present this percentage of the total amount of participants, but for this table only to two or three highest percentages are included. the main response, and yellow second highest etc.

These are the corresponding sources:

X = "Relationship between colors and emotion: A study of college students" – Kaya et al. – University of Georgia

Y = http://danskundervising.wikispaces.com/file/view/Farvesymbolik.pdf

Z = "Children's emotional associations with colour" – Chris J. Boyatzis et al. – California State University - The Journal of generic psychology v.155 - 1993

# Appendix C

## **Compiled research colour theory**

Emotions

Happy

Sad

Angry Bored Calm

# Appendix D

Treatment plan

## **Appendix E**

## Guide to social workers Program Vejledning

Følgende giver en kort introduktion til intentionerne bag programmet og hvordan det er opbygget. Programmet er som i første test baseret på en række spørgsmål brugeren skal besvare en gang daglig (helst). Til forskel fra første test er spørgsmålene denne gang baseret på en psykologisk model over følelser, revideret fra den kendte OCC model. Output af programmet skal således være en følelsesmæssig respons på begivenheder eller agenter (andre personer). Den reviderede model kan ses på sidste side.

I programmet gennemgår brugeren 4 begivenheder fra dagligdagen. I dette tilfælde skole, mad, søvn og fritid (aktiviteter). For hver begivenhed skal brugeren svare på følgende

- positiv/negativ respons til begivenheden
- om begivenheden drejer sig om brugeren selv, eller andre
- hvordan brugeren håndterede/opfattede begivenheden

Disse spørgsmål er opsat med lettest mulig ordvalg, og i hvert sin trin.

Trin 1 er en skala hvor brugeren bliver tvunget til at svare positiv eller negativ til begivenheden. For exempel: "hvordan gik skolen i dag?" -> a) meget dårligt b) dårligt c) godt d) meget godt.
Dette trin sikre at brugeren bevæger sig gennem trin 2 i OCC modellen.

I trin 2 kan brugeren vælge imellem sig selv, eller andre. F.eks. hvis god respons til maden er pga. andre, skal brugeren vælge andre. Er det fordi maden smagte godt, vælger brugeren sig selv. - Dette trin forholder sig til OCC modellens tredje trin.

Trin 3 giver brugeren specifikke spørgsmål til begivenheden. Disse skulle gerne give en ide om hvad begivenheden drejer sig om, og dermed udsigterne for samme. Har brugeren f.eks. valgt "andre" i trin 2, skal spørgsmålene i trin 3 give en ide om hvorvidt brugeren er enig eller uenig med begivenhedens udfald. Har brugeren valgt "mig selv" i trin, skulle spørgsmålene gerne give udtryk for hvorvidt udsigterne for brugeren er favorable eller ej.

- Svarer til trin 4 i modellen.

## Det skal siges at disse trin måske ikke fremgår særligt tydeligt. Dette er selvfølgeligt dilemmaet ved at simplificere noget som er relativt kompliceret til at starte med. Men vi er yderst interesseret i alle kommentarer angående både teksten i programmet, og opsætning.

Ved slutningen af programmet fremstår et billede samt dagbog/kommentar felt, hvor brugeren frit kan skrive i. Billedet kan f.eks. se sådanne ud:



Ovenstående billede er en repræsentation af svarende i de forskellige trin.

- Baggrundsfarve repræsentere det positive/negative valg i trin 1.
   Hvor a) er violet b) blå c) grøn og d) gul.
- Ikonet i midten er selve begivenheden som spørgsmålene drejer sig om
- Figurerne ved bunden af ikonet er valget mellem brugeren "selv" eller "andre".

# Ovenstående billede kan dermed tydes til: *Begivenheden drejer sig om mad og andre personer, og brugeren er glad.*

For at gøre det nemmere at tyde disse billeder printer programmet en kode ud i slutningen af alle begivenheder. Det vil sige at i løbet af en dags spørgsmål, bliver 4 koder printet. Ved at se koden i XML filen på Galaxy Tab'en kan denne sammenlignes med kataloget her i program vejledningen, og brugerens nuværende tilstand kan dermed afkodes (så at sige).

#### For at abne XML filen gør følgende:

- Tilslut Samsung Galaxy Tab til en Windows PC, når den er tændt.
- Fra Galaxy'en vælg "tilslut som lagringsmedie" fra drop down menuen i toppen af skærmen. (bevæg fingeren fra toppen og ned for at åbne denne menu (når tab'en er låst op)).
- Fra "min computer" i Windows PC, naviger til mappen: ?://prototype.xml (hvor ? er drev bogstav)
- Åbn XML filen i Explorer eller lignede program

### Igen mange tak for hjælpen med testen :)

Mvh.

Gruppe 111037

Medialogi, AAU.

## Billede Katalog:






