Design Implications for Free Fitness Apps to Promote Physical Activity

Masters in Computer Science

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1 Abstract

In this project, the exercise habits and use of fitness technologies of young people (age 20-39) in Copenhagen will be examined. The project follows the Double Diamond Design process, to create prototypes that are a result of a thorough understanding of the target group and their context. SCOT (Social Construction Of Technology) will serve as the theoretical framework that will be used to understand the users' perception of certain technologies and how the use of IT develops in general. Behavioural change techniques will describe ways in which apps can motivate users to exercise consistently. After an analysis of competing platforms, a workshop and two usability tests, five design implications for the design of free fitness apps for young people in Copenhagen will be created and explained. These are; 'Importance of community', 'tracking and competition as a motivational factor', 'the importance of emotional impact in use', 'managing perceptions in target the group with closures and features' and 'flexibility for a diverse user group'.

2 Introduction

Obesity is a rising issue in Denmark, with it potentially reaching a level of 66% percent of the country being overweight in 2045 if the current development continues (Frederiksen & Lund, 2019). Furthermore, being overweight correlates to having a lower income in high income countries (Hruby et al., 2016).

Higher levels of physical activity are shown to prevent weight gain (Hruby et al., 2016), but with rising prices of gym memberships (Prip, 2022), the issue of obesity amongst low income groups could increase. In Denmark, the average income of workers is at its lowest when people are young and rises as one ages (Valentin, 2022). Furthermore, the use of fitness is largest among young people (DFHO, 2020) and people in Copenhagen (Wittig, 2017). Therefore, young people in Copenhagen could be affected as a result of these rising prices. The Health and Fitness app category's top ten apps alone amassed over three hundred million downloads in 2022 (Ceci, 2023). The use of fitness apps is most widespread amongst 20-29 and 30-39 year olds (39 & 41%) (Eflein, 2019). This suggests that this might be an avenue to increase physical activity levels and thereby combat weight gain amongst young people (age 20-39) in Copenhagen. Throughout Copenhagen, free fitness parks are publicly available (Københavns Kommune, 2023). The apps connected to the paid fitness centres have more

downloads than the app connected to the free fitness parks (more than ten thousand vs more than one hundred thousand downloads, checked 03-14-23 in google play store) which suggests room for development to bridge this gap and increase the use of the free fitness parks.

During this research project, the exercise habits and use of fitness technologies will be examined to find ways to bridge this gap with app design. This will be done by conducting a design process, in compliance with the Double Diamond Design model, where the use context will be examined and prototypes will be tested to try and understand the users' interaction with technology in an exercise context. An understanding of behavioural change techniques and their use in fitness apps, will help shape the prototypes. Additionally, Nielsen's ten heuristics for user interface design will add knowledge that will aid in the analysis of existing apps, in the first analysis section. Observations and input from a workshop and usability test, of the current app used in conjunction with the free fitness parks, will be gathered and grouped in an affinity diagram to gain an overview of trends in the data collected. This will be described in the second analysis section. This, combined with existing research on the Danes' exercise habits will give a foundation from which a well reasoned prototype can be created and tested in the last analysis section. All these activities will allow a number of design implications to be created, that indicate what important factors there are when designing a fitness app for young people in Copenhagen.

3 Research Question

Now that the problem has been described, the main research question will be presented:

What are important factors to consider when designing a free fitness app for young people in Copenhagen?

This research question will be the north star of the project, the guiding light. It will be answered by drawing upon existing research and theory for background knowledge as well as conducting research with young people in Copenhagen. This is done to understand the

context and interactions of their use, to externalise important factors to consider when designing fitness apps for them.

4 Thesis Reading Guide

This thesis will have a starting section, explaining theory and methods used in the project. This will be followed by three analysis sections. The first analysis section discusses competing fitness apps using relevant theory, to gain an understanding of the domain before designing prototypes that can be tested to understand interactions with the user. To deepen the understanding gained from the existing research and first analysis chapter, the second analysis chapter will examine important points further and in a qualitative manner. The chapter contains an explanation and rationale of the practical execution of a usability test and a workshop. The insights from these will then be concatenated and sorted by headlines in an affinity diagram. The last part of the chapter will then be an analysis of those points using relevant theory. The last analysis chapter is another usability evaluation using a prototype created with insights from earlier analysis chapters and theory in mind. The feedback, in the form of a user created sketch is then presented and points drawn out from it. Lastly, a discussion outlines the major insights gained about free fitness apps throughout the report and reflects on the methodology used in the project. All of this will be outlined in a shorter format in the conclusion.

5 Related Research

Here, an integrative literature review will be conducted to figure out how to create a free fitness app that supports a fitness routine and engages users. This is due to the nature of the problem being quite specific and the amount of research that has been done within the specific niche being somewhat limited (Angosto et al, 2020, p. 17). Research that specifically discusses fitness apps, as well as research that covers important issues when maintaining an exercise routine will be drawn upon. That covers both aspects behind the design of fitness apps as well as the motivational aspects behind exercise routines.

5.1 Fitness Apps

A systematic review of 13 studies on the intention to use fitness and physical activity apps described the field of study as emerging (Angosto et al, 2020, p. 1). The development in technologies and increase in studies within the subject showed the increase in relevance due to fitness technologies being produced on a wider scale and gaining popularity (ibid). The number of studies is still limited, however. Furthermore, the studies conducted had some methodological deficiencies meaning that more systematic research within the area is needed to better understand the context of and intention behind the use of these technologies (Angosto et al, 2020, p. 17).

Multiple studies regarding fitness apps, focus on the use of behavioural change techniques (BCT). Behavioural change techniques are 'Coordinated sets of activities designed to change specified behaviour patterns' (Michie, S. *et al.* (2015)). One such study was centred around the review of 64 fitness and health apps, with an interest in examining the use of BCT's within those apps. It found that an average of 5 out of 24 BCT's were used in the apps and that this did not differ amongst paid and free apps. Self-monitoring, providing feedback on performance and goal setting were the most frequently used BCT's. These were similar to BCT's most frequently used in other types of physical activity promotion interventions (Middelweerd, A. et al., 2014, p. 1). Another study (of 64 out of 1680 health apps, chosen on use of gamification as inclusion criteria) found that feedback and monitoring, goals and planning, reward and threat and self monitoring of behaviour were amongst the most frequently used BCT's amongst health and fitness apps (Edwards, E.A. et al., 2016, p. 1).

5.2 Consistency in Exercise Routines

Another thing to examine, when discussing fitness apps, is the motivation behind maintaining a consistent exercise routine. A nationwide study regarding the Danish population's exercise habits show the current state of, as well as the motivation behind their exercise habits. The study is based on the answers of over 180 thousand informants. The study concluded that the amount of people that live up to WHO's minimum standard for physical activity is low, at 42% (SST, 2022, p. 5 & 14). Furthermore the amount of physical activity is lower amongst people with shorter educations and those out of employment, compared to people with longer educations and employed people (SST, 2022, p. 14). Lower physical activity levels and higher levels of obesity are some of the reasons why social inequality leads to higher risks of

diseases for people with shorter educations and people in unemployment, according to the study (SST, 2022, p. 16). Furthermore, a Danish study from Syddansk Universitet, in 2021, based on survey answers from 163 thousand adult Danes, examined their exercise habits. It concluded on four key motivational factors behind their exercise habits. These were health, the enjoyment of specific activities, well being and community (Ibsen et al., 2021, p. 73).

6 Research method(s) and design

Throughout this project, a number of methods were used to gain knowledge that will aid in answering the research question. Firstly, using prototypes as a research tool will serve as the overarching method of the report. Namely, using prototypes as research archetypes will allow them to be used as vehicles to draw knowledge about free fitness apps in general. To create and evaluate prototypes, the Double Diamond Design model serves as a framework through which one can shape their design process. The design process has phases for understanding the problem and subsequently creating solutions based on that understanding. The integrative literature review allows one to draw on different fields of research to understand areas of interest. The futures workshop and usability test will be methods used for data collection during the design process. Lastly, the affinity diagram will be used as a method to get an overview of the collected data and to spot trends in the data.

6.1 Prototyping in Design Research

Prototypes can be used in a design project, to raffine an idea or a concept through testable iterations. Prototypes can also be used in design research, as a research subject. One can also consider what specific information (Role, Look & Feel & Implementation) that will be looked for when evaluating prototypes.

6.1.1 Roles of prototypes in Design Research

Because design research examines designs and the process for designs, it often involves prototypes in its research. Matthews and Wensveen focus on "the roles of prototypes for vehicles of research".

When examining how to design aesthetic interactions, for example, one would likely have to design something to be able to present a convincing answer. Here the design research requires some form of design practice (Matthews et al., 2015, p. 2). The line between design and research practice is blurry, therefore requiring a distinction. When a prototype is used as a vehicle for research and not furthering a design, different properties come into view (Matthews et al., 2015, p. 3). Matthews and Wensveen describe these properties in different roles that the prototype can play within design research. Roles 1, 2 and 3 describe different functions of the prototype in research. Role 4 treats the process of prototyping as a vehicle of inquiry. Our focus will be on the prototype itself and not the design process and therefore we will explain those only.

6.1.1.1 The Prototype as an Experimental Component

In the first role, the prototype itself is often the subject from which one can seek design knowledge. Examples could be usability tests or accessing attributes, such as aesthetics (Matthews et al., 2015, p. 4). The prototypes are designed to show specific, design relevant relationships that can be tested by people using and evaluating the artefact. In some cases, the prototype is a physical hypothesis, where its form, function, interactivity etc, embody some theory that can be tested (Matthews et al., 2015, p. 6).

6.1.1.2 The Prototype as a Means of Inquiry

A prototype can also be used as an instrument to record and collect empirical data. An example used is a device that was used in homes as a communication device, where it also collected data about the use of it. The idea is not to test anything specific, rather it is to explore a design/use space, when there is limited information about it (Matthews et al., 2015; p. 7-8).

6.1.1.3 The Prototype as a Research Archetype

The prototypes can also be used as physical embodiments of concepts or design spaces. The prototype's role is exemplary. It embodies research concepts that have a broad application, but also needs specific examples to show why it could be a contribution to the research (Matthews et al., 2015, p. 8-9).

6.1.2 Role, Look and Feel and Implementation

Houde & Hill's terms for prototyping testing, defined in their paper "What Do Prototypes Prototype" will also be used.

They define prototypes as representations of (design) ideas. Furthermore, they have defined a model, describing three areas that can be the subject of testing (Hill et al, 1997, p. 1-3).
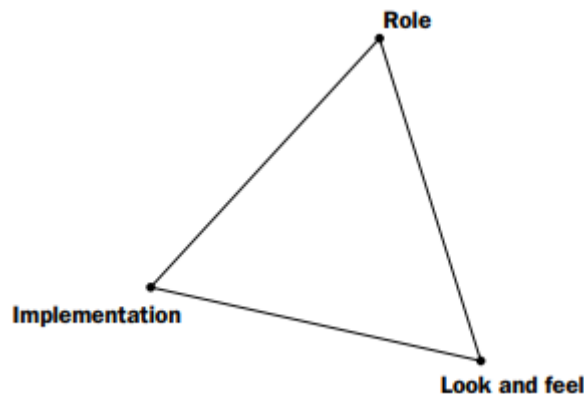
Figure 1: Role, Look and Feel and Implementation (ibid)

The model includes three dimensions (figure 1).

'Role', 'Look & Feel' & 'Implementation'. They describe different aspects that are important in the use of interactive technologies. We will now describe each of these.

'Role' describes the role that the artefact plays in the life of the user. 'Look and feel', is used to look at the designs' more superficial/aesthetic features. How the artefact looks and feels as opposed to the concept in itself. 'Implementation' regards the actual implementation of the artefact. Methods for implementation can be tested within this dimension (ibid).

6.1.3 Fidelity and Resolution

Throughout an iterative design process, several prototypes can be created. To measure the degree of development, the terms fidelity and resolution exist. Fidelity describes the degree to which the prototype is close to the final design. Both visually and in terms of functionality.

Resolution represents the degree of detail. The prototype is measured on how detailed it is (Hill et al., 1997, p. 3).

6.1.4 Prototyping as a Research Tool in This Project

Prototypes will mainly be used as a research archetype within this project, as an exemplary prototype with which the use of fitness apps can be explored through evaluation of the interactions with it.

6.2 Double Diamond Design Model

The Double Diamond Design model describes different phases in a design process. This helps designers gain an overview of the process and to have a specific focus throughout the different phases.

Two main thought patterns are described, divergent and convergent thinking. Thinking broadly and considering multiple options versus narrowing in on key issues. These thought patterns are used throughout the four phases of the model; Discover, Define, Develop og Deliver (Design council, 2007, p. 6).
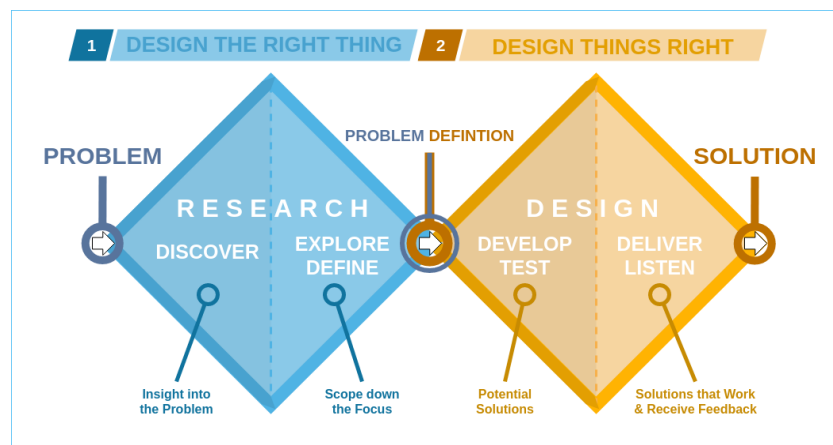
Figure 2: The Double Diamond Design Model (image by DIGI-ark, via Wikipedia)

6.2.1 Discover

The 'discover' phase is the first phase of the model, where designers explore a problem/domain. It is characterised by divergent thinking, by exploring widely to find key areas to investigate further. These areas are found by examining the problem area and the target group of the design. Market and user research helps designers understand current trends and user needs, which can be addressed in the following phases (Design council, 2007, p. 8-13).

6.2.2 Define

The second phase of the model is where we identify and define key problems that could be solved with a design solution. This phase is convergent, where the wide data collection of the 'discover' phase must be narrowed down to concrete problems. The 'discover' phase

establishes the existence of a problem/opportunity, whilst the 'define' phase's purpose is to understand the problem further. This includes the context of the problem, such as competitive designs and social and economic conditions surrounding the problem/domain (Design council, 2007, p. 14-16).

6.2.3 Develop

During the third phase, called 'develop', a divergent approach is used to explore possible solutions. The problems defined in earlier phases are addressed with solution proposals, through design development methods such as brainstorming and prototyping. The phase should result in a concept that is ready for production, final testing and evaluation (Design council, 2007, p. 19-23).

6.2.4 Deliver

'Deliver' is the final phase, where final testing and evaluation takes place before implementation. The convergent thinking that defines the phase allows the designers to further develop the concept/solution with feedback from users. This then leads to the implementation of the solution (Design council, 2007, p. 24-25).

6.2.5 Double Diamond Design in this project

The double diamond design model provides a framework, within which a design process can take place. When trying to understand how free fitness apps can be designed better, an overarching design method helps get an overview of the process. Additionally, the phases lend themselves to understanding the domain and nailing down a concept (role of the design) which answers the needs of the users and fits within the context. This focus on the wider context and understanding of users is in line with SCOT's understanding of the development and use of technology. Here the wider context and relevant social groups are important factors for the social construction of technology.
Furthermore the look and feel can be evaluated during the last two, development oriented, phases.

6.3 Futures Workshop

A futures workshop is a method for collecting data about a problem and ideating solutions or futures. A facilitator draws upon the experience of informants to understand the problem as it is currently and what possible new directions could be explored. In preparation for the workshop a goal must be set, as well as the selection of participants. The workshop itself consists of four parts:

1. The preparation phase, where post-its, pens and participants are gathered.
2. The critique phase, where the problem area is discussed and critically examined.

3. The fantasy phase, where visions of a different future or solutions are discussed.

4. The implementation phase, where solution suggestions are reviewed and a solution can be found (Lauttamäki, 2014).

In this project, a futures workshop will be carried out, to gain the perspective of the target group of users, when creating design implications. The workshop format means that both the perspective of the current use and future possibilities will be explored. In relation to the Double Diamond Design model, it also helps the project transition from the examination of the problem in the first two phases, to the exploration and development of solutions in the final two phases.

6.4 User Based Usability Test

The usability test can be used to examine the interaction between a user and a user interface. A user based usability test is centred around the user and their use of a prototype. Representative users will be given a set of representative tasks to complete, from the test facilitators. The goal of the method is to analyse the prototype and find potential usability problems from a user's perspective (Feng, p. 271-273). Usability as a concept includes efficiency, effectiveness and satisfaction (Hartson et al., 2012, p. 10). The tests can take place throughout the design process. Formative tests in the earlier stages of a project can help shape a product design. These can be less formal, with more interaction between the facilitator and the user. The focus is on how a user perceives elements of the interface, rather than how well they perform tasks. A summative test is used later on in the process on prototypes with higher fidelity, where the concept of the design is already decided upon. The focus here is on how effective a user can be when performing tasks (Feng, p. 271-273).

6.4.1 Think Aloud Technique

The think aloud technique is used to add to observations during an evaluation or test. Whilst performing tasks and interacting with the prototype, a user says their thoughts out loud, giving the facilitator an insight into their rationale, perspectives, likes and dislikes (Hartson et al., 2012, p. 440).

6.4.2 Testing for UX and emotional impact

During evaluations, an important factor should be the emotional impact of a prototype on a user and not usability and usefulness alone (Hartson et al., 2012, p. 616). This is especially important since users today are not satisfied with efficiency and effectiveness alone. To stand out amongst similar usable and useful products, the product must spark an emotional impact. The interaction should spark pleasure, fun or a sense of novelty and aesthetic pleasing (Hartson et al., 2012, p. 24).

6.4.3 Usability testing in this project

We will use usability testing and emotional impact to evaluate prototypes throughout the process (Hartson et al., 2012, p. 6-10). This will add to the understanding of how the user interacts with free fitness apps and what important factors are in this regard.

6.5 Affinity diagram

An affinity diagram (Bødker et al., 2008) is a method where all the points collected through interviews or observations can be written down on post-its and grouped by a shared headline. Each grouping will have a headline that classifies the subject of the points that are written on post-its below it. The method can be used to get an overview of large data samples. In this thesis, the affinity diagram is used to group observations and points from the first usability test and workshop. This is done to spot trends and overarching trends in how the user group perceives the use of fitness technologies and exercising in general.

6.6 Literature review as a research method

A literature review creates a stronger empirical base for one to answer their research questions, than what would be achievable with a single study. This is because it gathers research from multiple studies, giving the study backing from multiple pieces of research, rather than just one. This can also aid in the researcher finding areas for further research, as it can show gaps in the current knowledge base (Snyder, 2019).

6.6.1 Integrative literature review

In an integrative literature review, research can be gathered across different fields of research. This is especially helpful for areas that are not well researched or where the problem requires knowledge from different fields to solve. A research review of this nature can combine insights from different fields to create new conceptualizations and models (Snyder, 2019). In this project, the integrative literature review is a relevant method, as it can draw on multiple areas of research to concatenate useful knowledge. In the theory section, different aspects of a fitness app are explored. From the existing research section of this report, the use of behavioural change techniques suggests a need for behavioural psychology. This is combined with knowledge about the development of technology (SCOT) and design of usable user interfaces (Nielsen's ten heuristics) to address important aspects for fitness app development.

7 Theory

A range of theoretical tools will be used in this project to aid in the understanding and analysis of the specific domain that is being examined. As fitness apps often employ behavioural change techniques (Middelweerd, A. et al., 2014, p. 1) these will be outlined. The social construction of technology (SCOT) will be used as a theoretical framework from which the use and development can be analysed. Nielsen's ten heuristics will add some knowledge about the design of user interfaces which is relevant for the development and analysis of apps that have graphical user interfaces.

7.1 SCOT

SCOT is a theoretical framework and method that can be used to understand the development of technology. It sees technology as socially constructed and rejects a linear understanding of the development of technology. It argues that a linear development can only be constructed when looking back at it, seeing the emerging technologies as inevitable continuations of a running development (Jensen et al., 2008, p. 43). In fact, SCOT argues that when looking at contemporary technological development, many options could appear to have potential for success which serves as a counter argument for an obvious next step in a linear development. Different meanings and perceptions can shape the use and development of technology, as well as the technology itself. Therein lies the social construction. SCOT offers terms that

support analysis and the understanding of the use and development of technology. These terms and their relevance to this project will now be outlined.

7.1.1 Relevant Social Groups

The context within which a technology exists can contain several relevant social groups. These are groups of people that are relevant to the problem area and individuals who have a specific relationship with the artefact that is being examined. Certain social groups can be divided into smaller groups, each having a different set of meanings regarding a technology. The groups can give the technology a new meaning or purpose by the use of it or by influencing the design of it. The groups can consist of both users, developers of the technology or other relevant individuals (Bijker et al., 2012, p. 20-33).

7.1.2 Interpretative flexibility

The interpretative flexibility refers to the different ways an artefact can be used or perceived which can differ amongst different relevant social groups. The bicycle can be used as an example as it, in its early development, was used mostly by men since social norms prevented women from using it. As women often wore skirts and two wheeled bikes required the driver to spread their legs, it was deemed as inappropriate to use. Therefore bicycle riding was seen as a sign of manliness, which has since become a more gender neutral activity in terms of perception (Bijker et al., 2012, p. 33-37).

7.1.3 (Rhetorical) Closure

Rhetorical closures can be used to close a discussion surrounding a subject, to help stabilise the position of an artefact. This can be done when there is doubt or controversy regarding a technology by assuring a social group. If there is a safety problem with a technology, for example, a social group can be assured through marketing saying that it is actually safe thus making the problem 'disappear' from their perceptions (Bijker et al., 2012, p. 37-38).

7.1.4 (Closure by) Redefining the problem

Another tool for stabilisation of a technology can be through a redefinition of a problem, making it a solution. This does not necessarily solve the problem as a whole, but can do it in the perception of a certain social group. An example could be to say that holes in pants go

from being a problem to a solution, as a fashionable clothing item (Bijker et al., 2012, p. 38-39).

7.1.5 Wider Context

Lastly, the wider context of a technology and the relationship between the artefact and the sociopolitical environment surrounding it can be explored. The social and political factors surrounding a social group can shape their norms and thereby their perception of a technology and the meaning they give it (Bijker et al., 2012, p. 39-40).

7.1.6 SCOT in this project

SCOT's terms and understanding of the use and development/adoption of technology as socially constructed, will serve as a framework for analysis of the different factors, other than purely technological features, that are relevant for making a successful fitness app for young people in Copenhagen.

7.2 Behavioural Change Techniques as a Tool For Behavioural Change

Behavioural Change Techniques (BCT's) are a collection of systematic approaches that can be used as part of an intervention designed to change a behaviour. Behaviour change interventions can initiate or terminate a behaviour, as well as increase or decrease the amount a behaviour is carried out. Changing behaviours often include many complex factors, where BCT's can be a supporting force. BCT's specify the content of an approach, but not the way through which it must be delivered. Examples of BCT's include "Goal setting", "Self monitoring" and "Information about health consequences" (Johnston et al., 2013). As mentioned earlier, self-monitoring, feedback, reward and threat and goal setting were among the most used BCT's within fitness and health apps (Middelweerd, A. et al., 2014, p. 1 & Edwards, E.A. et al., 2016, p. 1) and will therefore now be explained.

7.2.1 Self-monitoring

A person undergoing a behavioural change intervention can use self monitoring as a method to monitor their behaviour (Michie et al., 2013). This could be in the form of a step counter showing the subject their daily number of steps. Self monitoring can also focus on the

outcomes of the behaviours rather than the behaviours themselves. An example would be weighing a person with intervals over a period of time to see if they are moving towards losing or gaining weight.

7.2.2 Goal Setting

The goal setting BCT is centred around setting or agreeing on a goal in order for a behaviour to be achieved (ibid). An example could be eating fruit each day, to meet public health guidelines. A goal can also target a specific outcome, as opposed to a behaviour. In that case, a wanted outcome of a behaviour is specified. Setting a weight loss goal of a certain weight for example.

7.2.3 Feedback

Feedback can also be provided on both behaviour and outcomes. Outcomes or behaviours are monitored and feedback is provided, pertaining to how the behaviour or outcome of a behaviour is in line with targeted behaviour/outcome (ibid).

7.2.4 Reward and Threat

There are a number of techniques used in the category of threat and reward that can be employed as BCT's. The wider categories of nonspecific incentives and rewards cover material and other rewards for behaviour or outcomes that pertain to a certain target. Incentive as a promise for reward can motivate an individual to change behaviour based on their efforts or results, where rewards are reinforcements promoting behaviours or outcomes that aid in reaching a targeted behaviour change. Threats can be future punishments or removal of rewards that an individual is informed of to promote a behavioural change (ibid).

7.2.5 BCT's Relevance to this project

BCT's are used as part of behaviour change interventions, often ones surrounding health. This is relevant for fitness apps, as one would want to increase the use of the app. This demands a consistent exercise routine, as it is the main purpose/use of the app.

7.3 Nielsen's Ten Heuristics for User Interface Design

During a prototyping process, Hill & Houde's terms for prototyping allows design practitioners to consider different aspects of the product throughout the design process. When

focusing on the look and feel of a prototype, design heuristics can serve as guidelines from which one can create or assess a design. The following are brief explanations of each of Jakob Nielsen's ten heuristics (Nielsen, 2020) for user interface design.

7.3.1 Visibility of System Status

The first of Nielsen's heuristics is the visibility of system status. Here it is mentioned that a system should indicate its current state by presenting feedback within a reasonable amount of time of actions taking place (ibid).

7.3.2 Match Between System and Real World

Another heuristic is the match between the system and the real world. The design should use language familiar to users and use conventions to ensure that information is presented in an easily understandable manner (ibid).

7.3.3 User Control and Freedom

The 'user control and freedom' heuristic refers to ways in which a designer can promote a comfortable user experience. This includes allowing users to exit or undo a process gives them a sense of freedom and comfortability when using the system (ibid).

7.3.4 Consistency and Standards

'Consistency and standards' as a heuristic describes how one can make use of industry standards to promote understanding in users. By following industry and platform standards, users have an easier time learning how to use the system (ibid).

7.3.5 Error Prevention

The 'error prevention' heuristic is about providing helpful constraints, supporting undo features and warning users to avoid slips and mistakes (ibid).

7.3.6 Recognition Rather Than Recall

The 'recognition rather than recall' heuristic is about reducing the information a user has to memorise by having important elements required for use visible or easily retrievable. Then a

user can recognize information or elements when being shown them, rather than having to remember them (ibid).

7.3.7 Flexibility and Efficiency of Use

'Flexibility and efficiency of use' is a heuristic that promotes flexibility and efficiency of use to better the user experience. Flexibility can allow different users to customise their use, so it fits with their tasks. Personalisation can be enabled by adjusting functionality and content to individual users. Furthermore, shortcuts can be provided to ensure efficiency (ibid).

7.3.8 Aesthetic and Minimalist Design

This heuristic refers to avoiding unnecessary elements or irrelevant information to ensure that the visual elements of the user interface support the users' primary tasks (ibid).

7.3.9 Help Users Recognize, Diagnose, and Recover From Errors

By using visual aids and precise, plain language to identify a problem and provide a solution to the user, a designer can help them 'recognize and recover from errors' (ibid).

7.3.10 Help and Documentation

Lastly, the tenth of Nielsen's heuristics is 'help and documentation'. Having searchable and precisely worded help and documentation can help users in understanding how to complete their tasks. It should be available when the users need it (ibid).

7.3.11 Nielsen's ten heuristics in this project

Nielsen's ten heuristics for user interface design add a theoretical perspective for user interface design. SCOT gives a perspective on the context around a technology and factors influencing user groups' perceptions whereas BCT's look at the psychological techniques to change behaviours. Nielsen's heuristics allows a more close look on the technology itself and the look and feel of it, rather than the role the technology might play in the context the users use it in.

8 Analysis

In the analysis, different apps in the fitness app space will be analysed, to figure out how competitors create their apps and what features are part of successful apps. Furthermore, a usability test and evaluation of Kompan's current app, which is a free app connected to the publicly available fitness parks in Copenhagen, will follow. The app and later prototype will serve as archetypal representations of free fitness apps, from which conclusions upon what works and what does not work can be drawn. Then, a workshop with ten participants will give insights into what motivates the target group to exercise and how they use technology in conjunction with their exercise routines. The analysis will end with a prototyping process, within which concrete insights into what user needs are in relation to free fitness apps connected to the publicly available fitness areas will be gained.

8.1 Competitors Analysis

To design a free fitness app for young people in Copenhagen, a run through of the current options will provide a foundational understanding from which to design from. For that, an analysis of three Danish fitness apps connected with physical equipment (Kompan, Arca & Fitness World) as well as an international fitness app with many downloads (7 minute workout) with no physical equipment attached or required will follow. This will deepen the understanding of the domain and current possibilities in similar apps, or apps that have similar features, to be able to ask informed questions in the following design workshop. Additionally it would aid in figuring out what factors could be in an app that gets a relatively high amount of downloads and satisfies users needs (after user involvement further on in the project).

8.1.1 An Overview of the Current Market

The people information act of Denmark means that the municipality of Copenhagen has to provide funds and facilities to sports. The law allows them to provide funds to partnerships to provide solutions to concrete issues (SST, 2018, p. 15). One of these partnerships, the municipality of Copenhagen has entered into is with Kompan (Københavns Kommune, 2023). Kompan is one of the world's largest playground and fitness facility providers, based in Denmark. They design, produce and install more than one thousand playgrounds and fitness facilities each month, across 90 countries. Multiple parks are publicly available across

Copenhagen, and their solution includes an app that can be used in conjunction with the physical equipment for free. In 2021, Kompan had a turnover of 2,4 billion kroner. Their customers span across, amongst others, municipalities, schools and theme parks (Mortensen, 2022).

Figure 3: One of Kompan's fitness facilities in Copenhagen (Københavns Kommune, 2023)

So whilst they are a financially successful company with locations worldwide, their app is not as used at fitness apps connected to paid Danish gyms. 'SATS' and 'Fitness World', two Danish gyms, both have apps with over 100 thousand downloads and ratings of 4,3 and 4,5 stars in the Google Play Store. As Apple does not supply download numbers, Google Play Store's numbers will be used. Kompan has three apps, all used in conjunction with their fitness parks. One for cardio and one for fitness, both with 10 thousand plus downloads and one using AR to see how their fitness park facilities would fit into your environment before purchase with over a thousand downloads. Their ratings are 3,5, 2,9 and 3 stars respectively (Google Play Store, checked 16-04-2023). The cardio app has to be used with some bikes that are attached to the fitness parks. These are, however, not available in Copenhagen (checked through app 16-04-2023) and this app will therefore not be considered.

Whilst Kompan can generate revenue through selling to municipalities, schools etc. their app, targeting users, is not as successful as the paid-for fitness chains. It further pales in comparison to international free fitness apps with a similar interface and functionality in '7 minute workout', which has over ten million downloads and a 4,8 star rating based on 391 thousand reviews (Google Play Store, checked 06-05-2023). A comparison of the different elements of the apps that could explain these differences in popularity will now ensue.

8.1.2 Social Features and Communities

As mentioned earlier, a Danish study (Ibsen et al., 2021) showed that community was an important motivational factor when it came to having a consistent exercise routine. Multiple apps employ social features, as well as the fitness gyms having exercise classes in the gym with signups happening through the app.
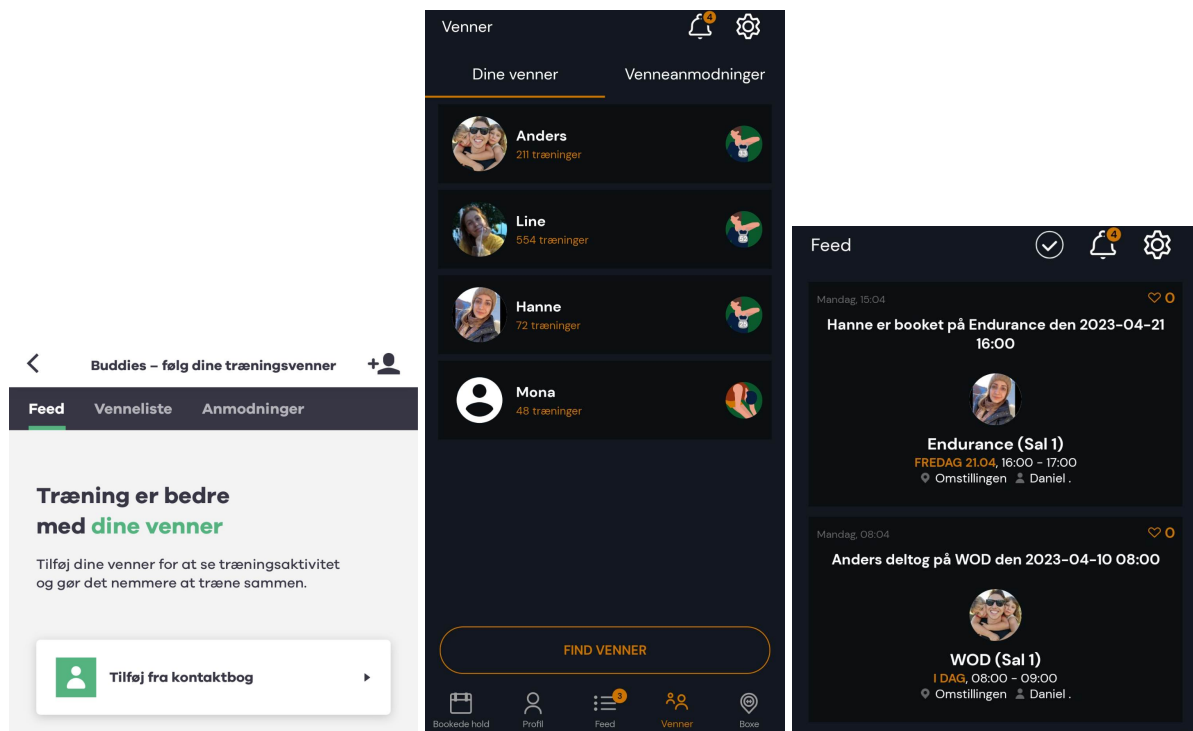
Figure 4, 5 & 6: Social features in Fitness World (left) and Arca's (middle and right) fitness apps

Both Arca and Fitness World have friend features, where users can add friends on the app to follow their exercise habits. In both apps, one can also see which exercise classes their friends are signing up to so they can join as well. This is a way in which fitness apps can support a community and interaction amongst users of their app or gym.

8.1.3 Training Features

Features that support training are also prevalent amongst the apps. The Arca app has features for signing up to classes, but not features in the app itself can be used as a tool during exercise. This is, however, the case for the other apps selected. These features will now be described and analysed using existing theory.
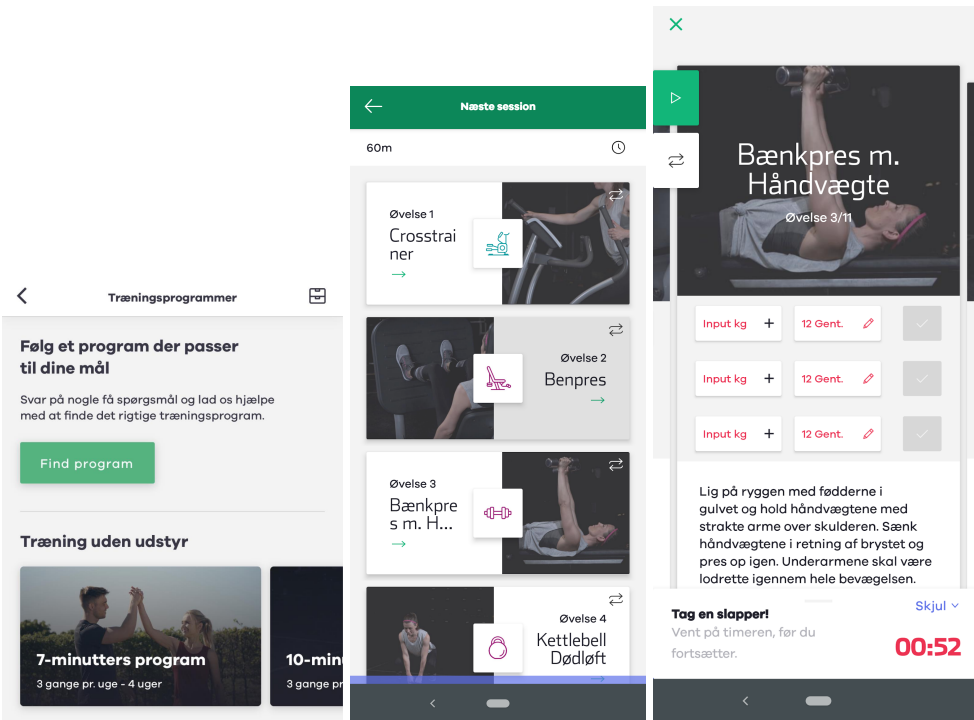
Figure 7, 8 & 9: One of the Fitness World's App's features is its use as a personal trainer, with fitness programs available.

First up is Fitness World's app which contains predefined programs (figure 7), with exercises (figure 8) that the users can use in the gym with the equipment available on the location. The user can then input the weights they used and the number of repetitions (figure 9).
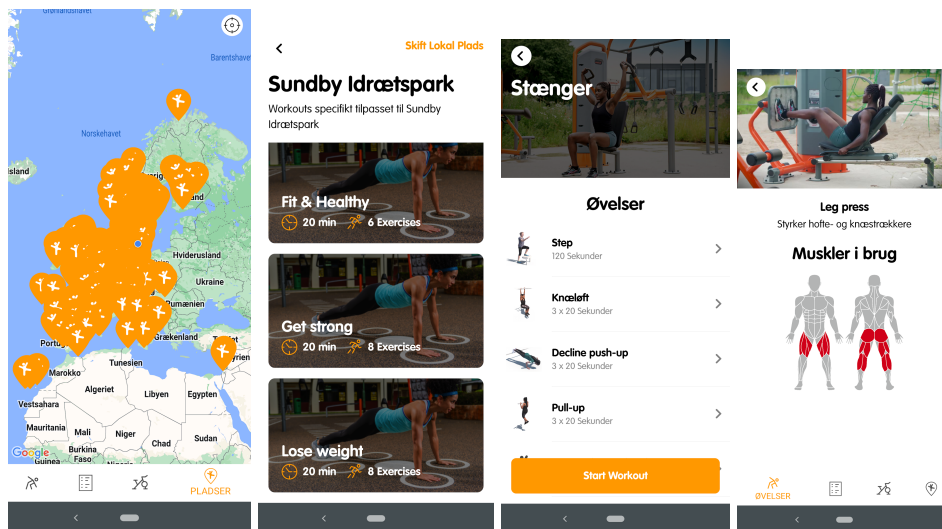
Figure 10, 11, 12 & 13: One of the Kompan's app's main features is its use as a personal trainer, with fitness programs available.

In Kompan's app there is a map where users can locate training stations (figure 10). Furthermore, users can choose exercise programs (figure 11) and see the exercises in the program (figure 12) as well as what muscles are used during (figure 13).
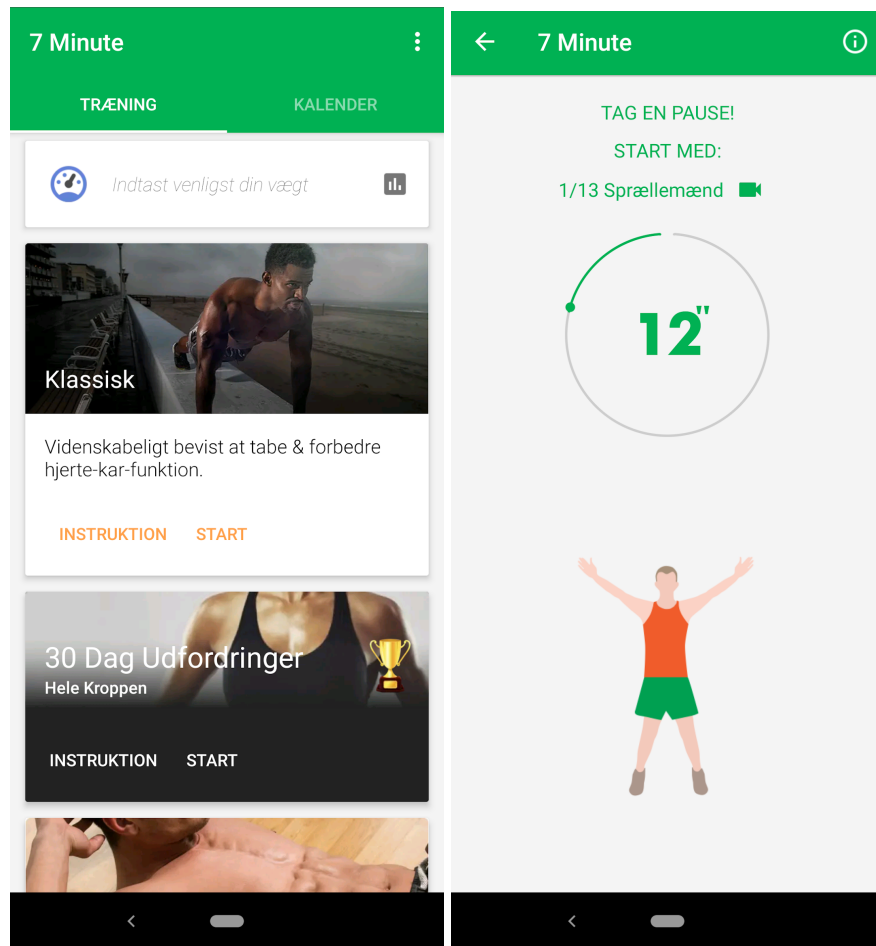
Figure 14 & 15: One of the 7 minute fitness app's main features is its use as a personal trainer, with fitness programs available.

In the 7 minute fitness app, there is a wide variety of different exercise programs to choose from (figure 14) and a screen whilst using the exercise feature with a countdown and a visualisation of the exercise that is to be performed (figure 15). The countdown as well as sounds indicate the system status as per Nielsen's heuristics. One can see how far in the process they are and when new actions must be taken. Furthermore, the screen is void of clickable buttons when exercising, leaving the users with a minimalist design, another of Nielsen's heuristics for a user friendly design.

8.1.4 Tracking Features

The apps chosen all employ some sort of 'monitoring' and 'feedback' or 'reward and threat' adjacent features. Features which correspond to BCT's and can be used to track or gain feedback on progress of either outcomes or on the process will now presented.
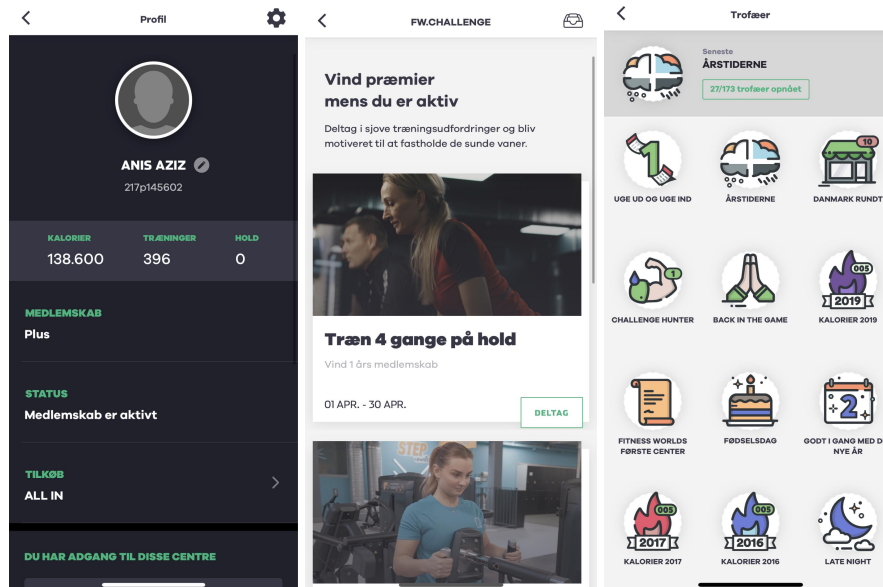
Figure 16, 17 & 18: Features from the Fitness World app employing monitoring and feedback/rewards.

In figure 16 it is shown how Fitness World's app has a section under their profile page, where users can see the amount of calories they have burnt and how many exercise sessions they have been through. This corresponds to the 'self-monitoring' BCT, within which users can monitor their behaviour to see if it contributes to them reaching a target behavioural change. In figure 17, different challenges are shown where users are able to sign up through the app and win rewards by succeeding. Here, a 'reward' can be used as an incentive for the user to change their behaviour. The challenge shown on the image gives the user a reward for exercising four times in an exercise class in the gym with a potential reward of a year of free membership. In figure 18, another form of rewards in the app is shown, with badges given as a reward for using the gym or burning a certain amount of calories.
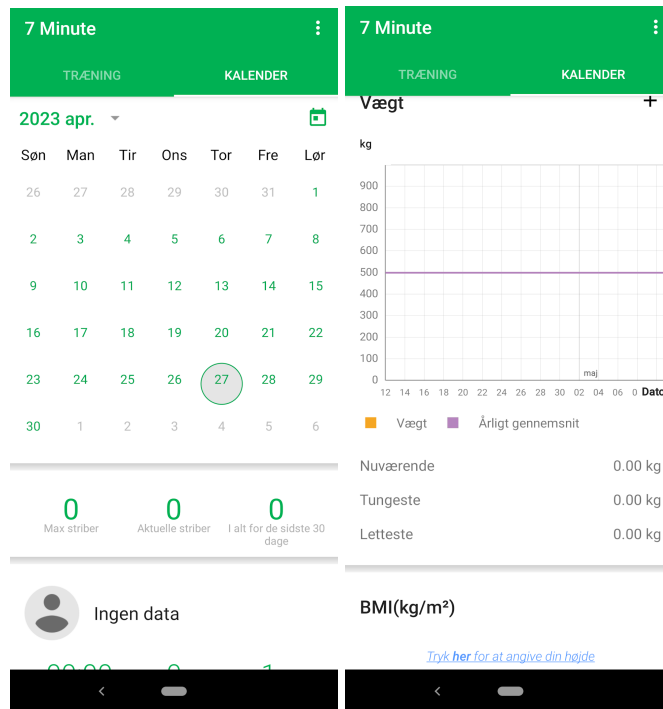
Figure 19 & 20: The 7 Minute Fitness app's tracking features

Within the 7 Minute Fitness app, the BCT 'self-monitoring' is also used. Here, the features support both monitoring of behaviour and outcomes. Behaviour can be monitored in the calendar (figure 19), where users can see how much they have exercised within the last thirty days, as well as when they have exercised within the last month. In figure 20, the outcomes of behaviours, in the form of a weight is shown. Here, users can type in their weight and track the progress of the outcomes of their behaviours, to see if they are going in the desired direction.

8.1.5 Wider Context and Opportunities

Increasing prices on fitness centre memberships (Prip, 2022) due to EU legislation (Løppenthin, 2023) comes in the wake of high inflation numbers, which leaves Danes with less money to spend (Fagbladet 3F, 2023). Herein lies an opportunity for free platforms, especially within low income groups (young people (Valentin, 2022)) that normally use fitness gyms (young people (DFHO, 2020) and people in Copenhagen (Wittig, 2017), where they have multiple facilities).

8.2 Current and Future Use from a User Perspective

Now that the current apps have been examined, a deeper dive into the surrounding context is needed as the development and use of technology is socially constructed, according to SCOT. The perceptions and relevant issues of the main relevant social group must be laid out. The

quantitative data and insights from the studies surrounding exercise habits and app use, give a general understanding of the problem. That supports the selection of certain areas of interest to examine further in a qualitative workshop and usability test. This can give a deeper understanding of the problem whilst still having multiple informants' input to ensure a more broadly applicable understanding of the problem is gained. This analysis chapter will start with an explanation and rationale behind the practical part of the workshop and usability test. The chapter will then end with a runthrough and analysis of how the insights gathered from those activities relate to one another and to relevant theory. This will be done using an affinity diagram as a way to gain an overview of the observations and insights from the data collection activities (workshop and usability test).

8.2.1 Future Workshop

To understand the current practice of fitness and use of fitness apps, a workshop with ten informants was conducted (see appendix 2). The informants were all part of the target group, young people in Copenhagen.
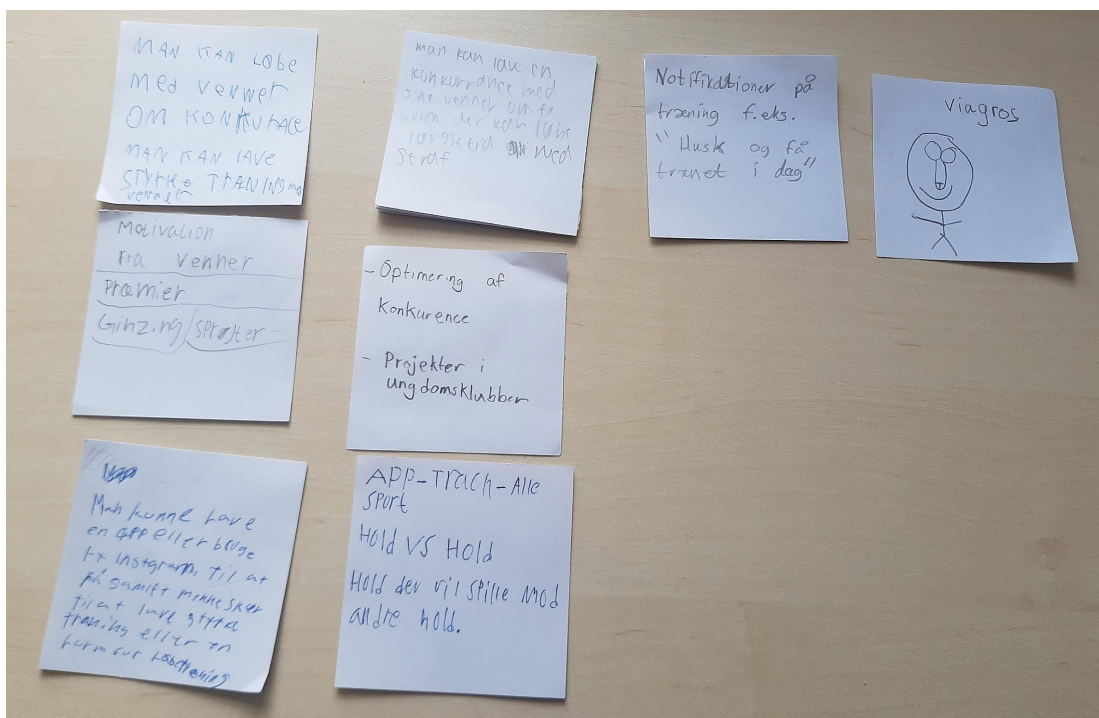

Figure 21: Image of post-its collected from the ten participants of the workshop, most in text form.

During the preparation phase of the workshop, snacks were prepared and post-its and pens were collected. For the critique phase, a number of questions had been prepared and were presented to the group for discussion. The open discussion as a medium brought forth conflicting answers where participants had to elaborate to explain and argue for their points. This facilitated users elaborating further on their answers and thinking about their answers. One point from a single participant could furthermore remind other participants of points they wanted to put forth, thus having points springing off the back of others' input.

For the fantasy phase of the workshop, a similar approach was used for a few questions, getting the informants input on future possibilities of exercise and technology, followed by a brainstorming session. Users were given post-its (figure 21) and pens and asked to write down ideas for how to promote exercise amongst young people in Copenhagen. Both ideas with or without technology were accepted as to not limit their ideation and depending on them having to think of creative ways of using technology. The concept or elements of their ideas could, whether or not they included IT, be relevant for a fitness app as long as the purpose of the ideas were the same.

During the implementation phase, the ideas were discussed in plenum and common ideas were agreed upon.

8.2.2 Usability Test of Kompan App

In conjunction with the workshop, a think aloud (usability) test of Kompan's current app provided some insight into the current use and needs of the users (see appendix 1). This was done with a user from the target group, in one of the publicly available fitness parks to understand the situated use in a real context. They were given limited instructions and a phone with the app installed. They were then told to carry out a workout using the app.

Figure 22: A user testing the app on one of Kompan's locations in Copenhagen

Here, the app serves as an archetypal prototype, as it is a tool that can be used in a realistic test to gather some knowledge about the interactions done with free fitness apps in general.

8.2.3 Affinity Diagram

To round up the 'define' phase of the project, an affinity diagram will follow. The focus of the define phase is mostly on the understanding of the problem and domain, which is one of the main areas of focus in the affinity diagram. The future workshop, however, gives a perspective to future solutions and towards the next phase ('develop') of the project. The diagram contains post-its with points from both the workshop and usability test. These points will then be outlined, explained and held up against existing research. The text written on the post-its in the affinity diagram are observations and points gathered through the usability test and workshop. Below the image of the affinity diagram (figure 23) are explanations of some of the most relevant and persistent points from the data collection activities, taken from the affinity diagram.

Figure 23: Affinity Diagram containing points from the workshop and usability test of Kompan's app

8.2.3.1 Perceptions within Relevant Social Group

As per the interpretative flexibility, the interest lies in the relevant social groups interpretation/perception of the technology. The perceptions within the group of informants differed slightly when discussing training in public. Some individuals saw it as a potentially awkward and uncomfortable setting to be in with people watching, whilst others did not regard it as an issue. Regarding the weather, however, all participants mentioned how that could be an issue. Both in the usability test and the workshop, informants mentioned how raining or cold weather could deter them from exercising outside, where the fitness parks are placed.

8.2.3.2 Feedback or Threat and Reward

A few informants mentioned competitions as a fun way to promote physical exercise. These competitions could end with a reward for winning or a punishment for losing. This is in line with BCT's often used in fitness apps (Middelweerd, A. et al., 2014, p. 1 & Edwards, E.A. et al., 2016, p. 1). Among them were 'feedback and monitoring on process or outcomes' and 'threat and reward'. In regards to 'threats and rewards', multiple workshop participants mentioned competitions with punishments for losers and prizes for winners were given a reward. For 'feedback and monitoring', the tracking of sleep and weight was mentioned as a motivational factor. This could be by seeing progress from monitoring outcomes in terms of weight or looking in the mirror and seeing progress as a result of exercise or dietary changes.

8.2.3.3 Community as a Motivational Factor

A recurring theme, within both theory, existing apps and the informants input, is community. Both ARCA and Fitness World implemented social features, where users could track each other's workouts and sign up for the same classes. Ibsen et al.'s 2021 study, which mentioned factors behind Danes' exercise habits, also mentioned community. This matches the main points of the workshop conducted with ten young people in Copenhagen. Under the community headline in the affinity diagram, the subjects mentioned accountability and social aspects. Accountability being how others depend on one showing up to carry out their sports or exercise routines. This was mentioned in relation to football training sessions and working out in a fitness gym with their friends.

As part of the discussion around social factors, multiple informants mentioned that Instagram or other social media were often used as communication tools to set up exercise sessions amongst friends or football teams. One of the design suggestions from the workshop also mentioned using Instagram or another app to gather people for running or resistance training sessions. This suggests that already existing apps could suffice as communication tools in the current environment.

8.2.3.4 Kompan App

The main issues occurring during the usability test of Kompan's app were with effectiveness and satisfaction/emotional impact. The user had issues figuring out where menu items were, as it was not "intuitive". In terms of satisfaction and emotional impact, the workout feature sparked dissatisfaction as it was clumsy to use because the user had to click through after each exercise and music not being able to play whilst exercising. This meant that the user had to have the phone in hand or close often and could not listen to music whilst exercising which was an issue. The user enjoyed the facilities but felt that the app did not offer much to add to the experience. It was mostly useful as an overview of different exercises that could be done with the equipment, but the lack of additional features, the clumsy user experience and lack of adjustability were the main issues. The lack of adjustability was an issue when the user could not carry out an exercise as it was too difficult, and there was no option to scale down the difficulty of the movement. Furthermore, the lack of options to customise an exercise routine/set of exercises would be an issue for experienced users wanting to put together their own routine to address their needs, according to the informant. In terms of Nielsen's heuristics, 'flexibility of use' and 'help and documentation', to address the non intuitive design, could be areas to address in a new app.

8.3 Prototyping and Evaluation

Based on the understanding gained of user needs and the market competitors in the prior two sections, an app prototype has been created and evaluated (see appendix 3). The rationale behind different design decisions as well as the features will be explained in the following, final, analysis section.

8.3.1 A Prototype Based on User Needs

Based on the input and feedback received in the 'define' phase of this project, the development and evaluation of a prototype will now be carried out in the 'develop' phase of the project. Input and feedback from user evaluations will give a sense of how members of the social group perceive the technology. Both in terms of the role it will play in their context as well as the look and feel of the prototypes. The prototype is of both low fidelity and resolution, with the resolution being slightly higher as there are a number of details present, of the app envisioned. The prototype is mostly thought of as an explanatory tool to give the

users a sense of the role the app could play in their environment. The prototype can be seen as both an experimental component and a research archetype. It can be perceived as an experimental component, because knowledge about the prototype is seeking to be found through evaluation of interactions with users. The prototype is, however, used as a means to gather knowledge about how to obtain good interactions with free fitness apps. It therefore serves as an archetype of a free fitness app, through which we are seeking to obtain knowledge about elements that spark good interactions. The important thing to examine and gain knowledge about is not the prototype itself, but free fitness apps, where the prototype created serves as a representation that can be tested with users.

8.3.1.1 Community, Tracking and Customization Features

Figure 24, 25 & 26: Community, tracking and customization features
in the powerpoint prototype

The representation of the app was created in powerpoint (figure 24, 25 & 26 and appendix 4), with clickable boxes linking to different slides. This was shown to the user on a phone, so that they could click through it like an app. This was done to mimic a real use situation. Implemented, was concepts that were shown to be important through theory and analysis earlier in the report. A team feature (figure 24), that allowed users to join a team and train together with their team and compete with team members. An option to create a customised

training program (figure 26) to ensure the flexibility of the app. As well as a tracking feature where you can see how one places compared to other users in their team (figure 25).

8.3.1.2 User Feedback

Figure 27: A user created representation of a suggested feature for finding exercise partners

To ensure user feedback that accurately described their needs, user sketching (figure 27) was used as a feedback method. The idea behind a sketch is to allow users to express their feedback and ideas in a very concrete medium. Abstract descriptions through the spoken language as a medium could fail to fully capture the details and message given by the user. In this case, the subject of the evaluation created a sketch representing a feature that could be added. It was mentioned in relation to users finding exercise partners. The prototype implied that this communication of finding partners would take place outside of the app, on social media, as per the workshop suggestions. The user, however, suggested an in app feature with a map where users could find other users nearby to exercise with (figure 27). Having an in app feature for finding other users would make it easier to find other users, especially for users who do not already know other (potential) users or have connections to such online.

Overall they enjoyed the features/concept/role of the app, but found the design to be very simple and not aesthetically pleasing. The features of the app sounded good to them at first glance, but due to the nature of the prototype being quite low fidelity the informant found it

difficult to judge definitively. Specifically the user enjoyed the simple design, which was easy to navigate as well as the team and customization features. Additionally the suggested feature of a sports specific training program, tailored to practitioners of a specific sport, garnered positive feedback. This feature was added to the prototype due to workshop participants mentioning how part of their motivation behind exercising (particularly resistance training) was to improve in their sport. This is also in line with one of Ibsen et al.'s motivational factors behind exercise being enjoyment of specific activities.

9 Discussion

To round up this report, important points from the project will be discussed. First the crux of the project will be outlined. Important points to consider when designing a free fitness app. This will be followed by a reflection on the process of the report, strengths and weaknesses in the use of methods and theory.

9.1 Free Fitness App Design Implications

Throughout this project a number of insights were gained on the subject of free fitness apps. These are design implications that come as a result of the examination of young people in Copenhagen's exercise habits and use of fitness technologies. Data was collected and theory was used to gain a perspective and spot connections in the collected data. Following will be a list of important aspects to consider and include when designing a free fitness app. These implications can be used for future fitness app development and is novel in its focus on free apps as a tool for helping a low income population with increasing obesity as well as being a study in a field that is not well studied (Angosto et al, 2020, p. 17).

9.1.1 Importance of Community

A large part of the motivation behind exercising is communities. This was apparent in the examination of existing research where Ibsen et al.'s, 2021 study on Danes' exercise habits concluded community as being one of four key factors motivating them to exercise. This was also apparent in the workshop conducted with ten participants, where users mentioned being motivated and feeling a sense of obligation to exercise when others depended on them showing up.

9.1.2 Tracking and Competition as a Motivational Factor

Another large part of fitness apps is being able to track one's progress and receiving feedback on it. 'Threat and reward' as a BCT can be used, for example, in the form of badges as rewards for achieving goals or having process progress, as shown in the Fitness World app (figure 18). This is an example of a simple way a free app can give out non costly rewards that can help users achieve their behavioural goals. These rewards and threats could be given in relation to how much a user has exercised compared to others, in order to bring in the community aspect.

9.1.3 The Importance of Emotional Impact in Use

Young users are those who use fitness apps the most. As seen in this report and mentioned in Hartson et al.'s 'The UX Book', modern users expect effectiveness and efficiency and it is no longer enough. They are also looking for emotional impact (Hartson et al., 2012, p. 24). When testing Kompan's current app, not being able to play music whilst exercising was an issue, even though it did not affect their ability to carry out a workout or use the app. This showcases how the users look for factors outside of those that directly contribute to carrying out exercises or doing so effectively. Furthermore, when testing the prototype created to show the features of a concept that was a result of the analysis, the user showed discontent with the visual design. This was a low fidelity and relatively low resolution prototype, so the visual design was not a focus, which makes the feedback understandable. But it again shows how factors outside of those promoting effectiveness and efficiency are of importance.

9.1.4 Managing Perceptions in the Target Group with Closures and Features

Due to the main relevant social group being young people in Copenhagen, in this report, those were the subject of examination. A large part of the project, especially during the 'discover' and 'define' phases of the project, was spent trying to understand the social group and their context for exercising and using IT in conjunction with such activities. Here their interpretative flexibility was apparent when discussing a couple of factors surrounding the use of the free fitness parks in Copenhagen. Especially the outdoor location, in relation to bad/rainy weather and the potential awkwardness of exercising alone in public. Some informants mentioned how they preferred paid gyms, due to the wider range of equipment.

These interpretations of the use of the parks can be managed in a couple of ways. Through features that support the issues in their concerns, by adding community features to the app for example allowing the users to find other users to exercise with. This could address their concern of how training in public alone might be awkward. Another way to solve perceived issues could be with some of SCOT's tools for closures. This would be relevant to address the concerns for rainy weather or lack of equipment. A rhetorical closure could be by using marketing to show the wide variety of equipment and exercises available on the equipment, which could convince users who have not used the equipment yet. They may have some preconceived notions that could be countered by marketing displaying the opposite to be the case. A closure by redefinition of the problem could be another tool to manage perceived problems. The rainy weather could go from a problem to an opportunity to train in tough conditions to build up physical or mental resilience. In summation, adding features that solve perceived issues or using closures are ways in which designers can manage the problems perceived in the social group.

9.1.5 Flexibility for a Diverse User Group

To target such a large group of people with differing levels of fitness, another point of feedback when using Kompan's app was the lack of 'flexibility of use', one of Nielsen's heuristics. A one size fits all approach to exercise within a large group of people proved an issue as the informant had difficulties with several of the exercises, not being able to perform them. This suggests that flexibility of use and exercise programming is one of the important points to consider when designing a free fitness app for a diverse user group.

9. 2 Reflections on Use of Methods

Due to limited resources (time and group size), a number of methodical adaptations were necessary. Some adaptation was also caused by the nature of the case and project itself. They will now be discussed.

9.2.1 Number of Informants

Both of the usability tests carried out were with only a single participant. This was in part due to the time limitation and the ambitious project scope of having multiple testing phases as well as a workshop in a single member group. But the rationale behind the decision is also

that the input received from the tests were in line with existing research from the literature review. These multiple studies with a much larger sample size served as a guideline that could be used for creating design implications, whilst the research in this project would gather specific insights into this case, with a more qualitative focus. Whilst a larger sample size in this project could have ensured a broader representation, the empirically larger studies in the literature review backs this research project where the specifics and more qualitative angle could be explored.

9.2.2 Look and Feel vs Role and Context

This project could have had a larger focus on the look and feel of the prototyping process, instead of spending a large part of the analysis (⅓) on analysing existing products in a project examining prototyping from a design research perspective. To create meaningful and useful prototypes however, the Double Diamond Design model suggests understanding the current domain and context by looking at competition in the context. Therefore it was relevant, but could have perhaps taken up less space/ressources compared to the prototyping, feedback/sketching and adjustment process.

SCOT also suggests a focus on context and understanding things around the technology rather than the technology itself as a way to understand the development of the technology. Therefore, the context is very important.

10 Conclusion

Through this study, a number of implications were created as a result of analysis and empirical data collection from a literature review, 2 usability tests and a workshop with ten participants. The integrative literature review provided knowledge on the most prevalent behavioural change techniques (BCT's) in fitness apps. Furthermore an understanding of the social construction of technology (SCOT) gave a perspective on important factors and possibilities when designing technology for a specific social group. Existing studies, a workshop with ten participants and the competitors analysis gave an understanding of the current market and context of the users. The two usability tests conducted and the resulting analysis provided an understanding of the specific elements and concepts that garnered favourable interactions that addressed user needs. These were the steps taken in order to examine what important factors there are, when designing a free fitness app for young people

in Copenhagen. This resulted in a number of factors listed in the discussion. 'Importance of community', 'tracking and competition as a motivational factor', 'the importance of emotional impact in use', 'managing perceptions in target the group with closures and features' and 'flexibility for a diverse user group'. The importance of community refers to how the feeling of community and exercising with others was an important motivational factor for maintaining an exercise habit. Tracking and competitions can be used as motivational factors for example with rewards and threats motivating users to perform well. The importance of emotional impact in the use of the app and not having an app that is only effective or efficient to use, but also evokes an emotional impact. Designers must also manage the perceptions within the group. To do so, closures can be employed or features can be added to address perceived issues and user needs. Lastly, the flexibility of use is important when designing for a diverse user group in fitness. This is due to differing levels of expertise allowing them to do different exercises, with novice users not being able to do advanced exercises and needing them scaled down.

10.1 Future Research

In regards to future research, this report has externalised several points that could be studied further or with different approaches. The large focus on the social construction of technology and the contextual use of fitness apps means that the evaluation and prototyping process could be allocated a larger amount of time and resources in future projects that explore this angle further. A focus on the interactions themselves rather than the context within which these happen. The focus of the research question required a large understanding of the context, especially with the theoretical framework of SCOT being employed, which explains the large focus on it in this project and report. Lastly, one could also examine how generally applicable the design implications are, to see if they generate positive results with other target groups.

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That's all folks!