



SPACE MISSION SANITAS

Integrating physical activity into the daily
life of cardiac patients - A persuasive
game during rehabilitation

MASTER THESIS

Design for interaction

Megan Chan

Colofon

Master thesis - Design for Interaction

Faculty of Industrial Design Engineering
Delft University of Technology

Space Mission Sanitas: A persuasive game to integrate physical activity in the daily life of cardiac patients during rehabilitation.

Defended on 06 - 07 - 2022

Written and designed by	Megan Chan
Tu Delft supervisory team	Valentijn Visch
	Jasper Faber

In collaboration with	Capri Hartrevalidatie
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Integrating physical activity in the daily life of cardiac patients

- A persuasive game during rehabilitation



Name
Age
Bachelor
Specialization
Focus

Megan Chan
23 years old
Industrial Design Engineering – TU Delft
Design for Interaction (DFI) – TU Delft
Physical activity,
Cardiac rehabilitation
Persuasive game design,
Motivation

PREFACE

Before you lies my master thesis “Integrating physical activity in the daily life of cardiac patients – a persuasive game during rehabilitation”. This master thesis is the result of my graduation project for the master’s Design for Interaction at the Delft University of Technology.

The project is done in cooperation with Capri Hartrevalidatie in Rotterdam. This is a cardiac rehabilitation centre and the outcome of this project is designed for the participants in cardiac rehabilitation. The health intervention that is created during this project is intended to integrate physical activity into the daily life of cardiac patients. I was engaged in researching and writing this master thesis from December 2021 to June 2022.

First of all, I would like to send my gratitude to my TU Delft supervisors Valentijn Visch and Jasper Faber. Valentijn, thank you for your guidance during this project, your enthusiastic and critical feedback and for always pointing me in promising directions during the research and design phases. Jasper, I want to thank you for your guidance and support, your critical feedback and your knowledge of the cardiac rehabilitation context. I appreciate you helping me get in contact with the right people at Capri, which made it a lot easier to conduct my research.

Secondly, I would like to thank Nienke, for providing me with the materials and connecting me with the social workers. Because of you, I was able to recruit the participants for my research. I want to thank Mariette for letting me interview you and for your cooperation in recruiting participants. The last persons I want to thank from Capri are Ayla and Marije. Thank you for your critical and enthusiastic feedback, letting me observe during the rehabilitation training and conduct my final evaluation with your participants.

Furthermore, I would like to send my gratitude to all the participants in cardiac rehabilitation that took part in interviews or my final user test. Without your cooperation, I would not have been able to conduct my research and gain valuable insights for the final design. It means a lot to me that you were open to share your personal experiences and provide me with honest feedback. It was a joy working with you on the creation of this game.

Additionally, I would like to thank the designers and the people in my surrounding who helped me discuss and brainstorm about my project. This helped me a lot to spark new ideas and to get my design direction clear. Your support kept me motivated and I am thankful for that.

Lastly, I am thankful for the opportunity to apply gamification in a healthcare context. This project shows how I applied what I learned during my studies but also which new things I learned during this project. All aspects of this process can be read in this master thesis.

Enjoy reading.

Megan Chan

June 2022

EXECUTIVE SUMMARY

This graduation project aims to maintain people's physical activity level after cardiac rehabilitation, by helping them integrate it into their daily life. Often people find it hard to maintain their physical activity level after cardiac rehabilitation. They face different barriers that lower their motivation, resulting in an unhealthy lifestyle with low physical activity.

This project is done in collaboration with the Capri Hartrevalidatie centre. The target group for this project are the participants that are rehabilitating here. The people that come to the rehabilitation training are often open to a lifestyle change but need guidance on how to achieve this. A part of the participants are people with a low socio-economy position(SEP), for them, it is even harder to maintain their physical activity after rehabilitation.

In this project, a game-based health intervention is designed that can be played during rehabilitation. It is important that all participants in cardiac rehabilitation can take part in this game, including the participants with a low SEP. The persuasive game is a tool to motivate physical behaviour in a gamified world. The physical activity experienced in the gamified world can motivate the participant to perform this behaviour in the real world. To design this game-based health intervention, a user-based literature study and a context field

study were conducted. This is to gain a deeper understanding of the drivers and barriers, their view on physical activity, and the needs and the motivation of the participants during and after rehabilitation.

When combining the insights, a behaviour analysis and a user persona could be made about the target group. A design brief, including a design goal, vision and design opportunities, was set up. The design goal of this project is to develop a persuasive game that supports the maintenance of physical activity in the daily lives of cardiac patients by stimulating their sense of competence, relatedness, and autonomy.

In the ideation and conceptualization phase of this project, the game-based health intervention got its shape. Co-creation sessions, interviews and expert validations were conducted to find the best concept direction. This led to the final design: Space Mission Sanitas.

Space Mission Sanitas is a game where six teams in a rehabilitation context are challenged to achieve their weekly Fuel Goal. This Fuel Goal needs to be reached to provide their Space Shuttle with enough Fuel to complete the overall mission. The Fuel Goal can be seen as a metaphor for a weekly physical activity goal since the goals are

related to physical exercise they can practice in their daily life context. Every week during the training, they will evaluate which team has achieved their Fuel Goal and every week they will select a new Goal for the coming week.

Finally, the game was evaluated with the participants in the rehabilitation context. This evaluation aimed to find out whether this game increased people their sense of competence, relatedness and autonomy and if this stimulated them to perform physical behaviour in their daily life.

The evaluation study showed that the game had a positive effect on people their sense of competence, relatedness and autonomy. This suggests that the game has a promising effect on the maintenance of physical activity after rehabilitation. However, it is recommended to evaluate this game over six weeks. Only then, the actual effect can be measured and the insights can be used for further research and health-interventions within Capri. Therefore, the outcome of this project is not only the tangible game-based intervention but also a variety of insights about the participants and the maintenance of their physical activity level.



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1.

INTRODUCTION

In this chapter more information about the context, stakeholders, physical activity, and the problem statement will be given. In the first subchapter, more information is given about the context & stakeholders. After that, the importance of physical activity and health is made clear to understand the essence of the fourth subchapter: the problem statement. Finally, in the fifth subchapter the overall project brief for the master thesis is given.

1.1 CONTEXT & STAKEHOLDERS

Cardiovascular diseases

To understand more about cardiac patients and cardiac rehabilitation, it is important to know what cardiac diseases are exactly. Cardiovascular disease (CVD) is an umbrella term covering diseases for both the heart (cardio) and blood vessels (vascular) in the body. There are four main types of CVD: coronary heart disease, stroke, peripheral arterial disease, and aortic disease (NHS, 2020).

Coronary heart disease (CHD) is the most common type of cardiovascular disease and occurs when the heart muscle's blood supply is blocked or interrupted by a build-up of fatty substances (atherosclerosis) in the coronary arteries. The coronary arteries are the main vessels that supply the heart with blood. This can result in chest pains and reduced flow of oxygen-rich blood (Balady, 2007). When the coronary artery is completely blocked, this can cause a myocardial infarction, also known as a heart attack. When atherosclerosis occurs in the vessels of the brain, a stroke can occur. Peripheral arterial diseases occur when there is a blockage in the arteries of the limbs and aortic disease occurs when there is a blockage in the aorta.

Cardiovascular disease can be the result of various risk factors such as hypertension, diabetes, smoking, family history, (abdominal) obesity or hypercholesterolemia. Hypertension is also known for high blood pressure, diabetes is a disease which causes a person's blood sugar level to become too high and hypercholesterolemia is also called high cholesterol (Durrington, 2003).

Cardiovascular diseases are the number one cause of death in Europe. According to studies on average 45% of all deaths are caused by CVD (Nieuwenburg-van Tilborg, et. al., 2014). With a yearly cost of 2.1 milliard euros spent on coronary heart disease in the Netherlands, the economic impact of CHD is high (Balady, 2007).

Cardiac patients

Every year new people are suffering from cardiovascular heart diseases. In 2020, a total of 36579 people died of cardiovascular diseases in the Netherlands, this was on average 50 men and 50 women (in total 100 people) per day (Koop, et. al., 2021).

This group of cardiac patients is not always aware of his/her illness or how to reduce the risk. A healthy lifestyle: not smoking, eating a healthy diet, getting enough exercise, and avoiding long-term stress, reduces the risk of cardiovascular disease (Tsui, et. al., 2004). However, many people do not have the right environmental factors and habits to maintain a healthy lifestyle (Hartstichting, 2021). These types of unhealthy lifestyle habits correlate with a low SEP. A low SEP stands for a low socioeconomic position and refers to an individual's social position in society. Research has shown that there is an association between low SEP and poorer health (RIVM, 2018). It is measured by educational attainment, the height of income and occupation.

SEP affects the overall human functioning, including people their physical and mental health (Schwartz, et. al, 2021). Poor health skills, low education, low socioeconomic position, and ethnicity are all risk factors for the development and complications of cardiovascular diseases

(Kaplan, 1993). An example: men with low education have a six times greater chance of cardiovascular diseases than highly educated men (Pharos, 2018).

Because people with a low SEP have a higher risk of cardiovascular diseases, it can be stated that a part of this group also participates in cardiac rehabilitation (CR). It is hard to determine how many low SEP people exactly participate. They can be selected by postal code, on cheaper and less good neighbourhoods, but it is possible that a higher educated person also lives in this neighbourhood and does not meet a low SEP profile. Therefore, there is no exact percentage available of people with a low SEP in CR. To still give an indication: in a study by ter Hoeve (2019), 70% of the participants in cardiac rehabilitation (n=914) had an intermediate or lower educational level. The intermediate educational level is considered when the patient's highest achieved education was a secondary school or secondary vocational. This states that 70% of the participants did not continue their studies after secondary school. Since educational attainment correlates with a low SEP, it can be stated that people with a low SEP are present in CR.

This group within CR is important to consider because often this group is excluded when new

health initiatives are designed. Resulting in limited adoption of health interventions in low SEP groups (Faber, et. al., 2021). In this master thesis, all cardiac patients in CR are included, therefore the intervention should be suitable for high as well as low SEP cardiac patients. It is important to overcome this health gap of low SEP patients and include them in this design intervention.

In chapter 2.1 Lifestyles of cardiac patients, more research will be conducted about this low SEP group within cardiac rehabilitation.

Cardiac rehabilitation (CR)

Cardiac rehabilitation is for anyone, young and old, who has recently been treated for a heart condition, such as a heart attack, a heart rhythm disorder, or someone who has undergone heart surgery. Often the cardiologist or general practitioner refers the patients for participation (Hartstichting, 2020).

With a cardiac condition, many people are uncertain about their abilities. What can they do and what are they allowed to do? Cardiac patients can feel restless, anxious, or easily emotional. Therefore, CR is an important intervention to help cardiac patients to recover. It not only helps them recover physically but will also work on patients' self-confidence and vitality. Recent studies have proven that CR has beneficial effects on people's health, physical fitness, quality of life, cardiovascular risk factors and clinical outcome, including mortality (Laustsen, S., 2020; Sunamura, et.al., 2020).

CR is advised by doctors because research has shown that patients who follow a CR program are 50% less likely to have a recurrence of the heart problem and 35% less likely to die in the following years (Hartstichting, 2020). This is partly because CR contributes to a better cholesterol level and lower BMI and fat percentage (Dalal, et. al., 2015).

Capri Hartrevalidatie Rotterdam

CR centres are existing all around the world. Capri Hartrevalidatie is a rehabilitation centre for cardiac patients in the region of Rotterdam and The Hague in the Netherlands (Capri, 2022). This graduation thesis is done in collaboration with the Capri rehabilitation centre Rotterdam.

Capri is a centre who provides cardiac rehabilitation for over 40 years. During this period, they are also running research projects to optimize the rehabilitation programme for the patients (Capri, 2022). The centre has four organizational teams. The highest board exists out of supervisory management and the director. The second team consists of the medical team, with cardiologists, doctors, and researchers. Next to that, Capri has a team that arranges medical and financial administration and staff matters. The last department consists of the practitioners in the rehabilitation and the client council. The client council represent the participants in the CR program. They contribute to important topics and advise the management of Capri (Capri, 2022). The cardiac patients in the Capri rehabilitation programme are called participants because they must begin to see themselves as individuals again rather than patients.

In this master thesis, the research and collaboration within Capri is mostly done with a multidisciplinary team of practitioners. This is because they are in close contact with the participants, who are the target group for the design intervention of this project. More about this target group will be explained in the following subchapter.

The team of practitioners is supervising the rehabilitation training in the sports hall. They are a team of specialised nurses, social workers, physiotherapists, and exercise educators. On top of the general training, there are Capri talks included in the rehabilitation. These Capri talks are provided by a social worker, a psychologist, or a dietician. If necessary, participants can be individually guided by a dietician, social worker, psychologist, psychiatrist, or rehabilitation doctor (Capri, 2022). The practitioners strive to help the participants with tailor-made care. This is



because everyone is different, and everyone can be motivated by different life goals. In this master thesis, the motivation for physical activity will be investigated during and after rehabilitation training.

Research background

This master thesis originates from the PhD research project of Faber at Capri rehabilitation centre in Rotterdam. Research is conducted in the same CR context at Capri and data will be shared to tilt both research projects to a higher level.

Prior to Faber's research at Capri, he, and another PhD candidate; Al-Dhahir, focused on making a set of guidelines that can be used to develop or adapt eHealth interventions for users with a low SEP. Faber worked from the bottom-up, exploring the attitudes of people living in a low SEP neighbourhood towards their health, healthcare, and eHealth. Al-Dhahir worked from a top-down approach and explored the experiences of the caregivers in cardiac rehabilitation. In Faber his research two general attitudes were found based on nine profiles towards health, healthcare, and eHealth. The first one is the

optimistically engaged profile and the second is the doubtfully disadvantaged profile. Next to that, participants recognized themselves for periods of the concerned profile, especially when experiencing medical complaints or limitations (Faber, et. al., 2021). The study advises intervention developers to be mindful of differentiating life situations, motivations, healthcare needs, and eHealth expectations when designing for this target group (Faber, et. al., 2021). In the next phase of Faber's PhD project, he is going to use this set of guidelines to design an eHealth intervention in the CR context. In this master thesis, the intervention does not have to comply with an eHealth intervention and the intervention will be designed for all people in CR. However, the low SEP attitude profiles of Faber and the guidelines of Faber and Al-Dhahir will be consulted. This is because the attitudes profiles of people with a low SEP can be found among the people in CR, as was explained earlier in this chapter. In the next subchapter more about the low SEP group within cardiac rehabilitation is explained.

Teachable moment

A myocardial infarct or other cardiac failures can be seen as teachable moments (Coull, 2021). Teachable moments are events or circumstances which lead individuals to positive behaviour change. When the timing is right, the ability to learn a particular behaviour will become possible. However, the right information and tools must be available to steer this behaviour in the right direction (Lawson, et.al., 2009).

Because myocardial infarct or other cardiac failures has a big impact on people's lives and the ones around them, they are more motivated to adopt risk-reducing behaviours to adapt their behaviour (Mills, 2008). CR uses this window of opportunity, to positively influence people's lifestyles. But how can physical behaviour change persevere after rehabilitation? This will be researched in the following chapters of this master thesis.

1.2 PHYSICAL ACTIVITY & HEALTH

A Healthy lifestyle

For people who already have or have had cardiovascular disease, it is difficult to suddenly adopt a healthy lifestyle. This puts them at an increased risk of developing another cardiovascular disease and reduces the chance of a full recovery (Gastel, et.al., 2015). That is why the patients must learn how to adopt this healthy lifestyle during rehabilitation and maintain it after rehabilitation. In the training, they work on their physical activity level, but at the same time, they work on all kinds of different aspects of a healthy lifestyle, such as self-confidence and overall vitality.

In this master thesis, it is important to know the importance and the essence of a healthy lifestyle. A person's lifestyle is how they live, it reflects their attitude and personal values. It can be described as the set of adjustable behaviours and choices that a person lives by in their life (Jensen, 2007). It significantly influences the health and well-being of a person (Sharma, Biedenharn, Fedor & Agarwal, 2013). But what is health? The World health organization (WHO) defines health as a condition of well-being on a physical, mental, and social level (Breslow, 1972). Recently Huber et. Al. contributed to a broadening of these visions. They say that functioning, resilience, and self-direction are central to positive health (Huber M., et. al, 2011).

Huber shows in her model 6 main dimensions that represent a broad view of health from a human perspective (Figure 1). The 6 dimensions are bodily functions, mental well-being, meaningfulness, quality of life, social participation, and daily functioning. Under these main dimensions,

underlying aspects can be seen, all of which have an impact on human health (Huber, 2013). In the following subchapters, the importance of each dimension within cardiac rehabilitation will become clear.

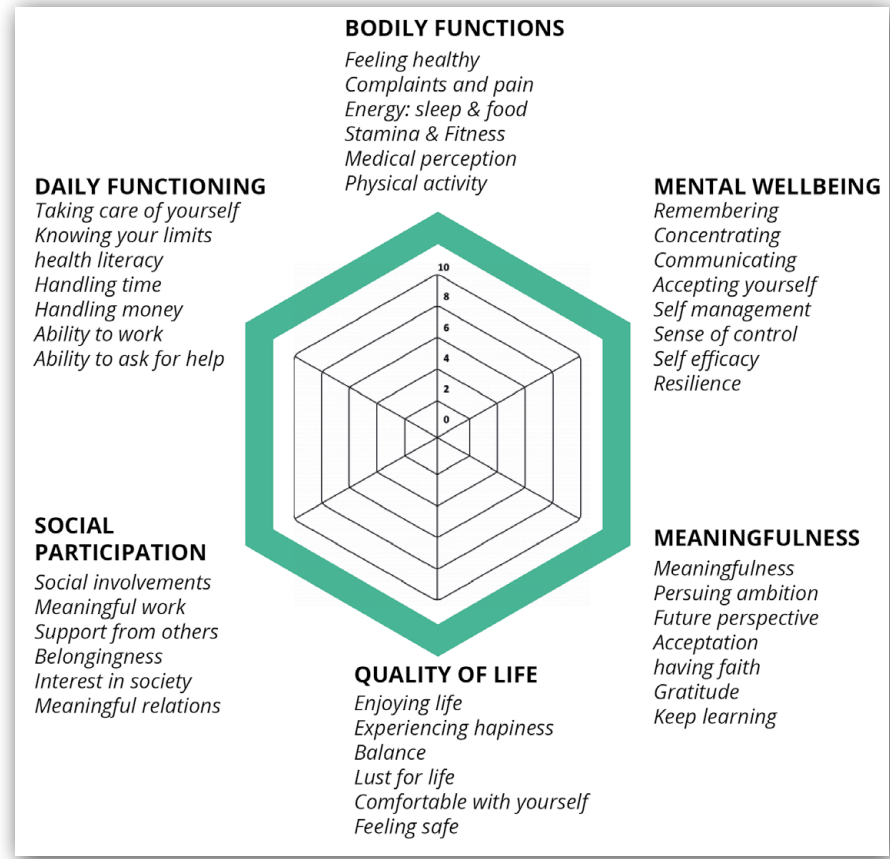


Figure 1: Positive health view of Huber (2013)

The impact of CR

When looking at all six dimensions of Huber's positive health view, CR is mainly focussing on increasing the bodily functions of the participants. This is because they work on fitness exercises, stamina, and their overall physical activity level. However, the dimensions in the model are all interrelated to each other. When improving their bodily functions, they are automatically improving the other dimensions. Indirectly the mental well-being, meaningfulness and quality of life are increasing because the participants regain a sense of control, and they are learning to have faith in their bodies.

A secondary goal of CR is to improve their social participation. It is proven that social support leads to lower blood pressure, lower heart rate, lower serum cholesterol, fewer stress responses and better immune responses (Savelkoul, 2011). The social participation is positively affected because in CR the people are supporting each other and have social involvement when coming to the rehabilitation training. Additionally, the participants learn how to know their limits and the practitioners provide them with information about physical activity, stress, food, and relaxation to increase their health literacy. Health literacy is the ability to obtain, understand, assess, and use health information when making health-related decisions (Sørensen, et. al, 2015). This results in a

better daily functioning, which is also a dimension of the positive health model.

With this insight, it can be concluded that the overall health of cardiac patients improves during rehabilitation. The big challenge is to keep up with this positive health change after rehabilitation, when the positive drivers fall away. The six dimensions of Huber show why it is important to keep up the bodily functions and other dimensions also after rehabilitation. If this can be achieved, then the improved health of cardiac patients can be preserved.

In the user-based literature study in chapter 2, more research will be done into the motivation for physical activity of this target group and how these changes after rehabilitation.

1.3 PROBLEM STATEMENT

The problem : maintaining long-term behaviour change

Every year there are new cardiac patients in the Netherlands. On average 1.5 million people are suffering from cardiovascular diseases in the Netherlands and it is expected that in 2030 this number will increase to 1.9 million people. This will have a huge impact on the care burden of hospitals and CR organizations (Hartstichting, 2019).

CR is already shown effective for cardiac patients, as 50% of the people are less likely to have a recurrence of the heart problem (Hartstichting, 2020). However, it is of great importance that cardiac rehabilitation has a bigger impact on people's lives, as the number of cardiac patients over the years will increase. If the influx of ex-cardiac patients and new patients continues to grow, this will result in higher health care costs and a higher mortality rate of cardiac patients (Hartstichting, 2019). CR at Capri usually ends after 6 weeks of training. Sometimes it is allowed to extend the rehabilitation training but once after the rehabilitation, people experience a lack of available guidance on maintaining their physical behaviour change. They experience feelings of vulnerability and fear of overexertion, affecting participants' self-efficacy to exercise (Coull, et. al., 2021). In figure 2, a cause-and-effect scheme of the problem is visible.

Their receptivity and motivation to maintain positive physical behaviour change are negatively impacted. It is suggested that current CR programmes need interventions that improve the PA belief systems and self-efficacy also after rehabilitation (Coull, et. al., 2021). Studies by researchers at Capri also state that the relapse to low PA levels after CR is a major issue within the treatment of patients with chronic heart failure(Limpens, et. al, 2021). A study from Ter Hoeve at Capri showed that implementing multiple face-to-face counselling sessions already improves the PA level after rehabilitation, however often

there is no time to implement these counselling sessions for the participants (Ter Hoeve, N., 2019).

In general, people find it hard to maintain physical behaviour changes long term due to different barriers such as; lack of time (in particular concerning family, childcare, household and occupational responsibilities, access issues (transport, facilities), financial costs, personal attitudes and behaviours, bad environment, negative social influences, low SEP and a lack of knowledge (Kelly, et. al, 2016).

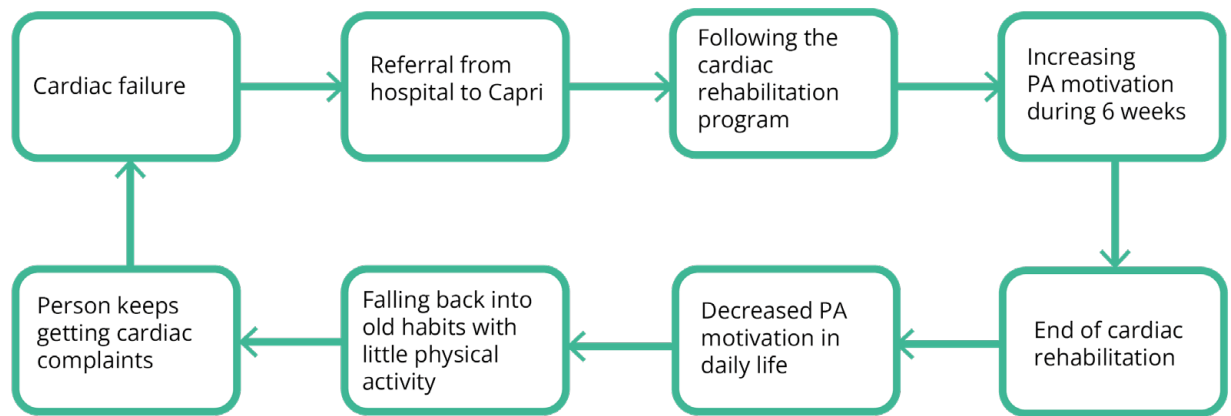


Figure 2: Cause and effect scheme of the problem

During the rehabilitation programme, most of these barriers disappear or become less strong. However, when returning to daily life after rehabilitation they regain their prominence again, resulting in the PA level to decrease. To prevent this from happening, it is essential to focus on patients' interests and to support them to incorporate PA into their daily life, so that they establish new routines (Knudsen, et. al., 2014). This suggests that there is a lot to be gained when it comes to PA relapse after CR.

Capri's point of view

For Capri it is of great importance that people who participate in CR will not have a recurrence of the heart problem. Capri rehabilitation centre stands for patient-oriented and high-quality care. Therefore, they need to keep developing new interventions. Interventions that maintain the PA level in people their daily life after rehabilitation. Not only rehabilitation itself is important for people's health, but also the implementation in their daily life.

The focus

The focus of this research and design project is on maintaining the PA level of cardiac patients after CR. When PA levels can be maintained, the bodily functions remain high, which indirectly improves a person's overall health (Huber, 2013). This is a higher secondary effect that this design project may have if the goal is achieved. In the next chapters; 2. User-based literature study and 3. Context field study, more research will be conducted to get a better understanding of the

problem and the motivation of the target group. In figure 3, the transition from the PA level in CR and the PA level in daily life is visible. This master thesis aims to develop a game-based intervention that integrates the PA levels of rehabilitation more with the PA level in daily life. This is to make sure that participants are fully prepared to pursue their PA level also after rehabilitation so that they will not suffer from heart failure in the future again.

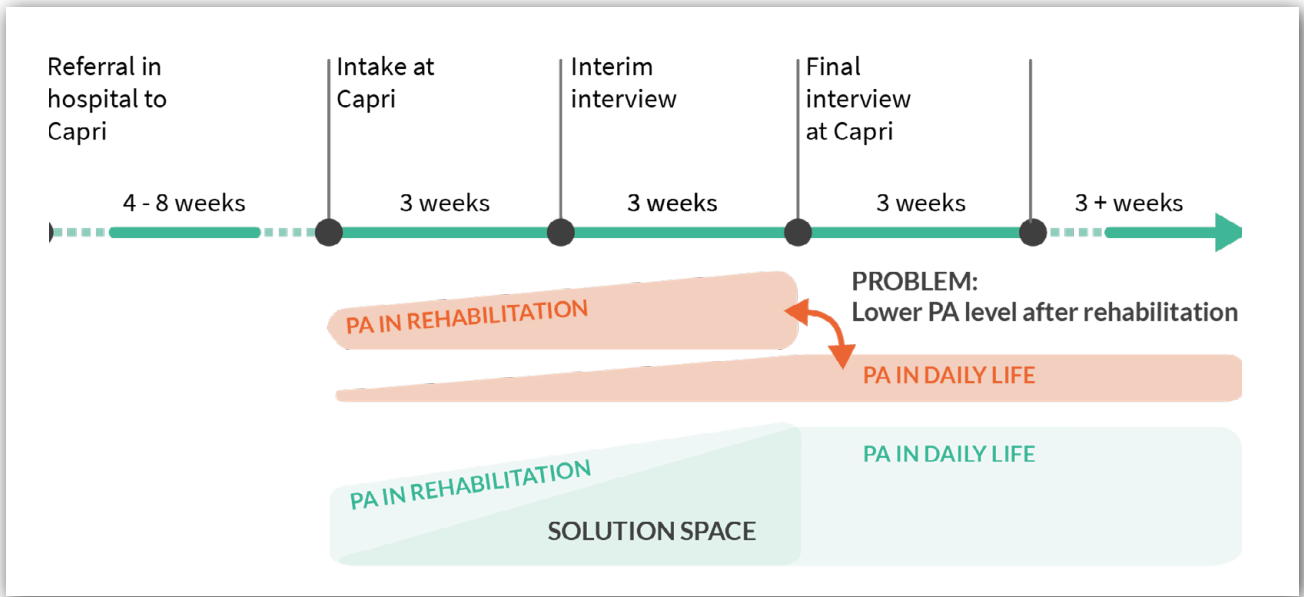


Figure 3: Design focus from rehabilitation to daily life

1.4 PROJECT BRIEF

The Goal

The goal of this master thesis is to improve PA maintenance after cardiac rehabilitation.

Design approach (report structure)

The design process that is used during this master thesis is based on the five-stage iterative design thinking process, visualised in figure 4. The **emphasize** and **define** phases are covering chapters 1 until 3 of this graduation report. These are important phases for the foundation of the ideation and prototype phase. Different research methods will be used to get a better understanding of the target group, the practitioners, and the rehabilitation program itself. These findings will be translated into design criteria, which will specify the design direction for the ideation and prototype phase. The **ideate** and **prototype** phase can be found in chapters 4 to 6. User and stakeholder **tests** and evaluations will be conducted throughout the ideate and prototype phase as well in the last evaluation phase in chapter 7. During the project, all phases are connected through insight and

Research questions

The research questions of this master thesis are formulated on the next page. During this project, literature research and a field study will be done to gather insights about the target group their motivations, drivers, and barriers during the transition from rehabilitation to daily life. In the final phase of the project, an evaluation study will be done to answer the question of how the game-based health intervention maintains the

motivation of its users and what game elements fit with the cardiac patients. The research insights of this graduation project can serve as inspiration or validation within research at Capri or other cardiac-related research. The game-based health intervention itself can be implemented and tested for a longer period, to measure the actual effect.

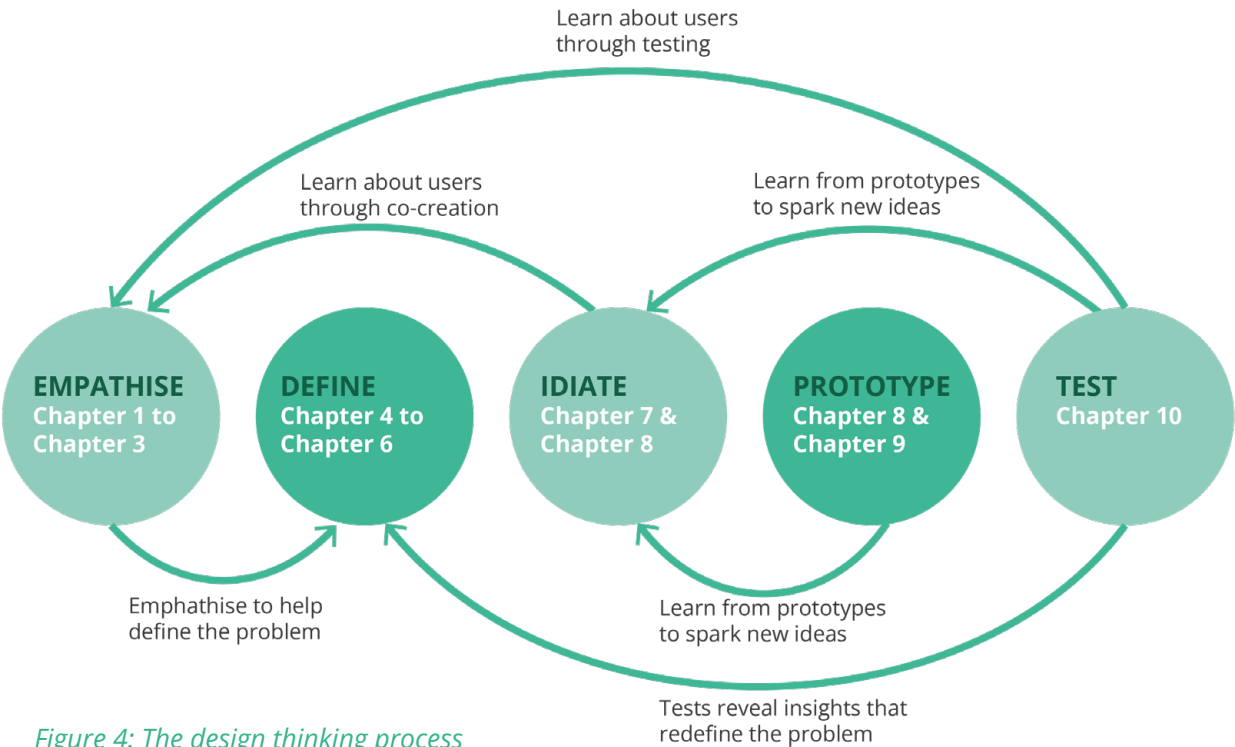


Figure 4: The design thinking process

RESEARCH QUESTIONS

What persuasive game supports the maintenance of PA after cardiac rehabilitation?

To find an answer on this research question, a few sub questions are formulated. These sub questions serve as a base for the user research and the design method research phases.

User based sub-research questions:

RQ1 What are the different drivers and barriers of cardiac patients for PA during and after the rehabilitation period?

RQ3 What is the attitude of cardiac patients towards physical activity during and after the rehabilitation period?

RQ2 What happens with the motivation of cardiac patients during the transition of rehabilitation to daily life?

RQ4 How can the motivation of cardiac patients be stimulated?

Design based sub-research questions:

RQ5 Which game elements match with the motivations and needs of cardiac patients?

RQ6 How maintains the persuasive game intervention the motivation of its users?

2.

USER-BASED LITERATURE STUDY

The goal of this phase is to gain a better understanding of the target group, their motivations, their drivers and barriers, and the CR context. To search for the right information, it is important to define the scope of the project. The overall scope includes the cardiac patients' motivation and attitude for physical activity and lifestyle change before and after rehabilitation. It includes their motivation for physical activity during rehabilitation and in their daily life after rehabilitation and it includes Capri as an organization.

2.1 LIFESTYLE

Lifestyle of cardiac patients

An unhealthy lifestyle has a great impact on a person's life. Smoking, drinking alcohol, stress, being overweight and lack of physical activity can cause diseases such as diabetes, cancer, high blood pressure or cardiovascular diseases which all can cause early mortality (Kamphuis et al., 2007). According to Harvard Medical School (2018), when all healthy behaviour criteria are met people lived approximately 13 years longer and when at least one of the criteria is met people lived 2 years longer.

In chapter 1.2 physical activity & health, six main dimensions of health were presented (Huber, 2013). To say something about the health of cardiac patients, their lifestyle is measured on these six dimensions. In the introduction chapter of this thesis, it is explained why it is important to include people with a low SEP when designing new health interventions because they are often excluded.

The following subchapter describes the consequences of environmental and financial factors on people their lifestyle choices.

People with a low SEP are more likely to experience these barriers in their lives, however, these are also barriers for people with higher SEP. Additionally, the barriers are translated into valuable design insights.

General barriers towards a healthy lifestyle

Lack of perceived time

One of the most common reasons why people do not maintain their physical activity is their perceived lack of time. People think they are too busy with family-related matters, childcare, household, and their occupational responsibilities, that they feel like they do not have enough time to work-out or be physically active. However, PA doesn't always require much time. A walk outside everyday can already be enough to maintain the bodily functions. It is just a matter of finding the right activity that suits them and incorporate it into their daily life (Knudsen, et. al., 2014).

Negative social influences

All people are influenced by their social surroundings, so they can encourage unhealthy behaviour. When for example everybody goes to the snack bar for lunch, a person is more likely to join. Or when people drink alcohol at a party because the others are also drinking (Bukman et al, 2014).

Social connections can also enhance the well-being of a person. This results in a dilemma between working out or spending time with friends. Within cardiac rehabilitation social connection is also made between other ex-cardiac patients. It is

valuable for the participants to learn how social connection can go hand in hand with physical activity. For example, they can go for a walk with friends, or they can sign up for a bike group with others.

Negligent upbringing

Another reason for unhealthy lifestyle habits is when people are not raised with playing sports or eating healthy food.

Because they never learned to play a sport, they lack a sense of confidence in their ability to be physically active. Because of their low self-efficacy level, they are not motivated to learn a new sports at a later age (Bukman, et. al, 2014). Therefore, the behaviour change towards a healthy lifestyle is more difficult. For these people it is even more important to regain this self-confidence and to discover what they like to do. Only then they are motivated enough to keep up PA in their daily life.

Short-term thinking

Most people have long-term goals, but these are often pushed into the background by their short-term goals that may be more important at that time. The short-term goals such as catching up with a friend in the pub can conflict with a long-term goal to lose some weight. This results in a more short-term thinking behaviour, which can have a bad influence on achieving the long-term goals (Michie, et. al., 2009).

Therefore, it is important that people learn to divide the long-term goals into smaller short term-goals. According to Faber his guidelines (2021), this approach allows people to build on small successes, leading to a greater sense of control. This is also important for people with a low SEP, as they think more about the short-term goals (Michie, et. al., 2009).

Extra barriers for people with a low SEP

There may be more extra barriers for people with a low SEP not to pursue a healthy lifestyle, but the most important ones for this design research are the following barriers.

Financial problems

If people do not have the financial means to afford healthy food, such as vegetables and fruits, or to buy a sports membership they are more likely to develop unhealthy lifestyle habits. Because of low education, people with a low SEP often have a tight financial position (Aikens, et. al., 2008). The effects can also be more extreme when people have money worries and debt. These factors have a strong negative impact on people's physical and mental health and life expectancy. Research by Drentea and Lavrakas (2000) shows that the more stress people experience from financial problems, the worse their physical health becomes.

When designing an intervention, it therefore, is an important factor that it is financially accessible for cardiac patients with a low SEP.

Bad environment

Often the environment of people has a big influence on their health. People with a low SEP are more likely to live or work in low-income environments, due to their tight financial position (Evans, et. al., 2010). Deprived neighbourhoods are more likely to experience high rates of lead paint exposure, noise, air pollution, and mould growth and are less likely to have access to nature,

safe areas for walking, affordable fresh food and parks and playgrounds for physical exercise. This all leads to poorer health outcomes (Hepp, et. al, 2016).

Additionally, when living in a low-income neighbourhood, there are more bad temptations located in people in their surroundings (Bukman, et al., 2014). When people are bumping a lot into a snack bar, pub or coffee shop, the temptation is very high to go there, with all the unhealthy habits that entail.

When designing the intervention, it is important that the cardiac patients also learn to incorporate physical activities in their unhealthy environments.

Low (health) Literacy

People with a low SEP are often people with a low (health) literacy (Coupe, et. al., 2018). In chapter 1.2 physical activity & health, health literacy is defined as the ability to obtain, understand, assess, and use health information when making health-related decisions (HSL-EU Consortium, 2012).

Due to low health literacy, and literacy in general, it is difficult for people to process and understand messages about their health. They might not understand the importance of a healthy lifestyle (Coupe, et. al., 2018).

Consequently, new health interventions must be explained and executed in a simple way, so that people can understand why it is important. The following guidelines are given when designing materials for this target group:

Guidelines for designing for people with low literacy (Davis 2009):

- Use active voice in conversational style
- Put main points in a logical order
- Use short words and sentences
- Use the same words consistently
- Use a font size larger than 12 points for the text
- Increase font size in headings and sub-headings or make them bold
- Use extra white space to separate sections
- Place illustrations close to the corresponding text
- Use visual elements

Additionally, it is known that videos engage people more than written text. About 90% of the total information transmitted in the brain is visual. On top of that, the brain can process these visuals 60000 times faster than text (Sharma, 2021). These guidelines need to be considered when designing the persuasive game for this target group.

Low education

People with a low SEP often have low education. Education creates desired outcomes because it trains people to acquire, evaluate and use information. When having a low education people encounter more trouble with setting personal goals and self-management, therefore this also affects people's willingness to change their behaviour (Pampel, et. al., 2010).

Within cardiac rehabilitation they are asked about their personal goals, however, some people may find it difficult to formulate them. Therefore, it is helpful for this target group if they are guided in this process. This can increase their sense of control and self-management, which stimulates physical behaviour change.

Teachable moment

The barriers described in the previous subchapter were already present in the lifestyle of cardiac patients before the cardiac failure happened. Often these people do not realise that their lifestyle is unhealthy until they experience something such as a myocardial infarct that creates a teachable moment. The teachable moments can be seen as a window of opportunity in which individuals are more likely to adopt positive behaviour change when the right tools and information are available (Lawson, et.al., 2009).

MAIN TAKEAWAYS

- + Divide long-term goals into smaller short-term goals
- + The intervention should be financially accessible
- + The intervention should be suitable for people with low literacy
- + People with low SEP need guidance to set up personal goals
- + Use CR as a window of opportunity to implement health-interventions



2.2 MOTIVATION

Motivation in CR

A dominant motivation theory within psychology is the self-determination theory. It is a theory that concerns people's innate growth tendencies and innate psychological needs. The self-determination theory focuses on the degree to which humans' behaviour is self-motivated and self-determined (Ryan & Deci, 2017).

Conditions supporting the individual's experience of autonomy, competence, and relatedness are argued to foster the most volitional and high-quality forms of motivation and engagement for activities, including enhanced performance, persistence, and creativity. SDT proposes that the degree to which any of these three psychological needs is unsupported or thwarted within a social context will have a robust detrimental impact on wellness in that setting.

The SDT sees the need for self-esteem as a need that only becomes manifest when the basic needs (competence, autonomy, and relatedness) are not in harmony. Next to that, the SDT sees the self-actualization need as a description of what happens when the three basic needs are met (Enhanced performance and wellbeing in figure5).

In the next phases of this project, the self-determination theory will be used as the main guideline for motivation.

When people are diagnosed with a disease or experience a cardiac failure, it impacts their competence, autonomy, and relatedness needs. The SDT includes all aspects of motivation and can be used to explain the motivation within the journey of cardiac rehabilitation. In the next chapters SDT basic needs will be explained. The insights may help to get a better understanding of the health state and needs of people who are in transition from rehabilitation to daily life.

Competence

The need for competence is an important aspect of the cardiac rehabilitation context. Competence is the need to feel effective, capable and to experience mastery (Bauer, 2018). Deci also suggests that offering unexpected positive encouragement and feedback on a person's performance on a task can increase intrinsic motivation. This type of feedback helps people to feel more competent, which is one of the key needs for personal growth (Sweet, et. al. 2012). Practitioners in cardiac rehabilitation also give positive feedback on people's performance on

a task. To practice their fitness and stamina every week the participants feel more and more competent to perform the task. It is also important that this competence level is also increased on activities outside and after rehabilitation in the daily life of participants.

Autonomy

Autonomy derives from free decision making. According to Piaget (1990), the term autonomous can be used to explain the idea that rules are self-chosen. By choosing which rules to follow or not, people are in turn determining their own behaviour.

Extrinsic motivators can sometimes lower self-determination. According to Deci, giving people extrinsic rewards for already intrinsically motivated behaviour can undermine autonomy. As the behaviour becomes increasingly controlled by external rewards, people begin to feel less in control of their own behaviour, which undermines their autonomy.

Studies looking at choice have found that increasing a participant's options and choices increases their intrinsic motivation (Zuckerman, 1978). When designing a persuasive game for cardiac rehabilitation, creating room for own choice can be a recommended.

Relatedness

Relatedness is the will to interact, be connected and experience caring for others. It resonates with the human emotional need of belongingness: to be an accepted member of a group. Whether this is family, friends, co-workers, fellow patients, or something else, people have the desire to belong and be an important part of something greater than themselves (Baumeister, 1995).

The influence of social relationships on both the physical and psychological health of people is significant. The relationships have both a protective effect and a mitigating effect on health problems. This is because people can also be influenced negatively by a social group. Think about spreading incorrect health information or social pressure to drink alcohol or use drugs.

Nonetheless, when relatedness is experienced, people get more motivated and engaged into specific activities, whether these activities are negative or positive for their own health.

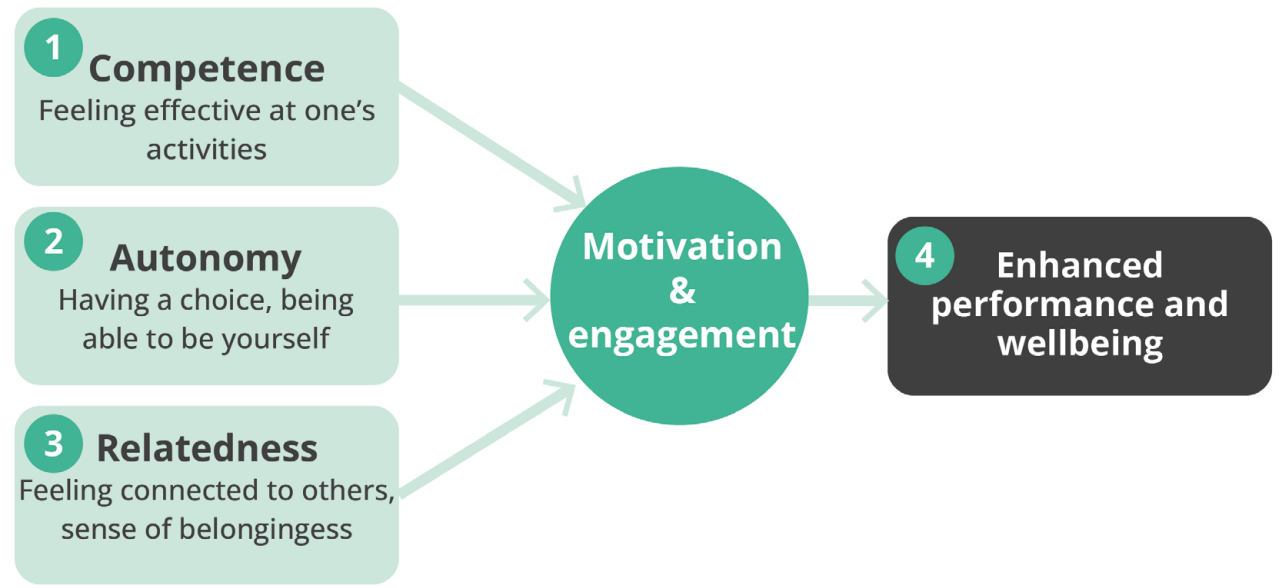


Figure 5: Self determination theory (Ryan & Deci, 2017)

MAIN TAKEAWAYS

- + Increase people their self-efficacy/ competence to stimulate PA motivation
- + Increase people their autonomy to stimulate PA motivation
- + Increase people their social connection to stimulate PA motivation

2.3 HUMAN BEHAVIOUR

Fogg’s behaviour model

The human needs in the self-determination theory for motivation are important factors for behaviour performance. Unlike the theory of Ryan and Deci, Fogg’s behaviour model (figure 6) explains the occurrence of behaviour according to the level of motivation, the level of ability and the presence of triggers. In this model, motivation and ability have a compensatory relationship with each other. According to the FBM, there are three elements that must converge at the same moment for a behaviour to occur: motivation, ability, and a trigger. At least one of those three elements is missing when a particular behaviour does not occur (Fogg, 2009).

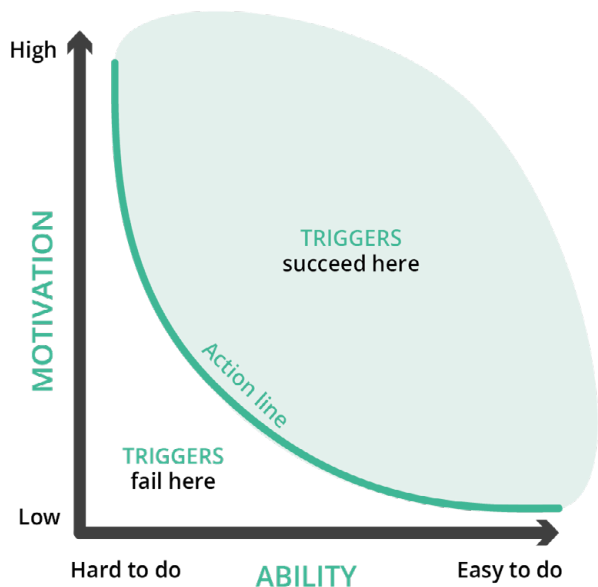


Figure 6: Fogg’s behaviour model (Fogg, 2009)

Motivation

This model is useful in design for persuasive interventions. It is interesting to analyze how this behaviour occurs within cardiac rehabilitation. This will be done on the basis of Fogg’s three core motivators:

1. Pleasure/pain motivator, is a physical motivator. In cardiac rehabilitation progress in bodily functioning can give pleasure and motivates people to continue this behaviour. On the other side, if people experience pain they will easily be demotivated for physical activity during the training.
2. Hope/ fear motivator is an emotional motivator. They are powerful motivators in persuasive interventions. People in cardiac rehabilitation hope that they will recover and live a healthy life in the future. They can however be demotivated by the fear of another cardiac failure.
3. Social acceptance / rejection is a social motivator. A high level of social acceptance is present in cardiac rehabilitation because everyone is going through the same thing. When participating on a new activity outside rehabilitation, people can be demotivated because the combination of fear for rejection is present. It might be interesting for a persuasive intervention to use this social acceptance as a motivator.

Ability

According to Fogg, designers of persuasive experiences must make the desired behaviour easier to do. In other words, persuasive design relies heavily on the power of simplicity (Fogg, 2009). This simplicity can be seen as a function of a person’s scarcest resource at the moment a behaviour is triggered. The resource for simplicity consists out of six elements; time, money, physical effort, brain cycles, social deviance and non-routine. Persuasive design succeeds faster when the behaviour needed in the intervention is simple. This is also why short-term goals, are easier to achieve than long term goals; they seem easier to do. The six elements of simplicity are described individually as they can all contribute to a persuasive design (Fogg, 2009).

Time

Time is an important factor in everyone’s life. Doing a task or performing a certain behaviour always requires time. If people don’t have time to perform a behaviour, it is not a simple behaviour for them. The motivation needs to be high to do a task that requires much time. In cardiac rehabilitation, most people are motivated to become more physically active to improve their health. They already decided to spend a big part of their time on rehabilitation, the intervention could use this time to invest in behaviour change.

Money

The second element of simplicity is money. Especially, for people in cardiac rehabilitation with a low SEP it is hard to perform a behaviour that costs money. Therefore, cardiac rehabilitation must be financed by the government so that people can learn how to be physically active. When designing persuasive interventions, designers should remember that what is simple for one person is not always simple for another (Fogg, 2009).

Physical Effort

Physical effort is an element of simplicity because behaviours that require physical effort may not be simple for everyone. For some people the behaviour to cycle for an hour to their work is simple, but for some people, this may not be a simple behaviour. They rather take the car even though they have to take a detour or stand in a traffic jam on their way back home. The travelling time may be the same, but the physical effort is lower. In rehabilitation, people are open to being more physically active. They only need to learn how they can implement this in their daily lives.

Brain Cycles

The next factor of simplicity is what Fogg calls “brain cycles”. If a certain behaviour costs too much thought through decisions, it is harder to execute the behaviour. This also becomes harder if the brain is already full of other issues that require many brain cycles. However, some people are highly skilled in good and fast thinking, so this element of simplicity will rarely be the cause of not performing a certain behaviour. In persuasive game design, interventions must not require too many brain cycles at once. Thinking deeply or thinking in new ways can be difficult and should be considered.

Social Deviance

Another element less obvious element of simplicity is social deviance. What Fogg means with social deviance is that certain behaviour that goes against social norms, is harder to proceed with. It is not simple for people to break the rules of society. People would for example not wear a swimsuit to a formal council meeting no matter how hot it is outside. It may require the least effort, but the social price is too high to pay. Therefore, in persuasive game design, it should be taken into account that certain desired behaviour does not interfere too much with the social deviance of a person.

Non-Routine

Finally, the sixth element of simplicity is Non-routine. Often, simple behaviours are behaviours which are part of people their daily life routine. These are activities that they do repeatedly. People often stay with their routine when seeking simplicity because they perfectly know how to perform the behaviour and what they can expect. They are confident enough that this behaviour can hardly fail. In persuasive game design, it is therefore important that people learn to feel competent in performing a behaviour. Sometimes people just need to experience a certain behaviour a few times, so that they realise how simple it can be.

Triggers

In Fogg’s behaviour model a trigger is something that tells people to perform a behaviour now. There are three types of triggers who do not function in the same way:

- 1. A spark is a trigger that motivates behaviour. In the cardiac rehabilitation context, this can be seen as the cardiac failure that motivates the patient to change his/her behaviour.
- 2. A facilitator makes behaviour easier. This type of trigger is appropriate for users that have high motivation but lack the ability. The practitioners in cardiac rehabilitation learn the participants how easy it is to perform a certain behaviour. They facilitate the behaviour, increasing their sense of ability.
- 3. A signal is a trigger that indicates or reminds people. Within the cardiac rehabilitation context, this can be an email or call from a practitioner, that informs them about the programme.

This is an interesting model to use for persuasive interventions within CR. The persuasive game intervention that will be designed in this master thesis will make use of the available motivation, ability and triggers of people in cardiac rehabilitation.

Self-efficacy theory

In the previous subchapters, different models were used to determine the role of motivation for performing certain behaviours. Self-determination theory described competence, relatedness and autonomy as the elements of self-determined motivation. Fogg’s behavioural model maps behaviour based on motivation in combination with ability and triggers. Then there is the self-efficacy theory.

Self-efficacy is a person’s belief in their ability to organise and carry out actions necessary in particular situations (Bandura, 1997). It has been shown to be a strong and consistent predictor of physical activity (Pan et al., 2009) and is therefore important for this master thesis. Additionally, self-efficacy is task-specific. This means that people can experience various forms of self-efficacy for various tasks. When people have self-efficacy for physical activity, they are confident to participate in PA, they know how to overcome PA-related barriers and they know how to organise time and responsibilities around PA (Sweet, et. al., 2012).

Research studies have demonstrated that constructs from different behaviour theories can work together in predicting physical activity

(Sweet, et. al., 2012). In this study, it is important to understand the overlapping elements in the theories to use them for persuasive game design. The goal of theoretical integration is not to pin one theory against another, but to incorporate constructs from two or more theories with the goal of better understanding the underlying mechanisms of behaviour change (Biddle, Hagger, Chatzisarantis, & Lippke, 2007).

The Self-determination theory and the Self-efficacy theory are well aligned because they are both based on the ideology that humans are agents of their actions. In SET and SDT, self-efficacy and competence can be seen as the same thing, but their role within the theories is different. SET states that self-efficacy/competence is the main driver of behaviour, whereas the SDT states that autonomy and relatedness also play an important role. In the SDT, self-efficacy/competence is a more distal factor for behaviour because it has a direct relationship with self-determined behaviour rather than behaviour. This is in contrast to SET, where self-efficacy is a more proximal factor for behaviour (Sweet, 2012). The ability factor in Fogg’s behaviour model also has a strong relation with self-efficacy/competence. When the six simplicity

factors of ability are difficult, people’s self-efficacy (belief in their ability to organise and carry out actions) will become lower. The difference here is that the ability is a set of situational factors, whereas the self-efficacy/competence is more about a person’s own belief and perception.

In this design project, it is important to understand the overlap of these theories to gain better design insights for the persuasive game. In the cardiac rehabilitation context, the main focus is to help people to become physically competent again after a cardiac failure. Therefore, the biggest focus lies on increasing this self-efficacy/competence level to be able to perform this behaviour. An additional focus lies in this project on increasing people’s sense of autonomy and relatedness. They can be used as motivational factors for the persuasive game.

Next to that, the six elements of simplicity will be taken into account when designing to increase the level of self-efficacy/competence, autonomy , and relatedness. Additionally, whenever the term self-efficacy is used in this master thesis, it also indicates the sense of competence and the other way around.

MAIN TAKEAWAYS

- + Time, money, physical effort, brain cycles, social deviance, and non-routine are all determined elements of simplicity and therefore for the ability to perform a certain behaviour
- + CR can be seen as a facilitator to perform a certain behaviour
- + Self-efficacy/competence is a predictor of physical activity

3.

CONTEXT FIELD STUDY

To give a complete answer to the research questions, a qualitative data analysis is done. To perform this analysis, data is gathered by doing in-depth interviews with participants and ex-participants at Capri. Additionally, a context observation was done to also capture deeper information about how the users behave and do. When conducting this field study, the research technique of Sanders & Stappers was used. It can be found that interviews and observations give data about what people say and what people do. Consequently, the knowledge derived from this data is most explicit and observable.

3.1 METHOD

Data collection

Because the target group is difficult to approach due to privacy reasons, this data was collected in collaboration with the PhD research of Faber, mentioned in the subchapter research background in chapter 1.1 context & stakeholders. Both research studies had similar goals to map the experience and motivation of people during rehabilitation. The participants that are interviewed in this chapter, are participants with a low SEP. This master thesis started already in the middle of Faber his user research. Participants were selected and were given a sensitizing booklet with interactive assignments and questions. The interviews that were conducted could immediately be used in this master thesis to get familiar with the people in cardiac rehabilitation and the context.

In total there were seven participants interviewed in the first phase of this field study. For some people the rehabilitation period was already a long time ago, so with the sensitizing booklets, they could already relive their experiences. During the interview, different topics were asked and discussed. They were asked about their current lifestyle, their experiences during Capri, their motivation during the rehabilitation process and if they would be open to eHealth interventions.

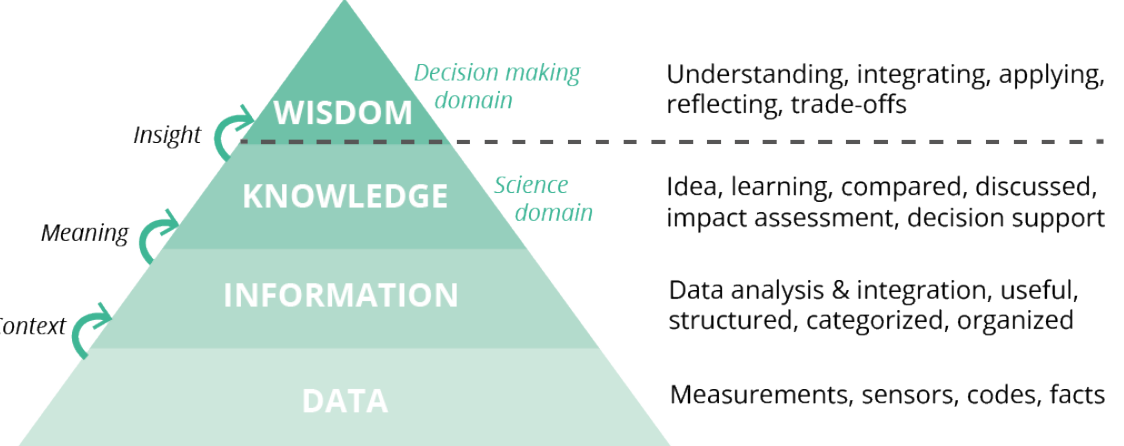


Figure 7: DIKW hierarchy (Ackoff, 1989)

For this master thesis, it was important to filter out the relevant data. During two interviews, some extra questions were asked for a deeper understanding of the participant's motivation level during and after rehabilitation. To analyze the data, the audio of the interviews was recorded, and memos have been made from the records afterwards. From these memos the most interesting and valuable quotes were coded and clustered. This transforms the data into information about the context. In figure 7, the Data, Information, Knowledge, Wisdom (DIKW) Pyramid of Ackoff is visible. This pyramid represents the structural and/or functional relationship between data, information, knowledge, and wisdom. With this model, it

can be explained how data can be transformed into valuable user insights. After generating the information from the data, meaning and conclusions can be drawn from the resulting themes. After that, valuable substantiated insights will be drawn from the knowledge to use for future design decisions. This wisdom will support the choices in the further design process. The content and the resulting insights will be discussed more in detail later in this chapter.

MAIN TAKEAWAYS

- + Persuasive design succeeds faster when the behaviour is simple, this can be done by taking into account the six elements of simplicity.
- + Facilitators are needed to increase the sense of ability
- + Self-efficacy/competence is a strong predictor of physical activity
- + Social acceptance/relatedness stimulates motivation

3.2 SETUP

Participants

As part of Faber his research, the participants were recruited from the XL trial group in 2021. Capri selected these participants because they already had given their consent to use their personal information for later research. Four people were called and agreed to participate in this research. Next to that, three people were selected by asking for their cooperation during one of the rehabilitation training. In this way, the experiences of people who are still in rehabilitation and people who already finished their rehabilitation can be gathered. The sensitizing package was sent to the people to be filled in. Two participants did not fill in the booklet, so they were filled in during the interview.

Ethical considerations

It is important that the people who followed the rehabilitation program at Capri, feel safe and secure. Due to privacy reasons, it is not possible to use their contact details for a research purpose. It is important to let people give their consent to contact them for interviews. The people in the XL course of the training already gave their consent for further research, so they could be approached for an interview. Another way was to personally ask them if they wanted to participate in an

interview, during a training. To protect this group from being harmed emotionally of feeling uncomfortable, a more detailed consent from needed to be filled in. In here was explained what it meant to participate in the research. They give consent that the data from the interviews and sensitizing workbook will be used anonymized in this research project. They also gave consent to audio record the session and that notes could be taken during the interview.

Interviews

The interview with the participants took about 45 minutes per interview. The interview was done individually per participant, so that they could speak freely about their personal experiences. Most interviews were done one by one, but with one participant two researchers were present. In total 7 participants were interviewed.

The subjects from the interview were categorized into the following themes:

- 1. Current lifestyle
- 2. Their experiences during rehabilitation
- 3. Their motivation during the rehabilitation
- 4. Attitude towards eHealth

Observations

A context observation always gives a deeper understanding in the behaviour of the target group. People can say anything in an interview or conversation, but it is important that their actual behaviour match their words. Therefore, a context observation is done in the training hall in Schiedam. The social workers and supervisors present at the training were permitted to speak to the participants and observe them during the training. In figure 8, the context of this observation is visible. During the observations the focus was on the following aspects:

- 1. What kind of activities do they do during the rehabilitation training?
- 2. What is the attitude of the participants towards the activities?
- 3. Were the participants motivated to be physically active?
- 4. How is the social connection between the participants? How do they interact with each other, but also with the supervisory team?

3.3 DATA ANALYSIS

Insights for intervention

Analysis

The key quotes, striking behaviour and statements were filtered from the interview and observation data. They were given tags based on participant number, type of data, subject and if they are still in rehabilitation or already finished. The 7 participants are numbered from P8 until P14 because this is how the data was collected and labelled in Faber his research. To avoid confusion, this labelling has also been adopted in the data analysis of this master thesis. In this chapter some of the quotes from the interview can be seen. The first quote is about the increased confidence of a participant during rehabilitation:

“ The first time I came I did not really believe in sport. The second time I thought; Yes! Also because I knew I would regain my self-confidence”

P9 Quote Rehabilitation Still in rehab

The gathered data was clustered into themes. All clusters with quotes can be found in Appendix 1. The most interesting knowledge can be found in the overlapping experiences between the participants. Overall, there were two returning themes in the data analysis: Motivation during and motivation after rehabilitation.

Motivation during rehabilitation

It is interesting to see how main subthemes were formed with in the cluster: Motivation during rehabilitation. In Appendix 2, this cluster can be found together with all the corresponding quotes and observations. One of them is how belongingness motivated the participants during the rehabilitation. Talking to other ex-cardiac patients who experienced the same thing creates some sort of bond. Additionally, the supervisors really empathize with the participants and try to help them with their personal goals.

"You know what it is, you are there with people where you form a bond with. You go there to train with each other, and the beauty of it is that you are accepted and understood"

Finished rehab P11 Quote Rehabilitation

Next to that, several interviewed participants talked about how they physically improved during rehabilitation. In their daily life they noticed it became easier to undertake activities. This also motivated the participants to continue their rehabilitation.

"I felt myself getting better and better during the rehabilitation and I noticed that everyday things became easier again"

Finished rehab P8 Quote Rehabilitation

Other interesting findings that improved the motivation of the participants were the positive feedback they got from the supervisors, the doctors advise and the safe environment they were in.



Figure 8: Cardiac rehabilitation training



Motivation after rehabilitation

The data from the motivation after rehabilitation mainly came from the participants who participated in the XL group and had already been rehabilitated at Capri a while ago. In Appendix 3, this cluster can be found together with all the corresponding quotes and observations.

It was most interesting to see how they kept motivating themselves when the rehabilitation training ended. Some wanted to go to the gym and others tried to walk a few times a week. However, every participant had difficulties keeping up their physical activity level in the period after the rehabilitation training. They wanted to pursue their physical activity after rehabilitation, but most of them did not know what to do, which results in a decreased feeling of competence, relatedness and autonomy. Additionally, other barriers such as comorbidity, temptations and wrong priorities are getting stronger again. More than one participant was wondering if they could rejoin the Capri training courses.

"I actually want to ask if I can take further training courses at Capri"

P12 Quote Rehabilitation Still in rehab

These findings suggest that the PA incorporation into the daily life of participants can be improved. An example of one participant that found a way to pursue his physical activity level was patient 9.

"After Capri I joined the Harttrim group where I train every Monday evening. I even became the secretary there"

Daily life Finished rehab P9 Quote

He became a member of a Harttrim group in Rotterdam. During rehabilitation, he realized that he liked to be physically active in a group. This shows that if people find an activity that they like, they are more motivated to incorporate it into their daily life.

Attitude towards physical activity

RQ3

What is the attitude of cardiac patients towards physical activity during and after rehabilitation?

The attitude towards physical activity during the rehabilitation differs per person. Most people had an open attitude and participated in all exercise assignments. They were a bit insecure about their abilities, so they just followed the instructions from the instructors. Some people were more stubborn and just wanted to do their own thing, like cycling on the fixed bicycle.

"Bending down hurts me, I'm not willing to put up with that pain"

P13 P9 Quote Rehabilitation

Others were very active and felt stimulated by the competitive element. Their attitude towards physical activity improved over the weeks because they noticed the positive impact it had on them:

"During the Capri training my motivation to keep on moving has increased. it also reassures you that there are people there to help you".

Finished rehab P10 Quote Rehabilitation

The attitude towards the physical activity of participants that already finished their rehabilitation had become more negative. One participant felt like it was already too late to work on his physical state:

"I just don't feel like moving, I think I've waited too long anyway"

Daily life Finished rehab P8 Quote

From the interviews, it became clear that their attitude toward physical activity remain positive after rehabilitation. However, when they did not find the motivation to continue their physical activity, more negative associations with physical activity rose.

3.4 CONCLUSION

Insights for intervention

The field study gave many valuable insights into the motivation of the user group. An overview of the insights from the data analysis is made in figure 9. This visualization is made to give meaning to the information and transfer it into knowledge (DIKW hierarchy). The strong drivers and barriers derived from the field research can be seen in the red and green circles. With these insights, research question 1 can be answered.

RQ1 What are the different drivers and barriers of cardiac patients for PA during and after rehabilitation?

By visualizing this as a motivation balance, it can be concluded that the barriers will disappear or become smaller when a person is stimulated with strong drivers. This happens during the rehabilitation training at Capri. The motivation balance visual is a good representation of how the motivation of participants at Capri is changing when switching from the rehabilitation context to daily life. This answers research question 2.

RQ2 What happens with the motivation of cardiac patients during the transition of rehabilitation to daily life?

The constant drivers and barriers such as negative social pressure, Covid-19 regulations, social support, giving into temptations etc. are visualised into the grey area. These drivers and barriers affect both the motivation during and after rehabilitation making these less likely to be the cause of the motivation change.

When the rehabilitation at Capri is finished, the positive drivers such as the safe environment, compliments of experts, working towards the same goal etc. fall away. These are all elements that stimulate their need for competence, relatedness and autonomy. It can be said that these strong drivers get overhand so that the motivation of the participant goes in the positive direction. However, these strong drivers fall away when rehabilitation is finished, which results in a decreasing sense of competence, relatedness, and autonomy.

It stands out that the positive drivers are mostly focused on exercises and doing activities together within rehabilitation. These drivers do not affect the activities outside and after rehabilitation, which makes more room for the barriers to rise. The negative drivers such as; not knowing what to do and now one checks on me indicate that they

lack their sense of competence and autonomy after rehabilitation. Additionally, their sense of relatedness is also decreasing, since they are not meeting and seeing the other participants anymore after rehabilitation.

Therefore, the challenge in this design project is to preserve their sense of competence/self-efficacy, autonomy and relatedness after rehabilitation, to reach this positive motivation level again.

MAIN TAKEAWAYS

- + Participants' sense of competence increases by compliments of experts.
- + Participants are doing what health experts say
- + Working with other participants towards the same goal is a good driver
- + Participants' sense of competence about activities in daily life must increase

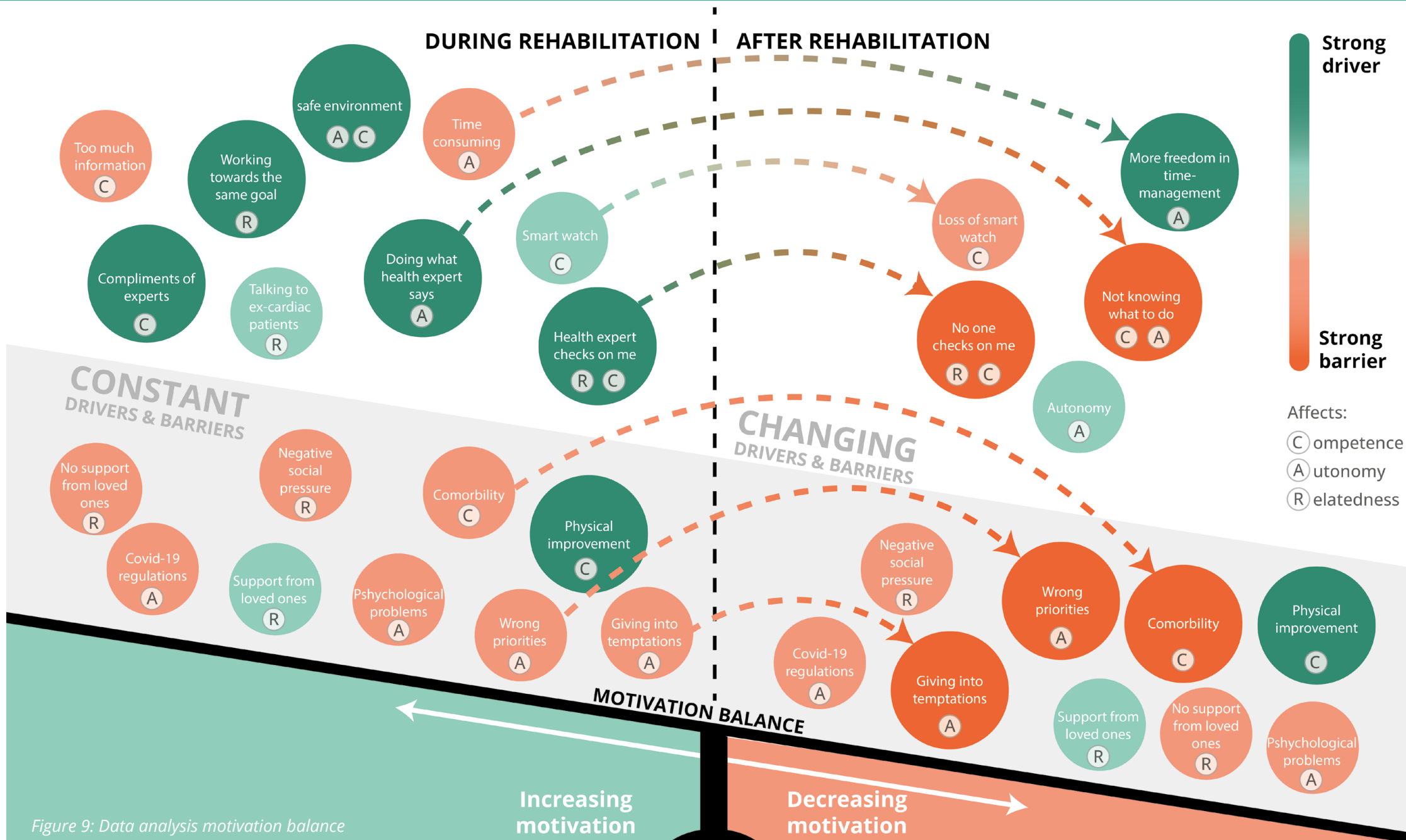


Figure 9: Data analysis motivation balance

4.

COMBINING LITERATURE & FIELD STUDY

The findings from the user-based literature study and the context field study gathered valuable insights for the rest of this design project. In the user-based literature study, the known behaviour of the target group was researched. Motivation and behaviour theories were consulted to find out this deeper-lying barrier, drivers and needs of the target group. To generate even more valuable knowledge, it is interesting to plot these findings on the insights from the context field study. In this way, key behaviour patterns can be found within the target group, but more importantly, the needs and opportunities for the design phase will become clear.

4.1 BEHAVIOUR ANALYSIS

Drivers and barriers

With the findings from the user-based literature study about people with a low SEP and the context field study of cardiac rehabilitation, the research questions could be answered. Starting with the first research question:

RQ1

What are the different drivers and barriers of cardiac patients for PA during and after the rehabilitation period?

People that participate in cardiac rehabilitation do experience barriers towards physical activity, such as comorbidity, wrong priorities, psychological problems, giving into temptations or negative social influence. However, these barriers can be seen as constant barriers that people experience during and after rehabilitation. The key question in this research, is what is the difference in barriers during and after rehabilitation?

The results of the context field study in figure 9 show that the positive drivers, such as the safe environment, doing what the health experts say, compliments and the social acceptance and relatedness, are falling away after rehabilitation. This makes room for new barriers towards PA after rehabilitation, such as not knowing what to do and being uncertain because no-one checks on them anymore. Other barriers that the people after cardiac rehabilitation may face are the barriers that were present in their lifestyle before their cardiac failure: financial problems, negligent upbringing, low (health) literacy, low education, short-term thinking, and negative social influences. If the positive drivers fall way after rehabilitation, it is likely for the participants to relapse into old unhealthy lifestyle patterns, not maintaining their physical activity level.

Motivation

The next question that is important to answer is the second research question:

RQ2

What happens with the motivation of cardiac patients during the transition of rehabilitation to daily life?

When looking at the Self-determination theory (Ryan & Decy, 2017) and Fogg's behaviour model (Fogg, 2009) discussed in the user-based literature study on page 24, the participants in CR increase their competence and ability level, which results in a higher success rate for physical behaviour to occur. This in combination with the other motivational driver of social acceptance or relatedness, it can be said that therefore the motivation for PA during rehabilitation is positive on the motivation balance in figure 9.

It can be said that the PA motivation is high during rehabilitation despite the barriers that this target group face towards pursuing a healthy lifestyle. When looking back at chapter 2.1 lifestyle of cardiac patients, a lot of the barriers become less

strong. The rehabilitation training is reimbursed by health insurance companies, so it is financially attractive to make use of it. Next to that, the lack of perceived time is gone since they are expected to go to the rehabilitation training two times a week and it becomes part of their routine. They also meet other people in rehabilitation training, so they will experience a positive social influence. Additionally, despite a possibly negligent upbringing in which people were never taught to be physically active, during rehabilitation they learn to trust their physical abilities. People are also experiencing that it is possible to be physically active, even when living in bad neighbourhoods. There are sports facilities everywhere, they just need to get to know them. It can be concluded that CR increases the sense of competence, autonomy and relatedness which results in this positive motivation for PA.

However, after rehabilitation, this higher sense of competence, autonomy and relatedness is not holding up because they were caused by the CR programme. It should be considered that the

definition of competence is as follows: Feeling effective at one's activities (Ryan & Deci, 2017) and it was indicated that self-efficacy/competence is task-specific PA (Sweet, et. al., 2012). The physical activities that the participants learn to feel confident about are the activities they practice during rehabilitation, which are; strength exercises with tires or balls, fitness training, or small sports games. The physical activities they can practice in their daily lives are not covered in the current

rehabilitation programme at Capri. The same applies to their sense of relatedness since they are not part of the Capri community anymore. Lastly, their sense of autonomy decreases because they do not know what they want to do after rehabilitation.

When going back to the motivation balance in figure 9, it comes as no surprise that barriers related to lack of competence/self-efficacy are

resurfacing after rehabilitation. The lack of competence can also go hand in hand with fear, which is according to Fogg (2009) a powerful demotivator. These factors ensure that people are below the action line of Fogg's behaviour model after cardiac rehabilitation, and it explains why the motivation balance in figure 9 is negative.

Attitude

Now that the drivers and barriers for the motivation towards PA are clear. It is interesting to see if the attitude of cardiac patients during and after rehabilitation has changed. This answers the third research question:

RQ3

What is the attitude of cardiac patients towards physical activity during and after the rehabilitation period?

From the user-based literature study it is known that an event like a cardiac failure is a teachable moment (Coull, 2021). This means that most people in cardiac rehabilitation have an open and positive attitude towards physical activity because they are motivated to recover. They are coming there for a reason; they just don't know what to expect. After cardiac rehabilitation it can be seen that this positive attitude towards physical activity remains. People in the interviews even indicate that this attitude became more positive because they experienced the benefits of being physically active. Some even wanted to come back to the Capri training sessions, as was discussed in chapter 3.3 data analysis.

Figure 10: CR training



4.2 USER PERSONAS

Findings

Every participant in the cardiac rehabilitation is different and needs personal guidance within rehabilitation. From the context field study three main persona profiles can be distinguished from the people in cardiac rehabilitation. The three personas all have their own behaviour types with different motivations, barriers, attitudes and needs. The personas are visible in the figure 11 below.

The enthusiastic explorer

The first person is Kevin, he has an open attitude towards physical activity, and he wants to get most out of the cardiac rehabilitation training to recover. He is a social person and likes to drink a beer with friends. His barrier is that he is sensitive for social pressure and unhealthy eating habits. However, he is used to work out in his daily life so he would be less likely to have a decreasing sense of competence and motivation after rehabilitation.

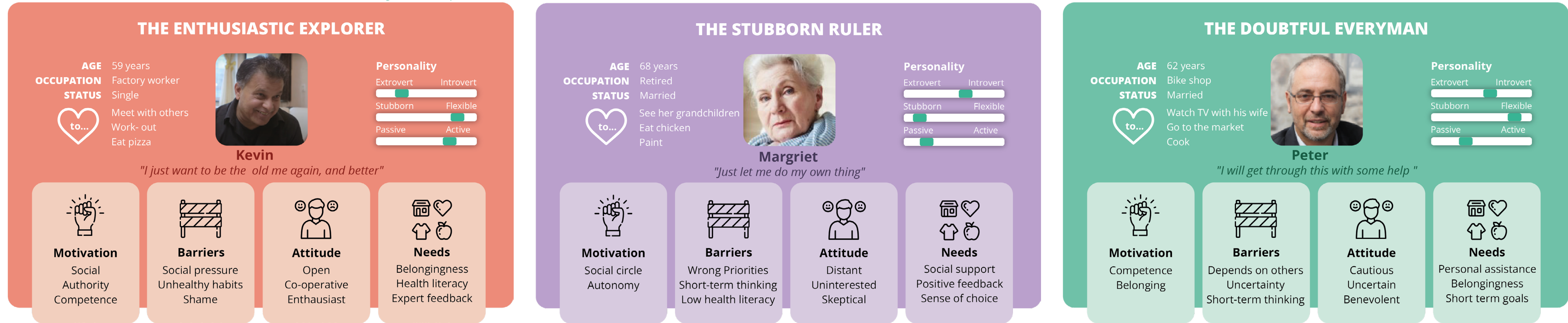
Figure 11: Three personas

The stubborn ruler

The second person is Margriet, she has a sceptical attitude towards physical activity. She is coming there more to reassure her social circle rather than she is intrinsically motivated. She already went through a lot, making the teachable moment of this heart failure less strong. She is a bit stubborn and only want to do things their own way. The way to guide her within rehabilitation is to give her some distance and sense of choice.

The doubtful everyman

There are always a few people like Margriet in the group, however the most people in cardiac rehabilitation are like Peter. Peter has an open attitude towards physical activity. He is motivated to change his behaviour because he wants to recover, he only is uncertain about his own capabilities. What he needs is personal guidance in achieving short term goals, to build up his competence level.



4.5 CONCLUSION

Within this master thesis, it is important to get to know the deeper-lying motivations, barriers, attitudes and needs of the target group for whom the persuasive game will be designed.

By defining the target group even more clearly, a better design foundation can be created for the design phase of this project. From the three personas that are identified from the general target group of cardiac patients, the doubtful everyman is most likely to relapse to a low PA level after rehabilitation. This is because these people are most dependent on their own self-efficacy/competence level to get into action. They gain their self-confidence during rehabilitation, but their self-efficacy is not strong enough to maintain their PA level after rehabilitation. When rehabilitation period ends, their motivation is likely to decrease. When looking at Fogg's behaviour model, the green dot indicates where the doubtful everyman is located during rehabilitation and the red arrow indicates in which direction the doubtful everyman is going after rehabilitation. This is visible in figure 12.

The people that identify with the doubtful everyman need the most guidance during but also after rehabilitation. When designing health interventions, these people can also benefit the most from it. Therefore, the main target group to design for in this project is the doubtful everyman persona. Within the intervention the doubtful everyman needs to learn about the PA possibilities and increase his/her self-efficacy level to maintain their PA level.

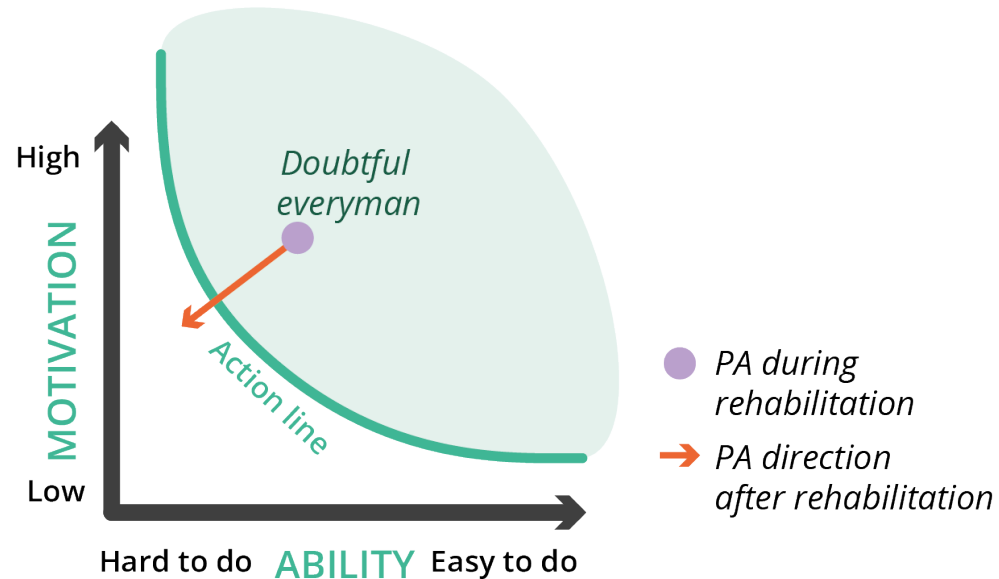


Figure 12: Fogg's behaviour model (Fogg, 2009).

5.1 PERSUASIVE GAME DESIGN

Theoretical explanation

A persuasive game is a great tool to persuade people to perform a desired behaviour. In persuasive games the aimed for transfer effect does not have entertainment as the primary goal but more a persuasive goal to influence players their behaviour. However, this does not mean that such games should not be entertaining for the users, this is even what needs to motivate the users to realise the non-entertaining transfer effects (Visch, 2013).

With gamification, a user experienced game world (GW) can be created. This game world can be seen as a safe sone in which user needs can be fulfilled, and where the actions do not have major consequences. In persuasive game design this user experienced game world (GW) stimulates behaviour change in the real world (RW). In figure 12 on the next page, this effect is visualised. The transition from GW to RW, is called the transfer. This transfer is the effect of the user experience in the GW on forming, altering, or reinforcing behaviour in the RW (Visch, 2013).

Within persuasive game design, the user experience often forms the main core of the game. It is a great tool to support action and can be valuable for behaviour change in cardiac rehabilitation. Since people in cardiac rehabilitation are already present in the sports hall, and are open to do and learn new things, this is a great window of opportunity to implement a persuasive game.

5. DESIGN METHOD STUDY

From the previous chapters it is known that an intervention should be made, that learns the doubtful everyman to integrate PA in their daily life. This behaviour can be best stimulated by doing, by making this part of their routine. A way to engage users in such activities is by gamifying it. In this chapter, the power of persuasive game design will be explained and plotted on the context of cardiac rehabilitation. Various persuasion principles and elements are discussed that may be valuable for the persuasive game that will be designed in this master's thesis.

5.2 GAME IN CONTEXT

Gamification

To design a persuasive game, it is important to know how gamification can be used. Gamification can be explained as using typical elements from gameplay to enhance systems, services, and activities to motivate and engage its users (Hamari, 2019). This is generally accomplished through the application of game -design mechanics and game dynamics in non-game contexts (Deterding, 2011). According to the MDA framework, the game designer's design process consists out of, mechanics, dynamics, and aesthetics.

Dynamics

In the MDA model, the dynamics are the game design principles that create and support aesthetic experience. The dynamics are the patterns of how the game and the players will evolve over some time. For example, time pressure and opponent play are two game dynamics that create and support the aesthetic of challenge. The dynamic of sharing information across players or a team are supporting the game aesthetic of fellowship (Kim, 2015).

Mechanics

The game dynamics tailor game mechanics. The mechanics are the various actions, behaviours and control mechanisms afforded to the player within a game context. Typical game design mechanics (Sailer, 2017) are:

1. Points
2. Storytelling
3. Levels /stages
4. Badges
5. Rewards
6. Challenges
7. Leaderboards
8. Progress bar
9. Storytelling
10. Avatars

Aesthetics

The game aesthetics are the different goals of games and the components of fun. Examples are (Kim, 2015):

1. Sensation (game as sense-peasure),
2. Fantasy (game as make-believe),
3. Narrative (game as drame),
4. Challenge (game as obstacle course),
5. Fellowship (game as social framework),
6. Discovery (game as uncharted territory),
7. Expression (game as self-discovery), and
8. Submission (game as pastime).

According to Marczewski (2013), the game mechanics are a distinct set of rules that dictate the outcome of interactions within the system with an input, a process, and an output, while game dynamics are the users' responses to collections of those mechanics.



Figure 13: Persuasive game design model (Visch et. al., 2013)

Desired transfer effect

The insights from previous chapters about the behaviour, barriers, drivers and needs of the target group, serve as the base for the transfer effect of the persuasive game that will be designed in the next phase of this design project. According to the cookbook method (Visch, et. al., 2013), the transfer effect consists out of the effect type, the change type, the point of impact and the transfer domain, which are all stated on the right.

The transfer effect during cardiac rehabilitation will be mainly achieved after gameplay, since it will encourage users integrate physical activity in their daily routine.

Game elements for target group

The dynamics of the persuasive game within cardiac rehabilitation does not need to be challenging in a way that personal competition is implemented. This because this is not in line with the essence of cardiac rehabilitation: That

TRANSFER EFFECT

Effect type: Encouraging physical changes in daily life

Change type: The game helps to encourage players to form new behaviour

Point of impact: The users will engage with the persuasive game in the cardiac rehabilitation period of 6 weeks

Domain: The domain where the change need to take place is within cardiac rehabilitation

everybody is rehabilitating at their own pace and achieving their own goals. If someone would be on the bottom of the competition, their motivation to come to rehabilitation can in fact decrease. The dynamics however can be challenging in a way if people are part of a team and they have to perform actions under time pressure. This dynamic supports the game aesthetics of challenge and does not affect someone personally. Next to that, a dynamic that is valuable for in this context is the dynamics for sharing information and helping each other. These dynamics support the game aesthetics of fellowship.

With the mechanics such as **storytelling** and corresponding **rewards**, the game aesthetics can come to life. It is important to find game-mechanics suitable for the desired challenge and fellowship game aesthetics. A leaderboard for example does not fit in this context because it is not the main purpose to be the best one in rehabilitation. Points or levels are also difficult because they do not carry meaningful values that they can bring to their real-life world. Whereas, a progress bar can give a sense of competence and improvement, which contributes to motivation.



6.

DESIGN BRIEF

In this phase, different concepts were further elaborated. Some concepts were merged, and some were evaluated with IDE designers or other stakeholders. Often this the design brief is about mixing promising design elements together, to come up with the right solution for the design goal: developing a persuasive game that supports the maintenance of PA in participants' daily life by stimulating their sense of competence, relatedness, and autonomy. The insights from this phase lead to the base of the final concept.

6.1 DESIGN GOAL

DESIGN GOAL

My design goal is to develop a **persuasive game** that supports the maintenance of **physical activity** in the **daily life** of cardiac patients by stimulating their sense of **competence**, **relatedness**, and **autonomy**.

6.2 DESIGN VISION

FUNCTION

The most important function of the game-based health intervention:

Learning the participants how to integrate physical activity into their daily lives, so that they experience a higher level of self-efficacy/competence, and feel more autonomous and related to others after rehabilitation.

TARGET GROUP

The main target group are the people that can identify with the doubtful everyman persona from chapter 4.2 personas. These participants at Capri rehabilitation are the most hesitant about their physical capabilities, so for them, it will be most valuable to learn how to integrate physical activities in their daily life. By integrating this already within rehabilitation, the transfer from rehabilitation to daily life will be less impactful. .

CONTEXT OF USE

The context of game-based health intervention is during the cardiac rehabilitation period. This is a window of opportunity to implement interventions because the target group is already open to learning new things. They already made the decision to join cardiac rehabilitation for twice a week, so they do not have to cross a new threshold to participate in the game.

INTERESTED PARTIES

Capri rehabilitation

The people at Capri have an interest in ensuring that the level of PA, is continued after the rehabilitation. They want to increase people's quality of life and ideally make sure that they will not need to come back in the future. Capri stands for high quality care, so they want to improve the maintainance of PA in the daily life of their participants.

Loved ones

It can be an enormous shock for the loved ones of someone who suffers from a cardiac failure. On top of that, they are not at the rehabilitation training so they do not get the reassurance that they are physically progressing. This is why it is important that they can also see the participants' rising physical activity level in their daily life.

Sports providers

The already existing sports associations in the field of physical activity have to rely on an influx of new registrations. Some of the activities for the more vulnerable groups are even subsidised by the government. However, it costs money to find people who want to join their sports facilities. Therefore, a tool that encourages people to take part in physical activities in everyday life will also be beneficial to them. Their interest would only increase if people were explicitly referred to their sports facilities in the game.

INTERACTION VISION

Making a deal

When making a deal, two or more people promise each other to do something (Figure 14). This can be something for the other person or something for yourself. A social promise is very strong because you know that the other person expects something of you. You do not want to disappoint the other and you want them to like you. This phenomenon derives from the human need for connection with others.

The human nature is wired to connect because they needed cooperation to survive. In other words, being liked meant being fed and protected (Murphy, 2015). That is why a social promise is a great motivation for people to get things done.



Figure 14: Interaction vision

6.3 DESIGN OPPORTUNITIES

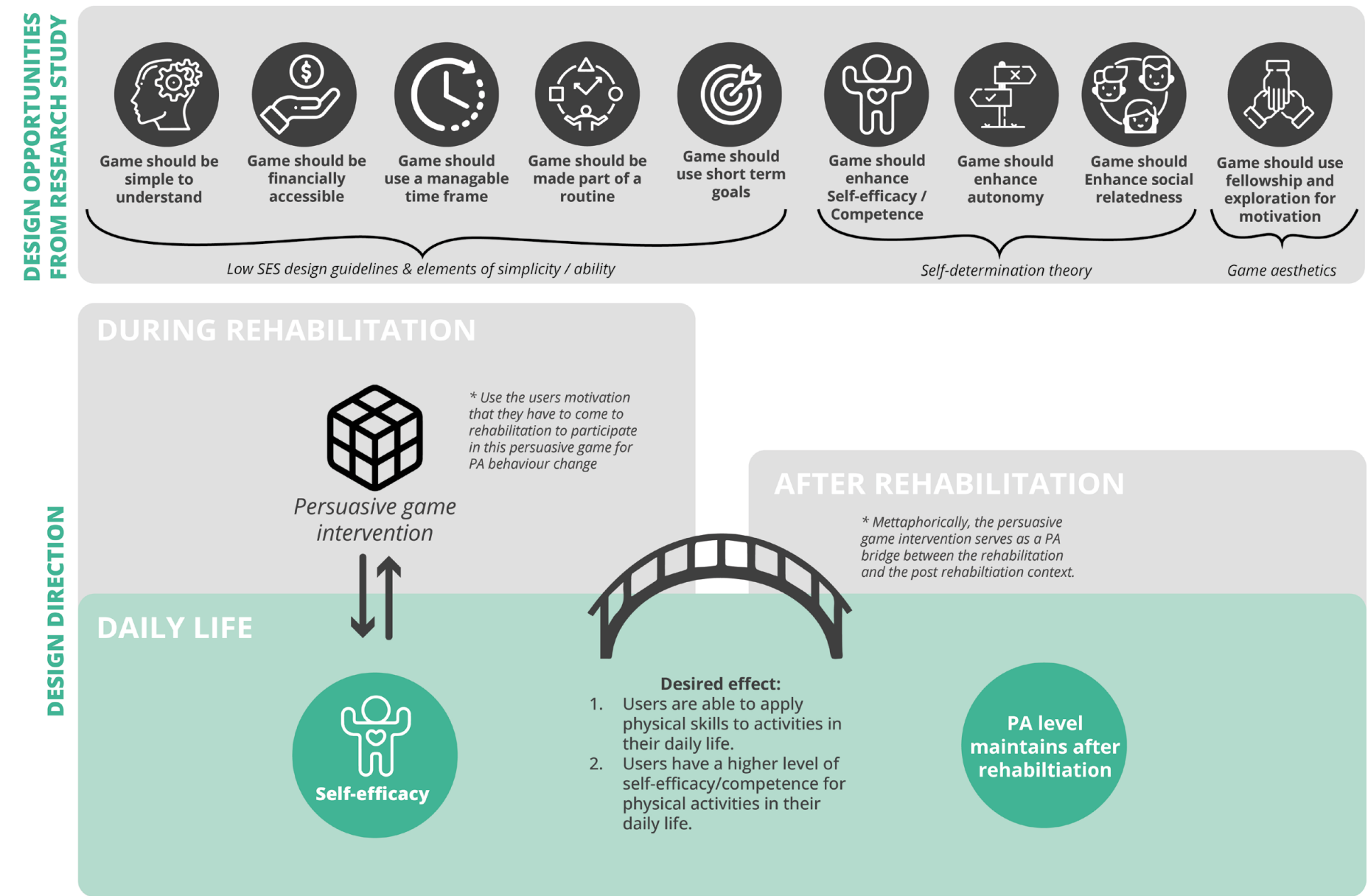


Figure 15: Design opportunities

7.1 INTRODUCTION

At the start of the ideation phase, the empathize and define phase is converged into a clear Design brief to start with. When looking at figure 16, this phase starts with divergent thinking. A lot of out-of-the-box ideas are generated and different design directions are explored. After that, a more convergence approach is needed. The different design directions are evaluated with experts of Capri. The insights that derive from this evaluation will give valuable input for another round of divergence thinking in the conceptualisation phase (next chapter).

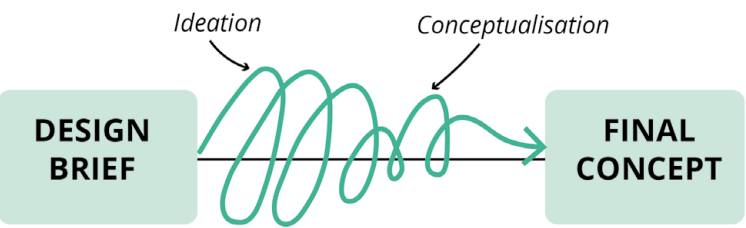


Figure 16: Divergent and convergent process until final concept

Because these iteration cycles are getting more specific, the concepts are getting more and more viable, feasible and usable. Within the iteration cycles, new concepts are generated through co-creation sessions with stakeholders, brainstorming sessions or creative sessions with other designers. These sessions and the most important design directions are discussed in the next chapters.

IDEATION

This phase consists out of the generation of many small or big design ideas. The most promising ideas and design directions were discussed, and some were validated with stakeholders and the target group. This led to valuable insights that were taking into the conceptualisation phase.

7.2 BRAINSTORM SESSION



Figure 17: Brainstorm session

Brainstorm session

After the empathize and define phase of this project, a brainstorming session was done to get a lot of new ideas that could serve as inspiration for designing a persuasive game within the context of cardiac rehabilitation.

The input of the brainstorming session were insights and findings from previous chapters within this master thesis. Different game aesthetics, dynamics and mechanics were used and scrambled to come up with out-of-the-box ideas. Every different combination evoked new ideas and gave a better understanding of important or promising elements.

In Appendix 4 an overview of some of the first Ideas can be found, even as the game elements that were used.

➤ One promising idea came from the combination of coaching support game dynamics in combination with simplistic game aesthetics. The mechanics that were used in these ideas were focused on challenge and collecting badges. This first idea was more focused on increasing a higher level of autonomy and competence by giving the user compliments and rewards for their physical achievements.

➤ The second idea that came forward from the combination of an individual game dynamics in combination with a cartoonish game aesthetics and role-playing and achievement game dynamics. In this idea the individual player need to take care of a smart ball, by doing physical workouts with him. In this way, by taking care of the smart pet, the player is taking care of himself.

➤ The third idea that came forward from the brainstorm originated from the combination of a social connected game dynamics in combination with a realistic game aesthetic. The mechanics that were used in this idea were focused on achieving goals with others and exploration. The idea is based on inspiring each other by sharing activities and collecting each other's activities.

To dive deeper into details in these ideas, some valuable insights for the coming design iteration can be found. Additionally, it is interesting to look at the core-game loop of these ideas to see which one is most interesting to continue with in the next design iteration. This will be done in the next chapter.

MAIN TAKEAWAYS

- + Compliment from a coach for physical achievement is motivating
- + Sharing activities can inspire others
- + The motivation to care for someone else can be used to take care of yourself.

7.3 DESIGN DIRECTIONS

From each idea, the core-game loop was defined and discussed. In game design, the core-game loop represents the repeating processes that drive the core action and the interaction between players and the game (Francillette, et. al., 2012)

The formulation of such a game loop allows designers to better analyze whether the game mechanics used in the gamification design actually support the key actions or interactions which leads to the desired therapeutic outcome(Visch, et. al., 2021). In this design process, it is therefore important to formulate this core-game loop to maintain direction and foundation for the rest of the design process.

From the brainstorming session, three potential

core-game loops are considered. The first one is the coach approach, the core-game loop is based on feedback and support from a coach on the physical activities of the player. In the core-game loop the coach will stimulate the physical activity in the player their daily life, when the player performs the action, he/she will get a positive feedback and support from the coach to continue.

The second core-game loop is based on a caring for someone of something else. This caring approach stimulates the need of someone to take care of their surroundings. Care motivation is a good driver because it gives the person more awareness of their self-efficacy. Once they find themselves able to provide care, it is more likely

that they are also able to take care of themselves. If others need the player to help them, they feel responsible for them and are more likely to perform the action. Take for example, the owners of a dog; they are more likely to walk outside after dinner, than if they didn't own a dog. The third core-game loop is based on social support. The buddy approach is a powerful core-game loop because it is a dynamic interaction between people, which maintains itself. When working with others towards the same goal, people feel responsible towards each other to contribute to the common goal. The interaction between players, drive them to be physically active, which driver other players again to be physical active. This results in a social reward of victory when the common goal is achieved.



Figure 18: core-game loops of design directions

7.4 EXPERT VALIDATIONS

Approach

It is important for a viable design to keep evaluating with experts in the design context. This ensures that the game-based health intervention meets the needs of the target group but also the needs of the stakeholders who must facilitate the game. This expert validation contributes to the feasibility and viability of the future health intervention.

Therefore, three interviews were set up with employees at Capri. In each interview, the core-game loops and the different personas were explained. After that a few questions were asked:

1. Do you recognize the personas within the participants that come to Capri?
2. What are you already doing to coach the participants to stay physically active?
3. What are you already doing to let participants feel autonomous?
4. Are you already doing something to stimulate social relatedness within the participants' group?
5. Which direction would you think best stimulate physical activity? This may also be a combination of directions.

After the interview, a small co-creation session

was done to see how they would envision each direction with each persona. To generate out-of-the-box ideas, visualisations of possible needs were printed out. In these visualisations, elements of social needs, competence needs and autonomy needs were visible. Next to that, more practical needs, such as when, where and for how long can be found. This last category is added to consider the feasibility of the concept direction. The visualizations can serve as a source of inspiration during the co-creation session (Appendix 5).

Participants

The interviews were executed with a social worker, a psychologist and a physiotherapist who are all working at Capri. More information about the experts are visible in table 1:

Expert	Social worker	Pshychologist	Physiotherapist
Age range	30 – 35 years old	35 – 40 years old	25 – 30 years old
Gender	Female	Female	Female
Works at Capri for...	12 years	1 year	1.5 years
Location	Capri office	Online call	Rehabilitation training

Table 1: Information about the interviewed experts

Data analysis

Persona's

The experts in the interviews could recognize the persona profiles. The psychologist mentioned that she also recognized the different barriers that they are struggling with.According to the social worker the most people in CR can identify with the doubtful everyman persona:

“A big part of the people in cardiac rehabilitation are insecure about their capabilities, they do not know yet what and how they need to continue their physical activity after Capri”
– Social worker

Coach approach

According to the experts, the coach approach is for certain a valuable motivator because this is what already happens in CR. However, it is a problem for practitioners to give every participant the coaching they need:

“The practitioners in the sports hall also do not have that much time to individually coach everyone outside rehabilitation”
– social worker

Caring approach

The caring approach is less suitable according to the psychologist and social worker:

“The caring approach is difficult to implement because it takes place at home. In this way Capri does not influence it and cannot motivate the participants to use it”
– social worker

However, the caring approach can also be interpreted in another way, where participants take care of other participants:

“Participants are already taking care of other participants during rehabilitation by talking about their own experiences and giving advice.”
– physiotherapist

Buddy approach

The buddy approach is strong during rehabilitation because the participants are already supporting each other in rehabilitation. However, they often do not keep in contact after rehabilitation:

“However it did not happen that often that people maintained contact after rehabilitation”
– physiotherapist

They also already did try out to make buddy matches in rehabilitation.

“We already made buddy matches once in rehabilitation to stimulate the social support. Some found an activity together to practice after rehabilitation, but most of them did not”
– physiotherapist

Feasibility

It would be a good addition if the concept provides the participants with the support of the practitioners since they are not able to individually coach everyone:

“What would be interesting if the practitioners just have a supporting role, so that it does not take too much time, but that the participants feel their support”
– social worker

All experts mentioned that it is important that the game intervention is more likely to be implemented if it does not add too much extra workload to the practitioners in the sports hall.

Design directions



Figure 19: Interview with social worker

The buddy approach and the coach approach were the most promising directions to go in:

“The buddy approach in combination with the coach approach can be valuable. The intervention would be interesting if the participants can motivate each other to perform the actions in this game. The role of the coach may be to support the team and give some feedback”
– Social worker

Additionally, the participants in rehabilitation need to be more aware of the activities they can practice outside rehabilitation.

“The participants should be more informed about which activities they can practice outside rehabilitation”
– physiotherapist

If they can explore these possibilities and find something they like, they are more likely to maintain their physical activity in their daily life:

“Participants need to explore what

they like to do. If they like to do something, they are more likely to be motivated to continue with it in their daily life. This can be walking, golfing, sporting at home, tennis, cycling, whatever, they just need to like it”
– social worker

Lastly, the psychologist thinks it is a smart move if the game intervention enhances each component of the self-determination theory:

“The concept needs to find a balance in competence, relatedness and autonomy drivers for motivation, to resonate with most people in cardiac rehabilitation”
– psychologist

Conclusion

Some valuable insights can be drawn from the interviews. The insecure participants need extra stimulus to continue their physical activity after rehabilitation. The coach approach is promising, although the game intervention should not put more workload on the practitioners. The buddy approach can work within CR to motivate each

other; however, it is hard to keep this up after rehabilitation since then they must maintain it themselves. The most interesting design direction to go in is a combination of the buddy and the coach approach. The caring approach is less suitable since people first need to take care of themselves.

Additionally, when participants can explore what they like to do, they are more likely to continue with this in their daily life. This can serve as an inspiration for the conceptualization phase of this design project.

MAIN TAKEAWAYS

- + The persuasive game should not put more workload on the practitioners.
- + A buddy system within rehabilitation can motivate the participants more than a buddy system after rehabilitation.
- + More emphasis can be placed on the possibilities of physical activity outside rehabilitation.

8. CONCEPTUALISATION

In this phase, different concepts were further elaborated. Some concepts were merged, and some were evaluated with IDE designers or other stakeholders. Often this phase is about mixing promising design elements together, to come up with the right solution for the design goal: developing a persuasive game that supports the maintenance of PA in the daily life of cardiac patients by stimulating their sense of competence, relatedness, and autonomy. The insights from this phase lead to the base of the final concept.

8.1 CREATIVE SESSION

Creative session with designers

The iteration cycles in the ideation phase gave valuable insights for further specifying the concept. The design goal, design vision and design opportunities formed a basis for this conceptualisation phase. The insights gained from previous chapters are considered when detailing the concept.

Together with other IDE designers a creative session was organized to further specify some concepts. In figure 20 an impression of the creative session can be seen. Next to that, the concepts were discussed multiple times with the supervisors in this project. This led to promising design elements that were implemented in one detailed concept.



Figure 20: Creative session with IDE designers

8.2 DESIGN ELEMENTS

Promising elements

After the creative session, some promising concepts were detailed further (Figure 21). The elaboration of these concepts can be found in Appendix 6. The most promising elements from these concepts are stated below:

1. Using physical attributes within cardiac rehabilitation contributes to the imagination and presence of the game. In this concept building blocks are used to build a tower that shows the score of a team.
2. In this concept the persuasive game within rehabilitation is motivating its users to use the free counselling and trial sessions offered by sports providers. Often, these sports providers are also reimbursed by the government, and people can participate every week for a good price.

3. In the last concept, a travel passport was used as a metaphor for their physical activities outside. The good quality of this concept was that it may help to overcome a threshold to undertake a physical activity with someone in your surroundings.

These promising elements will be considered when making iterations for the final concept.

Detailed concept

The insights from the creative session and promising elements, served as a basis for the development of a more detailed concept. In this concept, the participants are divided

in teams and they need to carry out a physical activity at a sports association in their neighbourhood. They have four weeks to achieve this goal together. When they carried out this challenge, they will give an experience talk in the last two weeks of their rehabilitation period to the other participants in rehabilitation. In this way, the participants can learn from each other what physical activities they can practice after rehabilitation.

A more detailed journey of this concept is described in Appendix 7 of this master thesis. After another iteration cycle, in which this concept was further evaluated with the supervisors and a physiotherapist in the rehabilitation context, the final design was created. This can be read in the next chapter.

Figure 21: Three concepts with promising elements



9.

FINAL DESIGN

In this phase the final design of this master thesis is explained. An introduction and the scenario of use of the game is given. After that, more will be explained about the Space Mission Sanitas in its game context, and a user journey of the final design is visualised to give a clear overview of the design choices that were made. In subchapter 9.5 more detailed explanations of the design choices are given. The last subchapters dive deeper into the prototyping of the final design that will be used for the final evaluation study.

9.1 INTRODUCTION

In this game, participants in CR form six teams and are challenged to meet a weekly fuel goal. This is to provide their space shuttle with enough fuel to complete the overall mission. This fuel goal can be seen as a metaphor for a physical activity goal. The goals on the cards are therefore all related to physical activity implementations in their daily lives. The goals can be about physical exercises they can do at home or about participating in a free trial class of activity in the area. Once the teams have met their weekly fuel goal, they show this during rehabilitation training by putting their team shuttle block on the tower. In this way, the practitioners can see which teams contributed to the mission. The goal of this game is to increase people their self-efficacy/competence level, relatedness level and autonomy level so that they are more likely to maintain their physical activity after rehabilitation. In this chapter the gameplay scenario, the game and choices for the game are further explained.

On the next page, a sketched scenario of the four phases of the Space Mission Sanitas game can be seen (Figure 22).

9.2 SCENARIO OF USE

Phase 1: Introduction & team forming

Before the first rehabilitation training

1. The new participant just had their intake conversations, and they are told that they form a team with the other new participants. They get to know each other, and the rehabilitation training starts.

Phase 2: Clapping for achieved fuel goals and new teams

Start of the rehabilitation training

2. The participants all come together and check with their teammates if they achieved their fuel goal.
3. If the majority of the people in the team achieved the fuel goal they may put their team shuttle block on the space shuttle.
4. The practitioners initiate an applause for the teams who contributed to the space mission!
5. After that, the practitioners initiate an applause for the new team that joined the rehabilitation training this week and gives them a shuttle block.
6. The team need to come up with a team name and they are recommended to make a Whatsapp group chat after the training is over.
7. The space shuttle stays in the sports hall during the rest of the training.

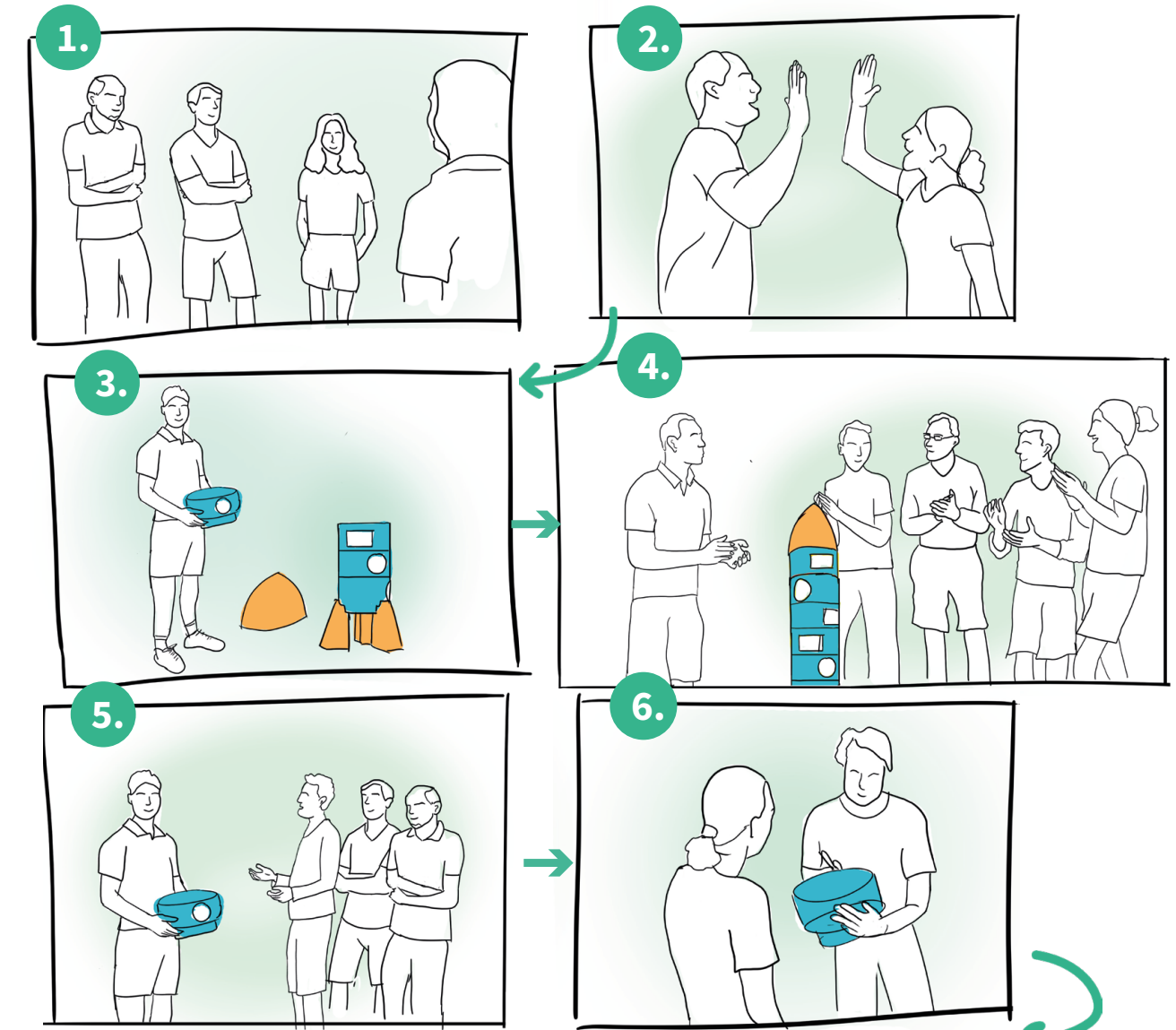


Figure 22: Scenario of use

9.3 SPACE MISSION SANITAS GAME

Phase 3: Selecting a fuel goal

End of the rehabilitation training

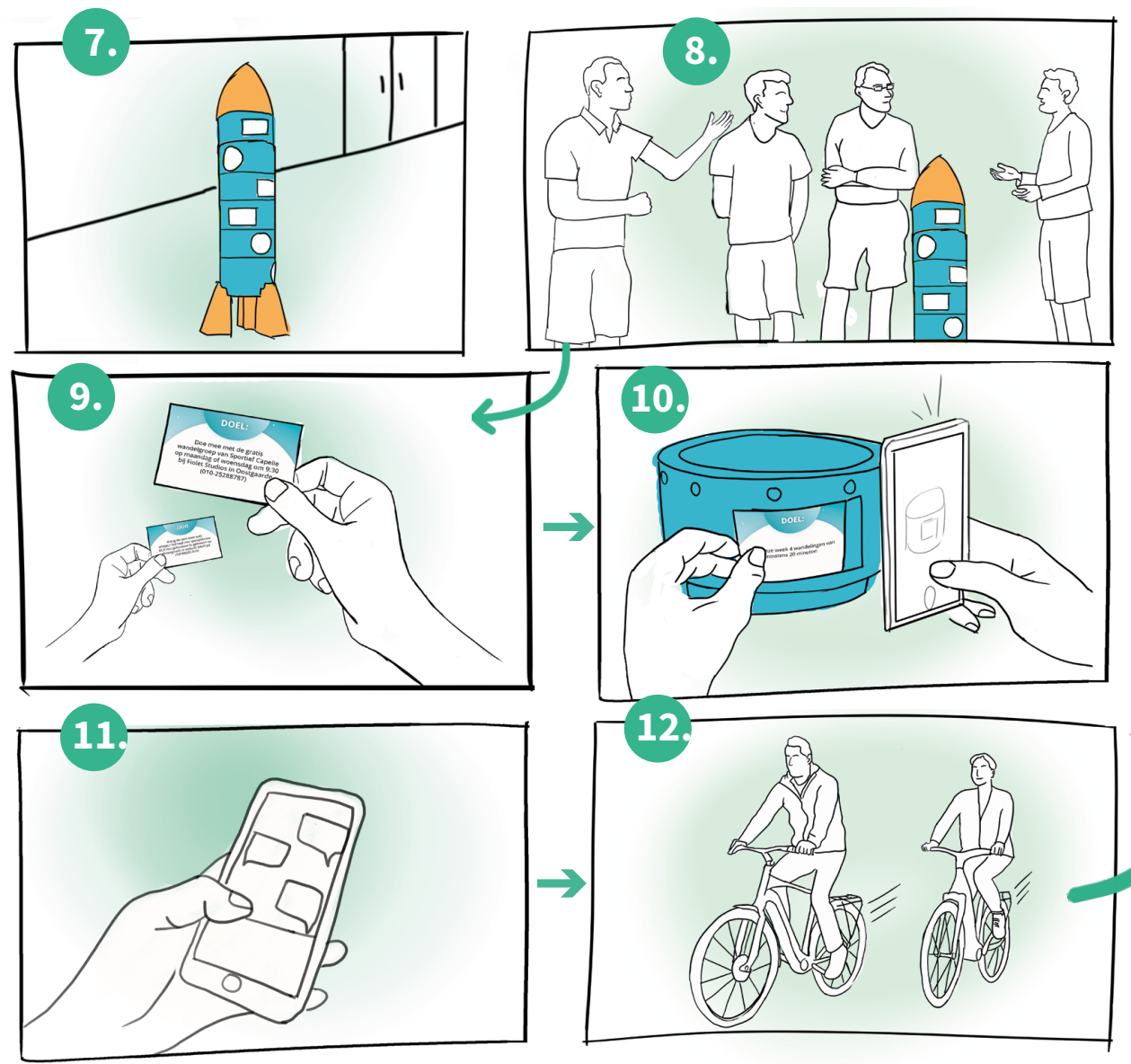
- All participants come together and draw a new fuel card from their team deck.
- One of the drawn cards will be chosen by the team to put on the shuttle block, this is the weekly fuel goal that the teams need to carry out this week.
- The practitioners remind people to take a picture of the chosen fuel goal and send it in their Whatsapp group chat.

Phase 4: Performing fuel goal

Daily life context

- A reminder is sent in the group chat about how it is going to perform the fuel goal.
- During the week, the fuel goal is performed. For example, by joining the cycling tour on Thursday together.

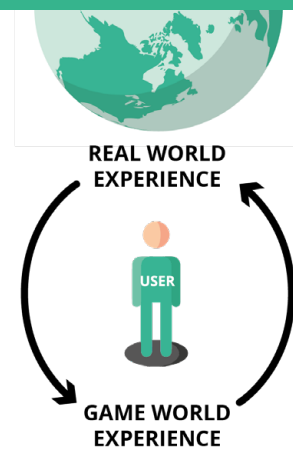
Repeat phase 2: Clapping for achieved fuel goals and introduce new team



From the game world to the real world

Everybody in rehabilitation will participate in the Space Misison Sanitas game. The most people in CR can identify with the doubtfull everyman persona (chapter 4.2, on page 41). When looking back at chapter 5, it is interesting to see what happens to the real world of the doubtfull everyman after participating in Space Mission Sanitas for over 6 weeks. In the old real world of the doubtfull everyman, his motivation for PA is stimulated during CR. Despite this target group perhaps progresses most during rehabilitation, they also have the most difficulty in continuing PA after rehabilitation. After rehabilitation, motivational drivers are falling away, and they don't know what to do anymore to maintain their PA level (figure 9 on page 35).

The Space Mission Sanitas game that is played during rehabilitation, will positively influence the doubtfull everyman his real world after rehabilitation. In the game world, the participants need to select a fuel goal that they must achieve every week. These fuel goals all have to do with physical activities that they can practice after rehabilitation. By gamifying this, they are more motivated to perform the week goals than if people just tell them to do so. Some activities challenge people to join a free lesson at a hartrim group, a walking football training, or a bike group.



Other activities are more about physical behaviour they can incorporate in their routine, for example; to walk every day for 20 minutes, to start the day with 10 mins physical workout, or to spend 1 hour cleaning the house. By stimulating the doubtful everyman to try out these activities with others during the rehabilitation period, he already actively starts to think about his PA maintenance after rehabilitation. In this way, CR centres can make the best use of this window of opportunity during rehabilitation (chapter 2.1: teachable moment on page 21), because they use the motivation for rehabilitation to prepare people for the physical activities they can practice after rehabilitation. The fuel goals that were achieved during rehabilitation, have a transfer effect on the real world of the doubtful everyman. When finishing rehabilitation he experienced to participate in physical activities and he may be inspired by other people in rehabilitation. The free trial lessons

he and his fellow participants tried out during rehabilitation, let him discover what he liked. The doubtful everyman knows now that he liked cycling with others and he has signed up for the cycling group that was in one of the cards of the game. The transfer effect from the game world to the real world is the self-knowledge of which physical activity people like to integrate in their daily lives. This ensures that people take a greater sense of competence, relatedness and autonomy with them into the real world than they would without playing this game during rehabilitation.

The core-game loop

In chapter 7.3 design directions the core-game loops of three concepts were defined. The final core-game loop of Space Mission Sanitas corresponds with the buddy approach from chapter 7.3 which is based on social motivation. This is a powerful core-game loop because it is a dynamic interaction between people in rehabilitation, which can maintain itself. During the space mission, they have to support their team members and work together towards the same goal. When working in teams, people feel more responsible towards each other to contribute to their common goal. When the goal is achieved, a social reward is given in the form of an applause. This core-game loop repeats itself during rehabilitation.

User journey of final concept

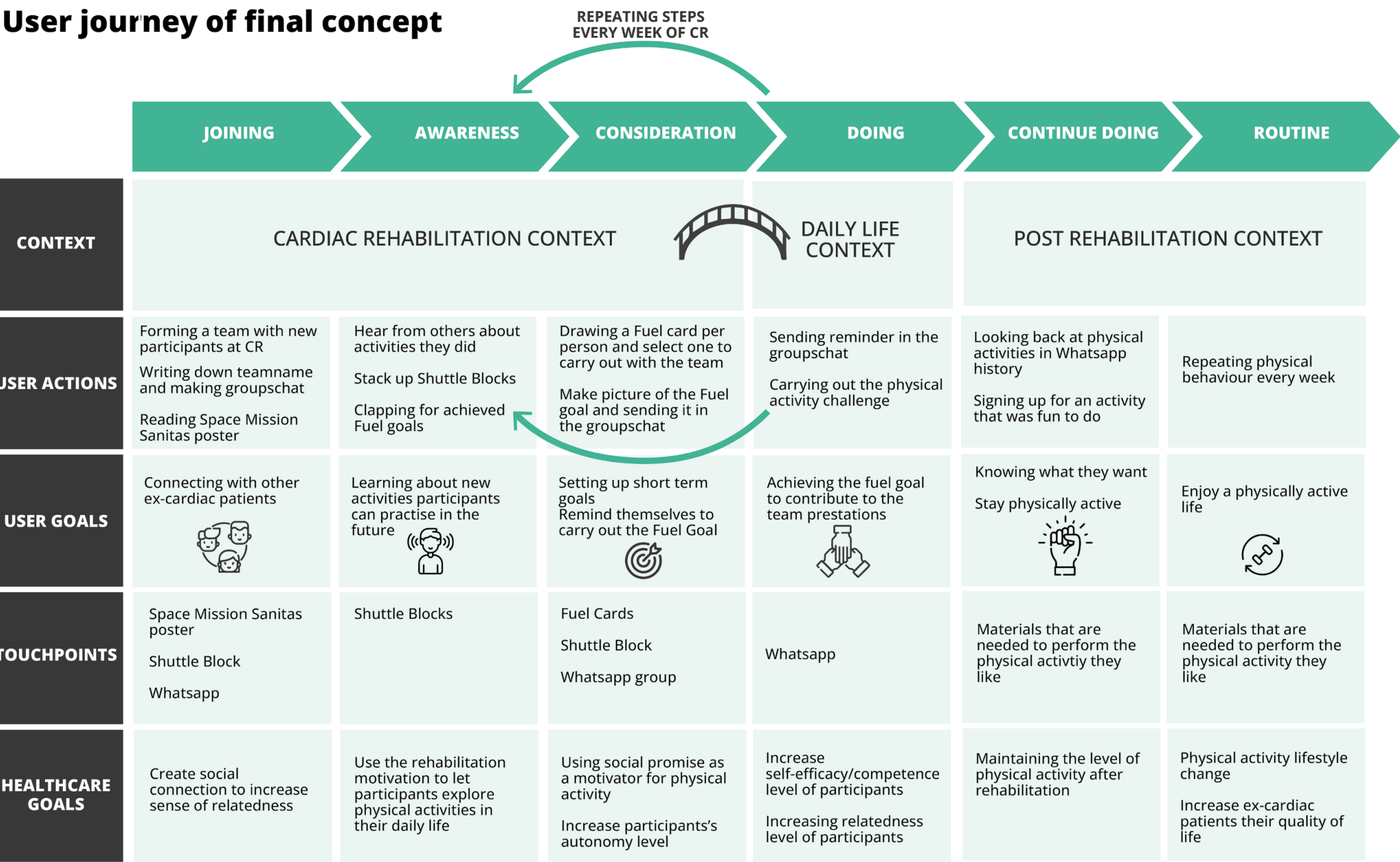


Figure 23: User journey of final concept

9.4 CHOICES FOR THE GAME

Implementation during rehabilitation

By playing this game during rehabilitation, the participants are likely to participate since they already passed the threshold to go to participate in CR. Additionally, in chapter 2.1 (page 21) it is described how CR can be seen as a window of opportunity in which people are more likely to adopt positive behaviour change (Lawson, et.al., 2009). These are the main reasons why the game is best implemented during the rehabilitation period. In this context, the drivers for PA motivation (figure 9 on page 35) can be used in favour to play this game. The social support of playing in teams and the positive feedback of practitioners all play a part in the positive motivation for PA.

Space Mission Sanitas story

Storytelling is used to engage people in the game. This is a persuasive game mechanic, that can be used to give an additional motivation for people to undertake certain actions. The storyline of a Space Shuttle that is on its mission to planet Sanitas is chosen because the story should be encouraging for adults. Their journey in space is based on fiction, but their journey during rehabilitation is serious. The Space Mission can be seen as a metaphor for participants' common journey towards a better future. In line with this storyline, the participants have to keep their fuel goals up each week. This is a metaphor for carrying out their weekly physical activities in their daily life.



9.4 LO-FI PROTOTYPING

Increased ability level

The game provides people with various physical activities that can be practised in their daily life. This saves them from a lot of research and energy when they have to find these activities themselves. According to Fogg's behaviour model and his six elements of simplicity, it can be said that it saves them from a lot of brain cycles (chapter 2.3 Human Behaviour on page 24).

Something can also be said about the other elements of simplicity. The game is financially accessible because it is provided in CR which is paid by their health insurance. The challenges in the game ask some time of their daily lives, but they are manageable to achieve within a week. At first, the weekly fuel goals are not part of people their weekly routine. However, just like the rest of the rehabilitation training, after a few weeks, it becomes part of their routine. Therefore, performing the weekly physical activities will become easier over the weeks. Lastly, the game makes use of short-term goals. Short-term goals seem easier to do compared to long-term goals. Dividing the long-term goals into these short-term goals helps people to stick to the goal. It can be concluded that this game serves as a facilitator for participants to perform physical behaviour. According to Foggs behaviour model, this is a trigger which increases people their ability

level. Since the goal of the game is in line with their own goals of becoming more physically active, their motivation to participants is high. Therefore, the participants are located above the action line in Fogg's behaviour model and are triggered by the game.

Playing in teams

In the game, the participants are playing in teams to use social support as a motivational driver (Foggs behaviour model). The team achievements are part of the dynamics of a persuasive game, which supports the game aesthetics of fellowship (chapter 5.1 on page 44). When playing in teams, people are more likely to contribute to the team goal. Next to that, they can help remind each other to achieve the goal. In the game, it is recommended to make a group chat with the team and take picture of the chosen Fuel goal each week. This is to remind people of their common goal and to make it easier for them to participate in physical activities together.

Fuel card challenges

The physical activity challenges on the fuel cards are part of the mechanics of this game (chapter 5.1 on page 44). They contribute to giving the participants short-term goals to focus on and provide them with new inspiration and ideas to practise in their daily life. They contain physical activities that they can practise at home because people often don't know what kind of physical activities they can do at home. In addition, the cards provide free trial lessons at sports associations in their neighbourhood. A lot of associations are also reimbursed by the government and are financially accessible for the low SEP people in CR. Often people in CR are not aware of all possibilities, and the fuel cards encourage them to explore the different PA possibilities. This helps people make more autonomous decisions about what they like to do after rehabilitation, to maintain their PA.

Testing design choices

To give body to the final concept, lo-fi prototypes were made to explore which materials could be used. Lo-fi prototypes stand for low fidelity prototypes, which are simple prototype that allow you to quickly test design characteristics.

It is important to test the material and size of the components that are necessary for the game. First, a 0.5 scale model was 3D printed to test the dimensions and form of the space shuttle (visible in figure 24).

A writing surface is needed to write down the team names. To test the size of the writing surface, an 8 cm diameter piece was cut out of whiteboard sticker material. This was placed on an old 3D model. The size seemed good and the adhesive layer stuck well to the spraypainted surface of the 3D model (figure 25).



Figure 24: Whiteboard sticker on 3D model



Figure 25: 0.5 scale model of the Space Shuttle



9.5 HIGH-FI PROTOTYPING

Space shuttle

The design of the separate parts of the space shuttle is made in SolidWorks. It is important to consider the dimensions of the parts, so that the 3D printed parts would fit properly with each other. This is important because the teams that have reached their fuel target must stack the parts on top of each other when building the space shuttle. Therefore, the hollow diameter dimension of the shuttle block is 170mm, and the diameter of the bottom part of the block is 169mm (figure 26), this results in half a millimeter of backlash all around the round block.

The dimension of the top nose and the bottom motor part of the shuttle block are also considering this half a millimeter of backlash. The overall diameter of the shuttle block is 200mm and the motor undercarriage has a diameter of 325,5mm wide.

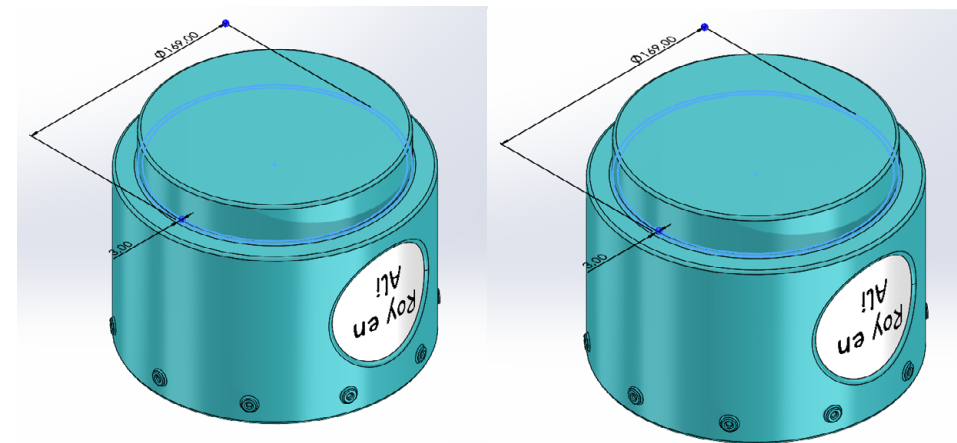


Figure 26: Shuttle block dimensions



Figure 27: Space Mission Sanitas poster

Poster

To evaluate the persuasive game in the context with the target group, an introduction poster was made (figure 27). People that participate in the game for the first-time during rehabilitation can read the steps of Space Mission Sanitas on here. Normally these are the people that are new in rehabilitation, but for this evaluation the persuasive game is new to everybody. Therefore, it is extra important that this poster is present during the evaluation session to remind people of what is expected. This poster can be seen in figure 25 on the side. The poster is printed on A1 matte paper, so that it is readable and noticeable in the big sports hall during rehabilitation training. The poster is made based on the guidelines of creating understandable materials for people with a low literacy. This is done based on the guidelines explained in chapter 2.1 on page 21 of this thesis. Since a large part of the target group has a low literacy and not everybody can understand the English language, the poster is made in Dutch.

Fuel cards

The fuel card deck is made for the participants at Capri who train in in a particulair sportshall in Rotterdam. Since the final evaluation will be held here, the goals need to be relevant for them. For example, if people want to do a free lesson at the harttrim group in Krimpen, it would be nice if the location is in the neighbourhood they live in. The goals on the fuel cards are a mix of trying out new physical activities at different sports associations, but there are also assignments of how to be physical active at home. For example, train your arms everyday while using water bottles as weights. In this way a mixture of different PA goals can be chosen to carry out during the week.

More fuel cards can be found in Appendix 8.



Figure 28: Fuel cards

Introduction movie

Since a large part of the target group consists of people with a low SEP (chapter 1.1 on page 9), it is important to take their low literacy into account. In order to inform and motivate people about the game, it is important to engage them in a persuasive way. From the Design Method study in chapter 5 on page 43, it was concluded that storytelling is a good way to engage people. A video was made to tell the story of Space Mission Sanitas and why it is important to participate on this mission. Especially for people with a low SEP in cardiac rehabilitation, a video is easier to understand than written text (as was concluded in chapter 2.1 on page 21). The introduction movie is a short video of 1 minute and 23 seconds, to catch their attention and involve them in the story. The video can be viewed by scanning the QR code or using the link above..



Just as the poster, the audio of the introduction video is in Dutch. However, the translated text in the video tells the following:

*“Welcome astronauts, together we will undertake this mission.
Our space shuttle has just been launched to planet Sanitas.*

We know from our analyses that we can survive on this planet. It would be a breakthrough for the future of mankind if we reach this planet.

To make the journey manageable, we divided it into weeks. Your task as an astronaut is to keep up the fuel supply every week. You do this by meeting your weekly fuel target as a team.

Each astronaut is assigned to a team of 3. Each team is responsible for a separate part of the space shuttle. Write your team name on your part of the space shuttle.

Once the majority of the team member has achieved the weekly fuel goal, you will ensure that Space Mission Sanitas can continue.

By doing this you will contribute to a better future for yourselves and for your fellow astronauts. Good luck.



Figure 29: Introduction movie



Figure 30: Practitioners' guideline manual (Appendix 9)

Practitioners' guideline manual

To implement this intervention in the Capri rehabilitation program, it is important that the practitioners know what is expected. A guideline manual is made which includes all the gameplay information when implementing the game for the first time in rehabilitation. In addition, the gameplay information is explained when continuing Space Mission Sanitas every week. The pages of this manual can be found in Appendix 9 of this report. In the figures 30 the manual is visible.



EVALUATION

10.

10.1 APPROACH

In this phase of the project, an evaluation cycle is done to measure the impact of the final design and to see if it fulfills the final design goal:
... to develop a persuasive game that stimulates the sense of competence, relatedness, and autonomy of cardiac patients at Capri, to support the maintenance of physical activity in their daily life.

In addition, this evaluation gives answers to research question 5 and 6; Which game elements match with the motivations and needs of cardiac patients? And how maintains the persuasive gaming tool the motivation of its users?

Participants

The evaluation test will be carried out with group 1 that trains at medium-high level during rehabilitation and group 2 that trains at medium-low level. These two groups will always train after each other on Monday and Wednesday. By testing Space Mission Sanitas with both groups, the intensity level of the fuel cards can be tested and the results of both groups can be compared. Group 1 consists of 19 people and group 2 consists of 12 people.

Group 1	Group 2
11 participants	9 participants
Medium- high intensitiy level	Medium - low intensity level
Age range 40 - 65 years old	Age range 55 - 70 years old
3 women and 8 men	4 women and 5 men
Somewhat active physical condition	low physical condition

Table 2: Evaluation participants

The two groups will always train after each other on Monday and Wednesday. By testing Space Mission Sanitas with both groups, the intensity level of the fuel cards can be tested and the results of both groups can be compared. Some people that participated in the rehabilitation training for the last week were excluded from this evaluation study. In group 1 this were 5 people and in group 2 this were 3 people (table 2).

Additionally, an interview will be done with the physiotherapists in the sports hall. This will be done with two female physiotherapists with an age range of 25 – 30 years old (Table 3).

Physiotherapist 1	Physiotherapist 2
Female	Female
Works for 2.5 years at Capri	Works for 1.5 years at Capri
Age range 25-30 years old	Age range 25-30 years old

Table 3: Evaluation physiotherapists

Set-up & materials

In preparation for the first training session, the following materials are needed (visible in figure 31):

1. Tape to hang up the A1 explanation poster
2. A1 Poster
3. The Space Shuttle Prototype
 - 4x Space Shuttle blocks
 - Top nose
 - Motor undercarriage
4. 4x sets of Fuel cards
5. 4x elastic bands
6. 4x white board markers
7. 4x wipe cloth
8. Notebook
9. A4 preparation sheet
10. Camera

In figure 32 the set-up of the session can be seen. The A1 poster is placed on a noticeable place and the shuttle blocks is build up on an elevation. The fuel card decks, white board marker and piece of wipe cloth are placed in the shuttle blocks as can be seen in figure 31. A camera is used to make some pictures of the evaluation and a note book is used to make notes about the behaviour and comments of the participants.

In preparation of the second training session, the following extra materials are needed:



Figure 31: Materials



Figure 32: Set-up

11. 30x evaluation forms achieved
12. 30x evaluation forms not achieved
13. 20x pen

The materials used in the first session will stay in the Capri storage of the sports hall. Before the training the materials will be set-up again, so that the second session can begin at the start of the training. At the end of the training, the evaluation forms and enough pens are needed for the participants to fill in the evaluation form.

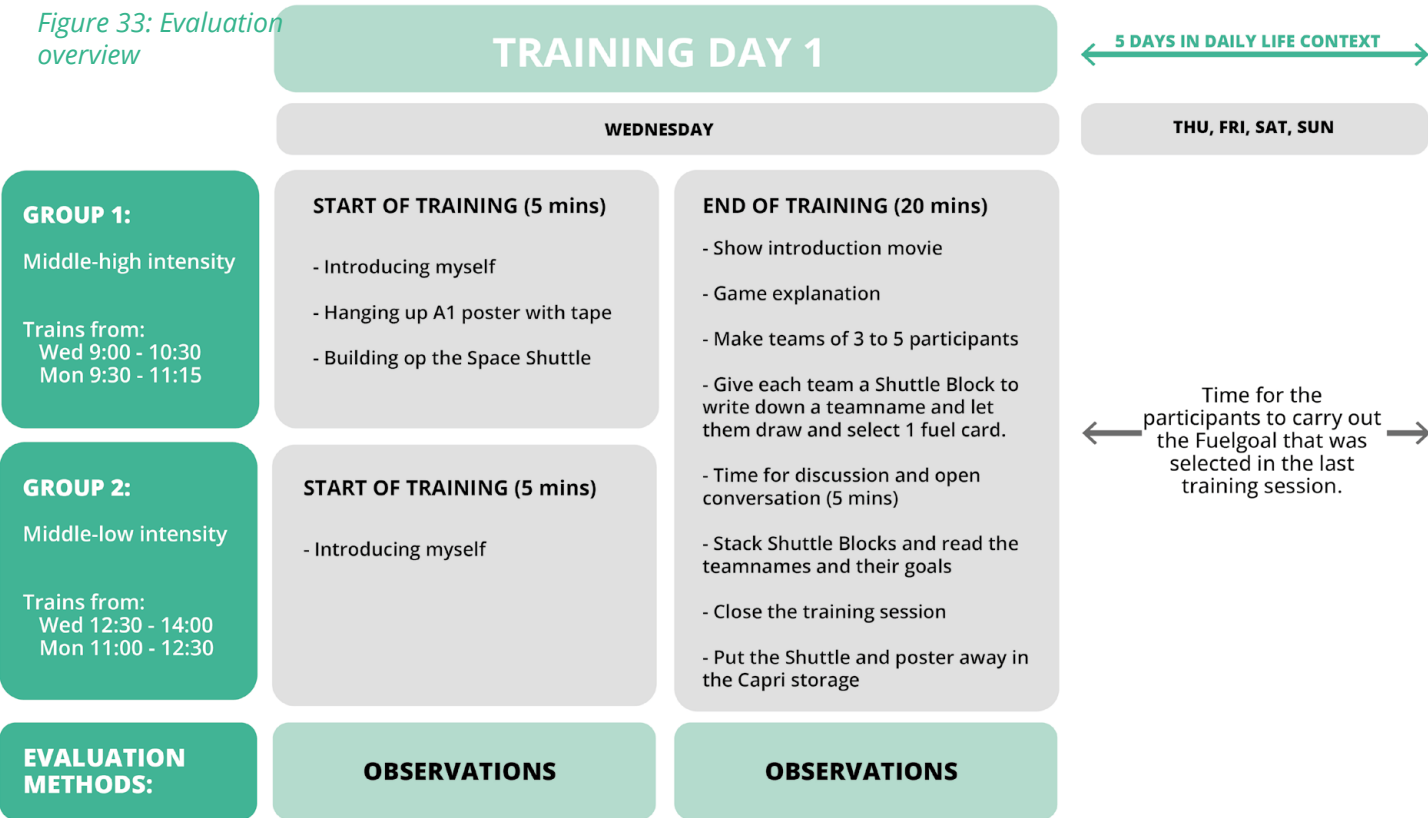
Procedure

For the final evaluation it has been arranged with Capri that the final product can be tested in the sports hall with participants in cardiac rehabilitation. To test whether the persuasive game contributes to the design goal, the evaluation will be spread over two rehabilitation training sessions. The first session will be at the end of the training on a Wednesday, and the second session will be on Monday at the beginning of the training. Normally, the participants get 1 week to fulfill the fuel goal, but due to a tight training schedule they get 5 days for this evaluation test. In 5 days the impact of the fuel goals can already be tested. The participants go through 1 cycle of selecting, performing, and celebrating their fuel target. In this way it can be tested whether the participants grow in their sense of competence, relatedness, and autonomy

after performing the fuel goal within these 5 days. In the figure below the overall planning of this evaluation is visible.

To get relevant data from this evaluation cycle, observations and focus group discussions are done during the sessions. Additionally, an interview with the physiotherapists will be done and a questionnaire will be given to the participants. An overview of the evaluation is visible in figure 33.

Figure 33: Evaluation overview



10.2 DATA ANALYSIS

Interview with physiotherapists

After the training sessions with the participants an interview will be done with the two physiotherapists in the sports hall. They are the people who have to facilitate the game during rehabilitation, so interesting insights about the implementation of it can derive from this interview. The following questions were asked:

1. What do you think about achieving the weekly physical activity goals in this game?
2. Do you think playing in teams is a good addition to the game?
3. What do you think about the goals on the fuel cards?
4. What do you think about the Space Shuttle and the Shuttle blocks per team?
5. What should be taken into account when implementing this game in the rehabilitation programme?

Survey questions

The survey questions (Figure 34) on the evaluation form are important to quantify the effect of Space Misison Sanitas on the participant’s sense of competence, relatedness and autonomy after the rehabilitation. To get the best results it is important that the participants understand the questions and that the lay-out is easy to read

for people with a low literacy. When making this evaluation form, the guidelines of chapter 2.1 on page 21 were used. To ensure that participants fill out the whole form, they are not asked to write down an answer. Instead, they have to quantify their opinion about some statements using the 7-points Likert scale (1932) that goes from totally agree, agree, somewhat agree, neutral, somewhat disagree, disagree to totally disagree. The statements on the evaluation forms for people that achieved their goal are as follows:

1. I like to achieve the weekly goal together with others.
2. The goals on the fuel cards make me know better what I can do after rehabilitation.
3. Achieving the weekly goal gives me more confidence in what I can do.
4. The Space Mission is a good addition to the Capri programme.

The first statement measures the level of relatedness when playing the game. The second statement measures if people regain their autonomy by being able to choose what they like to do after rehabilitation and the third statement is measuring if their competence level increased after playing the game. Lastly, the fourth statement measures if the participants liked the Space Mission in general and if they think it is a good addition to the rehabilitation programme. The questions for people that did not achieve

their goal are based on the same subjects but are written down a bit differently:

1. I like the fact that you are trying to reach the weekly fuel goal together.
2. The goals on the fuel cards make me know better what I can do after rehabilitation.
3. Achieving a weekly goal would give me more confidence in what I can do:
4. I think the Space Mission is a good addition to the Capri programme.

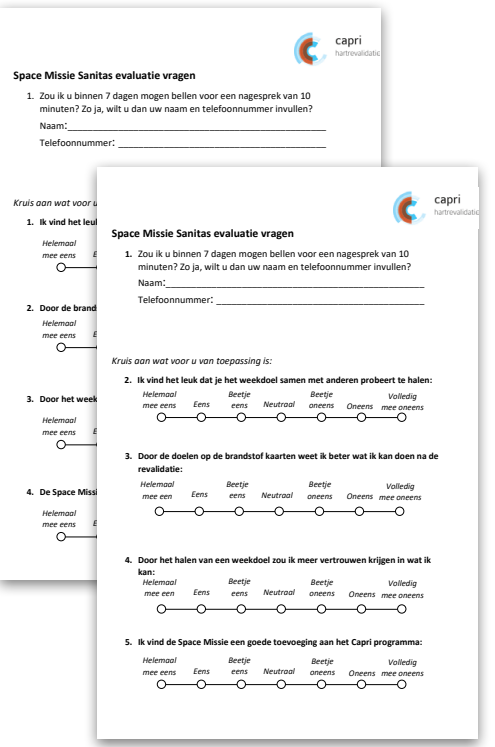


Figure 34: Questionnaire (Appendix 10)

Observation analysis

Start of the training session

People were looking forward to the explanation of the game because at the start of the training it was already introduced that they would take part in this in the last part of the training session. The A1 poster was already visible in the sports hall and some people already read it during the training. The Space Shuttle itself was standing next to it. One person said while running:

“Well, You got me very curious about what we are going to do next ”
– participant group 1

This showed that their interest was there, and that the waiting made them extra excited to try out this game.

Explaining the concept

From the first observation, people were very open to participate in this experience as they were told that they were one of the first groups to play it. After explaining the game and showing the introduction video, they were asking some questions about when they should select a fuel goal. When the first group (middle-high intensity group) was told to make teams of 4 people, they made teams within no time. The space shuttle block

was given to the teams, and they laughed about coming up with a good team name. They were told to each draw 1 card from the fuel deck and then select one of them to carry out that week. What stood out was that some people sticked to the rules and drew one card, but other people were too curious and just read all cards first and then made a decision. For this user test it was okay for them to read multiple cards from the deck, since they could get inspired by them. The second group (middle-low intensity group) were a bit more hesitant when making groups. Therefore, the groups were made by me and they could come up with a team name. Some found it hard to come up with a team name, so the suggestion was made just to write down the first letters of each member of the team. This group also read multiple cards instead of drawing one card per person out of the fuel deck.

Selecting a fuel card

When selecting the fuel card, some interesting discussions came up within the teams. One participant from group 1 asked: “This fuel goal is an activity on Tuesday evening, but can we still choose it?” – participant group 1 Because the evaluation cycle of this weekly test consists out of 5 days, from Wednesday till Monday, it was suggested they should choose a feasible goal to carry out before Monday morning. The fuel goals were more challenging for the second group. One group chose to do an arm

exercise with two water bottles each day until Monday. One member said:

“I think this is a doable goal, we can do this!”
– participant group 2

At first they were a bit hesitant, but after working in teams they became more talkative and more discussions took place. One team could not choose 1 fuel goal so they wanted to select two of them. Since the rules of the game can be bend a bit by the practitioners in the sports hall, it was allowed for them to select two goals so that each participant could choose which one to execute. Since the participants got cirous and read all cards, some people got interest in the activities on the fuel cards. They however, did not choose the activity with their team, so they asked the following:

“I am interested in this card, to join the hartrim group in Krimpen, can I choose this card next time?”
– participant group 1

It was not clear to him that since they were the first group, we would only do this for one week to try it out. Instead, the website of the hartrim group was given to him so that he could look up some



Figure 35: Participants selecting fuel goal

extra information to visit himself. Another man from group 1 asked if he could make a picture of the card. He wanted to sign up for the free sports advice for after rehabilitation. Additionally, one participant asked:

“What is walking football? I would like to try it out”
- participant group 1

He was interested to join this free trial lesson, and wanted to know more about it. A folder was given to him with more information, so that he could check it out himself. These kind of responses were good insights because this confirms that they are curious about the possibilities for PA after rehabilitation. Only reading the cards, made them aware of their existence, which is the first step to be able to implement it in their daily life.

Achievement of the goal (second training)

At the start of the second training, the participants all came together and were asked to find their groups again and take their Shuttle Block. They had to consult with each other whether the majority carried out the fuel goal they had selected.

An interesting insight was that every team in groups 1 and 2, put their Shuttle Block on the Space Shuttle. When the people from group 1 were asked if they carried out the goal, they said that they all did it.

In the second group, people were also asked if they had carried out the goal, to which 1 participant responded with:

“I did try, but after 3 stairs I was completely worn out. I thought it would count since I did not completely fail”
- participant group 2

Because the game is more about participation than about winning or losing, it was said that if they completed the goal or if they felt that the goal had challenged them, it would count in their team score. Therefore, in the second group were a bit less strict rules which also resulted in all Shuttle Blocks ending up in the Space Shuttle, ready to continue Space Mission Sanitas.



77 Figure 36: Fuel goal on Shuttle block

After an applause for all teams that contributed to the Mission, some teams were asked how they experienced achieving the goal. An answer was that the goal was easy to carry out, since they could already manage more physical activity. The practitioner responded with:

“So if there was a next time, you would challenge yourself more by picking another goal right?” - Physiotherapist 1

This shows that the intensity level on some cards in the deck were too low for the middle-high group. In chapter 11, some of these recommendations are given to let the game fit even better to the target group. After building up the Space Shuttle together and giving an applause to the new participants in rehabilitation today, it was time for the regular training to start.

Evaluation

When the regular training was finished, the people in rehabilitation sat down for a Capri talk about stress. Before the start of this Capri talk, they were thanked to participate in Space Mission Sanitas and they were asked to fill in the questionnaire. After filling in the questionnaire an open conversation started about their experiences with this concept.

“I think this is very good, especially for people who are leaving soon. Look I am here for only two training sessions, but I can imagine that after a few weeks you want to know what you can do outside rehabilitation”

- participant group 1

This indicates that they understood how these week goals were contributing to their rehabilitation process. Some people wanted to select another goal for next week. They were told that they could set a goal for themselves, but I was not being there next week to evaluate it. In the next subchapter, the survey results will be evaluated further.



Figure 37: Final user test

Physiotherapist interview analysis

Cohesion within the group

Two physiotherapist were interviewed after the second training session. The following quote was said:

"It is a very nice way to get cohesion within the group and to introduce them to a wide variety of activities they can do outside of rehabilitation"

- Physiotherapist

From the interview could be concluded that the participants should be more aware about the physical possibilities after rehabilitation. They sometimes see that people join a post Capri group after rehabilitation. When working in teams in Space Mission Sanitas they are automatically encouraged to try out these kind of activities together.

Fuel cards intensity level

Some fuel cards were too easy to carry out for the middle-high group (group 1).

"They are not meant to choose a card that they find too easy to do right? I would challenge them to pick a card that is not that easy to do"

- physiotherapist

Because there are cards in the deck that are too easy to carry out, the other more promising ones are not picked initially. Therefore it is recommended to evaluate the cards in the deck extensively in next iterations of this intervention. This will be further discussed in chapter 11.2 recommendations and 11.3 implementation.

Teams in practice

For the practitioners in the sports hall it would be most easy if the teams consist out of the people who start in the same week. This also gives them a clear overview of which team is leaving after 6 weeks and who just started.

"For us, it is much easier to keep track of the teams if we just put everyone who starts together in the same team"

- physiotherapist

In this way, a new group of 3 – 4 people will start every week. Since the rehabilitation period normally lasts for 6 weeks, then six Shuttle Blocks are needed. Every team that starts, gets the Shuttle Block of team that leaves. They suggested the following:

"When two teams are really small, they can be merged together by the practitioners"

- physiotherapist

Next to that, some people train longer than six weeks. The physiotherapist said:

"We also have people who train longer than six weeks. Maybe these people can join another group for the remaining 2 or 4 weeks"

- physiotherapist

Implementation

When implementing this intervention, the time of the physiotherapists need to be considered. During the interview the physiotherapists said that they can build up the Space Shuttle together, at the beginning of the training. They can give their support and an motivational applause. After which they can give another applause to the new team that joined the rehabilitation training this week. However, the physiotherapists said that the participants have to keep the game alive themselves during rehabilitation and in their free time:

"People need to maintain the rest of the game themselves, so making appointments to join a walking group or to select a new fuel goal, because we have no time to steer this"

They said that they just want to be able to show them the poster, and when entering the rehabilitation they already experience how it is like to achieve a week goal.

"They would be able to ask other participants how it works and watch the introduction video for themselves"

- physiotherapist

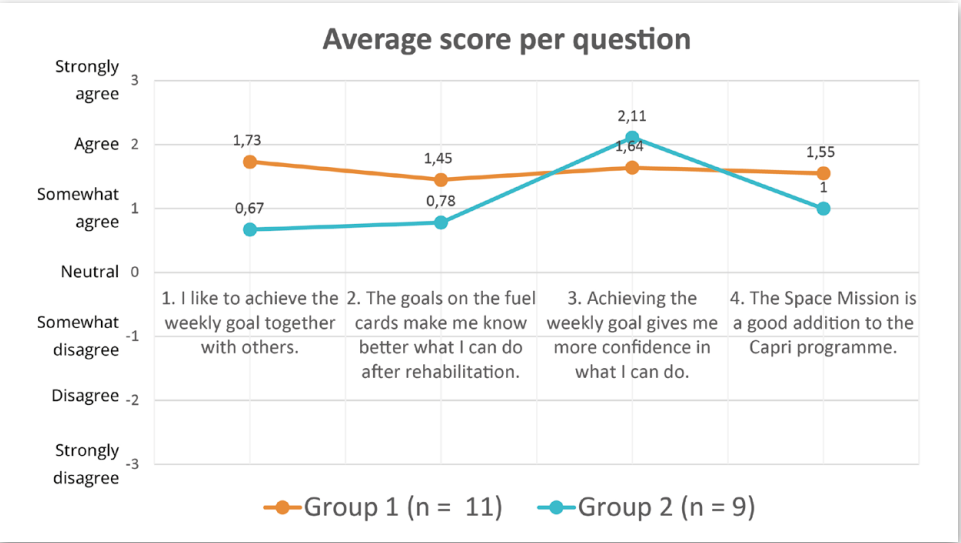
Questionnaire analysis

Average scores

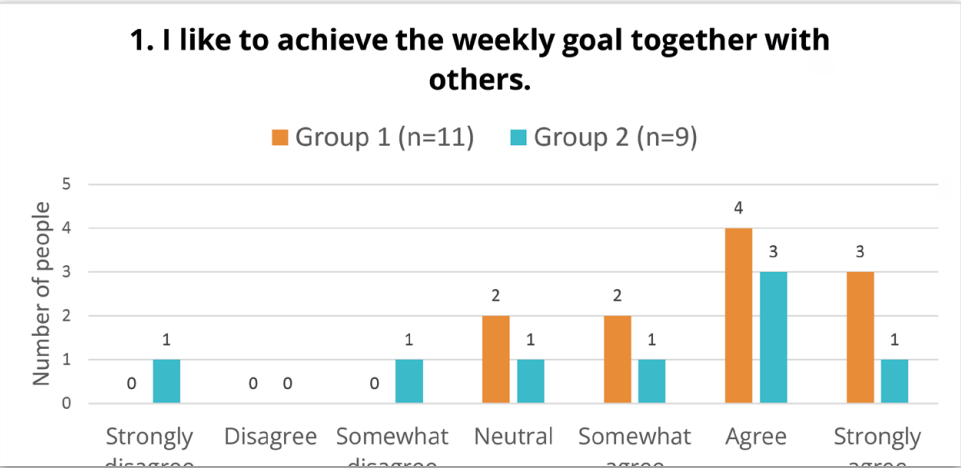
On average, the participants gave promising answers to each statement in the questionnaire on the 7-point licert scale. In graph 1 the average score of the two groups is visible. What is striking is that the average score of the second group (blue) scores higher than the other statements. On average people are agreeing with the statement that they get more confidence when they achieve their weekly goals. Additionally, group 1 (orange) is in general quite positive, as all 4 statements score between somewhat agree and agree.

Statement 1

In the bar chart below it can be seen that most people of group 1 (orange) agree or strongly agree that they liked to achieve the weekly goal together with others. It stands out that nobody in this group is disagreeing with this statement. One person in group 2 (blue) strongly disagrees with this statement and one person somewhat disagrees.



Graph 1: Average score per statement



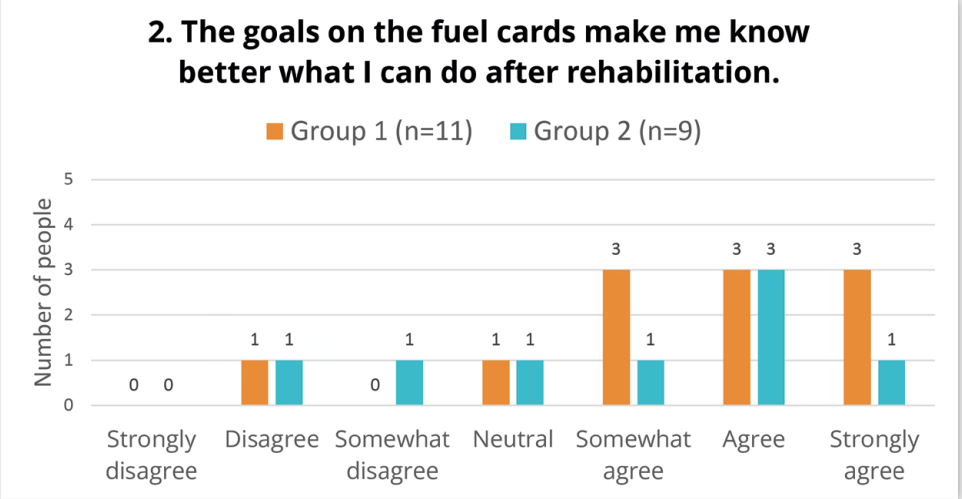
Graph 2: Bar chart of statement 1

Statement 2

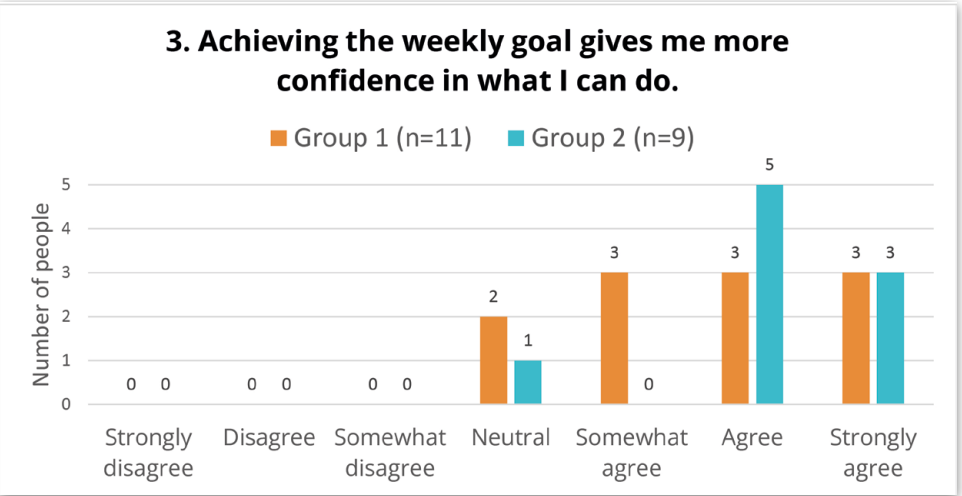
The second bar chart shows the scores of the second statement that was asked of the participants. The score of somewhat agree, agree and strongly agree is equally distributed in group 1 (orange), however, one person disagreed with the statement that the fuel cards make them know better what to do after rehabilitation. Next to that, most of the people in group 2 (blue) agreed with this statement and two people somewhat disagreed or disagreed.

Statement 3

In the third bar chart, the results of statement three is visible. It stands out that both groups were neutral or agreed with the statement that they got more confidence in what they can do after achieving the weekly goal. In group 1 (orange) two of the eleven people responded neutral and the rest was equally distributed over somewhat agree, agree and strongly agree. In group 2 (blue) five of the nine people agreed with the statement and three strongly agreed with the statement.



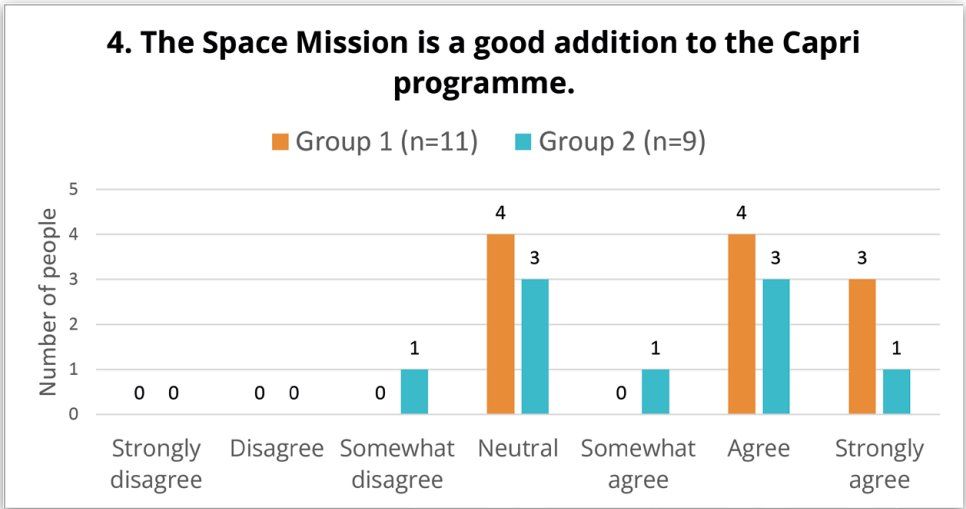
Graph 3: Bar chart of statement 2



Graph 4: Bar chart of statement 3

Statement 4

In the fourth bar chart, the results of statement four are visible. What stands out is that four people from group 1 were neutral (four) and three people from group 2 were neutral (blue) in the statement if Space Mission Sanitas is a good addition to the Capri programme. The rest of the participants in group 1 (orange) agreed or strongly agreed with the statement. One participant of group 2 disagreed but the other 5 participants somewhat agreed, agreed, or strongly agreed with the statement.



Graph 5: Bar chart of statement 4

10.3 CONCLUSION

With this data analysis, it is important to draw conclusions for future iterations and research studies. To be able to see if the design goal is met, the following topics were evaluated: competence, relatedness, autonomy and implementation. The first three elements are the factors that stimulate motivation and engagement, derived from the user-based literature study (chapter 2). Additionally, conclusions on the feasibility, desirability and viability of the intervention can be drawn from this evaluation study. All three aspects contribute to the success of an innovative intervention.

Answering the research questions

The game elements that were chosen for this game were social elements that supported fellowship in the game. Next to that, the game mechanic of achievements are used when building up the Space Shuttle. Positive feedback is given to the participants who achieved their weekly fuel goal as well as a social rewards (the applause). These game elements match with this user group since they are based on team achievements. The game is played in teams on purpose, so that

people do not feel too bad when a weekly goal is not achieved. It is not a strict competition, since it is about exploring physical activities. After the user evaluation it can be concluded that the game elements used in this persuasive game match the motivations and needs of the cardiac patients. Answering research question 5.

RQ5

Which game elements match with the motivations and needs of cardiac patients?

In addition, after the final evaluation it became clear that these elements all contributed to the motivation of the users. This gives an answer to research question 6.

RQ6

How maintains the persuasive game intervention the motivation of its users?

Competence

The results of the evaluation study showed that the competence level of the participants increased after achieving the weekly fuel goal. This conclusion can be drawn from the bar chart analysis of statement 3. This was expected since this affects their self-efficacy level. In this chapter, the importance of people their self-efficacy/competence for maintaining physical activity was explained. Participants in rehabilitation learned to practice physical activities in the rehabilitation context, but not in their daily life context. This intervention serves as a bridge between the rehabilitation context and their daily life context since they learn how to be physically active in their personal context without any help. By practising this in the rehabilitation context, participants are still in a safe environment and are free to explore their possibilities. This will increase their self-efficacy in their daily life context which is the basis of continuing physical activity after rehabilitation.

Relatedness



In this evaluation study, it became clear that participants liked to work in teams. From the bar chart analysis of statement 1, it can be concluded that they like to achieve their weekly goals together. The physiotherapists suggested that it would be good if the teams are formed, based on when people enter the rehabilitation. People who start together are experiencing this journey already together. Making them a team from the start, and letting them figure out a team name immediately creates cohesion within the group. From the research phase of this master thesis, it can be concluded that social support within the rehabilitation context is a good driver for motivation. According to Fogg's behaviour model (from chapter 2.3 on page 24), motivation is stimulated by social acceptance. In this game, people make a promise to each other to fulfil the Fuel Goal. By doing this together they are more likely to carry out the action.

The physiotherapists confirmed that it was good to see the cohesion within the groups. They liked how they were challenged and saw the potential of this game to motivate participants to undertake physical activities together outside rehabilitation. Therefore, it can be concluded that the

intervention increases the sense of relatedness during rehabilitation but it may also facilitate relatedness after rehabilitation. Some people were already inspired by some Fuel Cards to try out a sports lesson or join a walking football class. Because of this design intervention, the threshold will be lower to find a suitable activity that suits people's interests. Next to that, it contributes to an increased relatedness level when meeting other people in these trial lessons.

Autonomy



The sense of autonomy could be measured according to the bar chart analysis of statement 2. Most people in the evaluation session indicated that the fuel cards made them know better what they can do after rehabilitation. During the evaluation session, a lot of people read all the cards in the Fuel card deck. Some people got inspired and were already interested to join a trial lesson that was mentioned on a Fuel Card. This suggests that only the knowledge of the existence of these activities outside rehabilitation already affected people their sense of autonomy. The

physiotherapists mentioned that the fuel goals are a good way to let people see which activities they can try out so that they know what to do after rehabilitation. By obtaining this self-knowledge, people become more aware of what they like to do. This results in making better autonomous decisions about what they want to do with their life (as was described in the self-determination theory in chapter 2.2)

A few people disagreed with statement 2 and felt they did not know better what to do after rehabilitation. This can be explained because they did not read all the cards. It is more likely that they don't know what to do yet because they did not experience this game during the full six weeks of rehabilitation training. When people will play this game for six weeks and try out multiple Fuel Goals, it is expected that their sense of autonomy will also increase.

Feasibility

From the evaluation test, it can be concluded that this game can be implemented in the rehabilitation programme by the practitioners. They can see the importance of this game since it enhances the motivation of people to be physically active in their daily life context.

They mention that it is a game that maintains itself since the participants can carry out the goals themselves in their daily life. This also takes some pressure off the practitioners because this game provides the participants with positive feedback all at once. When the Space Shuttle is built up at the start of the training, the practitioners can see which team achieved their goal, and which teams did not. In this way, they can give their compliments to the teams that contributed to the Space Mission and give applause. During the regular rehabilitation training, the practitioners have too little time to give every participant the personal attention they need. With the Space Mission, they can make sure the teams get positive feedback that encourages them to go on.

When implementing this game, it is also important that the Fuel Goals will be reviewed with the

physiotherapists. This is because the middle-high intensity group need some more challenging cards and the middle-low intensity group need some less challenging cards. These are all design iterations that should be made before the intervention is implemented again for a longer period. More recommendations can be found in the next chapter: 11.2 Recommendations.

All in all, the intervention is feasible to be implemented in the short term. The physical Space Shuttle can be used and the empty cards can be used to write down more goals. In this way, a new iteration can be tested over a longer period at one Capri rehabilitation location. Further research will allow the long-term effect on people who maintain their physical activity to be measured.

Desirability

The desirability of the Space Mission Sanitas among the participants in cardiac rehabilitation was also evaluated. The results from questionnaire statement 4 made clear that most people thought the Space Mission is a good addition to the rehabilitation programme. The Fuel Goals that need to be achieved during the game help

the participants to gain a bigger sense of competence, relatedness and autonomy in their daily life context. This also relates to the design goal:

...to develop a persuasive game that supports the maintenance of physical activity in the daily life of cardiac patients by stimulating their sense of competence, relatedness, and autonomy.

Especially the doubtful everyman persona that was described in chapter 4, experienced the most trouble with maintaining the physical activity in their daily life. The people who relate to this persona were very uncertain about their capabilities at the beginning of rehabilitation and they need support to increase their self-efficacy level to maintain their physical activity level after rehabilitation. Most people in this group are benevolent and want to adopt physical behaviour change. With this game, they are getting the right support and information to achieve this goal and increase their self-efficacy level.

Additionally, some people are like the enthusiastic explorer persona. The Space Mission Sanitas game will also be desired by

them because it will serve as an extra stimulus to stay physically active and it will increase their sense of relatedness with others. Some people in rehabilitation might be like the stubborn ruler persona. Once in a while, a participant may not feel like carrying out the weekly fuel goals. For them, this game might not be desirable, because they think they know better or they do not understand the purpose. The participant that identifies with the stubborn ruler, can do something for him/herself, like cycling on the bike during the rehabilitation while the rest is participating in the game.

To conclude, it is important to know that for most people in CR the Space Mission Sanitas game is desirable, because it helps them gain a higher self-efficacy level in their daily life. In addition, it contributes to their sense of relatedness and autonomy, which are the drivers of motivation and physical activity.

Viability

The outcomes of the questionnaire showed positive effects on participants' sense of competence, relatedness and autonomy. This indicates that further research might give promising insights about the higher self-efficacy and therefore PA level after rehabilitation.

This contributes to the viability of the game-based health intervention since this might be a promising approach to increasing people their quality of life. The actual viability of the intervention will become clear after implementing the game for a longer period. When this shows that people indeed go to trial lessons from a sports activity in their neighbourhood or find a way to stay physically active at home through this game, it is likely that Capri will incorporate such a game-based intervention. This game serves as a bridge between CR and the daily life context and will be promising for the entire CR industry. However, the cost of the game must be considered, as each sports hall needs its own space shuttle. Future design iterations will have to be made to produce and use multiple space shuttles as efficiently as possible.

In chapter 11.1 more information can be found on the next steps of implementation of this game in CR. With more concept iterations, this intervention can be used in other Capri sports facilities and even in other CR centres, which makes it survivable in the long term.



DISCUSSION

11.

11.1 LIMITATIONS

Short term evaluation

Due to the tight rehabilitation schedule and the period in this project, the final evaluation could not be performed over the time span of people's whole rehabilitation period (at least six weeks). The game was designed to be played every week during someone their rehabilitation. In this project, only one cycle of one week was tested in two training sessions. Therefore, the quantitative results are less convincing whether this game maintains the participant's physical activity level after rehabilitation. However, they do suggest that they contribute to an increased level of competence, relatedness and autonomy.

A longer testing period of 9 weeks is recommended to evaluate the actual effect of the game on people their physical activity level after rehabilitation. It should be tested if people are continuing some of the physical activities that were executed during gameplay in their daily life after rehabilitation.

Different people in rehabilitation

In the previous chapter 10.3 conclusion, it was described that the stubborn ruler persona can not feeling like participating in the game. This might be a limitation to the rest of the players in their team. It is not desired that this player will affect the enthusiasm in achieving the Fuel Goals. Therefore, it is best to let the person that does not want to participate, do something for him/herself. They can cycle on the bike while the rest is playing the game. In general, this target group is already difficult to help during CR.

The big picture

With this game intervention some barriers are tackled that caused a negative motivational balance (Figure 9 on page 35). This are the barriers of not knowing what to do and the feeling that no one checks on them anymore. Next to that, some positive drivers that were present during rehabilitation are maintained when people find a new way to maintain their physical activity. Because their sense of competence, relatedness and autonomy will stay high after rehabilitation, the motivation balance (of chapter 3.3) will not become negative. When looking at the bigger picture, the overall health will increase since the

six domains of Huber are interrelated to each other(chapter 1.2 Physical activity and health).

However, this game addresses the drivers and barriers that are affecting self-efficacy and motivation. When people are suffering from big psychological problems, have wrong priorities or suffer from comorbidity, it becomes harder for them to keep a positive motivation balance. Other interventions and solutions are needed to help these people to increase their overall health. Since the six domains of health are interrelated to each other, the dimension of bodily functions can also be negatively affected when mental well-being is on a lower level.

Therefore, this game intervention will not help everyone in rehabilitation. More problems in the rehabilitation process but also in cardiac healthcare need to be addressed to let help cardiac patients recover. On top of that, one intervention will not immediately solve the increasing level of cardiovascular heart disease. Thus, more research should be done and more innovative interventions should be made to help cardiac patients to regain their quality of life and overall health.

11.2 RECCOMENDATIONS

Some improvements can be made to the Space Mission Sanitas game for future implementation. These insights derived from the evaluation study.

Develop separate fuel card decks for intensity level

As was mentioned, some fuel cards were too easy for the middle-high group. Therefore it is recommended to plan a co-creation session with a physiotherapist to come up with even more suitable physical challenges that can be incorporated into the game.

Get in touch with sport associations

To make it even easier for the participants to participate in free trial lessons from sports associations it is valuable to contact these associations and ask them for their cooperation in the game. Since the game is advertising for them and helps them to recruit new people, it is expected that they are interested to contribute to the game. This can be some kind of investment or offering a special deal that they can offer the participants.

Create two extra shuttle blocks

To play the game with six teams during rehabilitation, six shuttle blocks are needed. Since there are four shuttle blocks available, two more shuttle blocks need to be created. Ideally, the whole product will be remade on an even bigger scale. This scale would be as high as a normal person, so 1.70 meters high. In this way, the Space Shuttle makes a bigger impression and it will fit with all other physical attributes that are used in CR.

11.3 IMPLEMENTATION

Implementation at Capri

To use the game intervention and its insights in future Capri interventions that stimulate physical activity, some implementation steps need to be taken.

The first step of implementation is a bigger research study in which the feasibility of this intervention is tested on a wider scale. It is important to validate that the results that were gathered in this evaluation study (during one week cycle), will be similar to the results when people are participating in the game for six weeks. From this, it will become more clear if people like the game, if people continue to pursue their Fuel Goals, and if it can be implemented in the rehabilitation schedule. During this test, it is important to already integrate a study where the proof of concept can be tested. This can be a questionnaire which asks the participants if they intend to pursue a physical activity that they tried out in this game.

After this test, a bigger test can be done to see the actual effect of the game on maintaining the physical activity level after rehabilitation. In this test, the results of the two groups can be compared to each other. One group will play the

game during their rehabilitation period, and one group will not do it. After this, the outcomes will be compared and it can be concluded what effect the game has on the physical activity maintenance after rehabilitation.

Implementation on a wider scale

If the game is proven to be effective for physical acitvty maintainance after rehabilitation, the game can be implemented on a wider scale. This can be at other Capri facilities in Rotterdam and The Hague, but is is also valuable for other CR organizations. At this point it is important to keep making new design iterations, so that the game intervention is suitable for other CR companies and their locations.



12.

CONCLUSION

CONCLUSION

In this master thesis, a game-based health intervention is designed. According to the evaluation study, this gives an answer to the main research question:

What persuasive game supports the maintenance of PA motivation from the rehabilitation period to participants' daily life?

The game-based health intervention that was evaluated in the rehabilitation context at Capri shows promising results for PA motivation in participants' daily life. More research studies should be conducted to measure the actual effect on people their PA maintenance after playing this game during rehabilitation.

The game-based health intervention actively engages participants in cardiac rehabilitation to explore physical activities that can be practised in their daily lives. These engagements make sure that the drivers, that were found in the user-based literature study and the context field study, are maintained when the rehabilitation period ends. The sub-research questions ensured that the right elements were integrated in the persuasive game to motivate the user group. The game makes use of social support and promises and they receive positive feedback from the health experts. Also, to a certain extent, the participants can choose the activity they want to participate in. It was a conscious decision to include these game elements because they fit the current rehabilitation context and the drivers of the target group. In addition, they contribute to the three determinants of

motivation, which are also included in the design goal of this master's thesis:

To develop a persuasive game that supports the maintenance of physical activity in the daily lives of cardiac patients by stimulating their sense of competence, relatedness and autonomy.

The game intervention also considered the fact that a part of the people in CR are people with a low Socioeconomic position. The poster and an introduction movie were made to engage people in a simple way. For people with a high socioeconomic position, it is also preferable that interventions are simple to engage in. Therefore, the elements of simplicity were used within the final design: Easy to understand, financially accessible, manageable time frame and part of a routine. Because every participant takes part in this game, they feel a social stimulus to also achieve their short-term goals. The game makes use of the window of opportunity in the rehabilitation context, as it uses people their motivation for behaviour change after an impactful event.

This game shows Capri Hartrevalidatie, that this is a promising approach to improving the rehabilitation programme. By applying gamification elements in the rehabilitation context, the PA maintenance of participants can be improved. Gamification has been proven for a reason to be a good method to involve people in the desired behaviour.

This project shows that the human-centred design approach is needed to discover the underlying needs and motivations of the target group. The game-based health intervention of this master thesis allows Capri or other cardiac rehabilitation centres to conduct more research about the maintenance of physical activity in the daily lives of cardiac patients. On top of that, the vision created in this master thesis can serve as an inspiration for future health initiatives.

REFERENCES

Ackoff, R.L., From data to wisdom, Journal of Applied Systems Analysis 16 (1989) 3–9.

Aikens, N. L., & Barbarin, O. (2008). Socioeconomic differences in reading trajectories: The contribution of family, neighborhood, and school contexts. Journal of Educational Psychology, 100, 235-251.

Andrzej Marczewski, Gamification: A Simple Introduction and a Bit More, 2nd ed. (self-published on Amazon Digital Services, 2013), Kindle edition, Loc 1119 of 1798.

Balady, G.J., M.A. Williams, P.A. Ades, V. Bittner, et al., Core components of cardiac rehabilitation/secondary prevention programs: 2007 update: a scientific statement from the American Heart Association Exercise, Cardiac Rehabilitation, and Prevention Committee. Circulation, 2007. 115(20): p. 2675-82.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. Psychological Review, 84(2), 191-215.

Bandura, A. (1997). Self-Efficacy: The exercise of control. New York, NY: W. H. Freeman.

Bauer, Jack J.; King, Laura A.; Steger, Michael F. (2018). "Meaning making, self-determination theory, and the question of wisdom in personality". Journal of Personality. 87 (1): 82–101.

Baumeister, R.; Leary, M. R. (1995). "The need to belong: Desire for interpersonal attachments as a fundamental human motivation". Psychological Bulletin. 117 (3): 497–529.

Breslow, L. (1972). A quantitative approach to the World Health Organization definition of health: physical, mental and social well-being. International journal of Epidemiology, 1(4), 347-355.

Capri hartrevalidatie - organisatie. (2022). Capri. Geraadpleegd op 2022.

Coronaire hartziekten | Cijfers & Context | Huidige situatie | Volksgezondheidszorg.info. (2020, 28 december). Volksgezondheid. Geraadpleegd op 3 december 2021

Coull, A., & Pugh, G. (2021). Maintaining physical activity following myocardial infarction: a qualitative study. BMC cardiovascular disorders, 21(1), 1-9.

Dalal, H. M., Doherty, P., & Taylor, R. S. (2015). Cardiac rehabilitation. Bmj, 351.

Davis, T., Neuhauser, L., Riffenburgh, A., Rudd, R. (2009). A guide for creating easy-to-understand materials. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention.

De Nederlandse Hartstichting. (2020, 14 mei). Oproep NVVC, Harteraad en : zet hartrevalidatie op afstand in. Hartstichting. Geraadpleegd op 9 mei 2022.

Durrington, P. (2003). Dyslipidaemia. The Lancet, 362(9385), 717-731.

Eleven lessons. A study of the design process" (PDF). Design Council. Retrieved 6 April 2021.

Evans, G. W., & Kim, P. (2010). Multiple risk exposure as a potential explanatory mechanism for the socioeconomic status–health gradient. Annals of the New York Academy of Sciences, 1186(1), 174-189.

Faber, J. (2021). Een richtlijn voor toegankelijke eHealth. TU Delft.

Faber, J. S., Al-Dhahir, I., Reijnders, T., Chavannes, N. H., Evers, A. W., Kraal, J. J., ... & Visch, V. T. (2021). Attitudes Toward Health, Healthcare, and eHealth of People With a Low Socioeconomic Status: A Community-Based Participatory Approach. Frontiers in digital health, 68.

Fogg, B. J. (2009, April). A behaviour model for persuasive design. In Proceedings of the 4th international Conference on Persuasive Technology (pp. 1-7).

Gezondheidsverschillen | Volksgezondheid

Toekomst Verkenning. (2018, juni). Rijksinstituut voor Volksgezondheid en Milieu. Geraadpleegd op 3 december 2021

Hamari, J. (2019). Gamification. Blackwell Pub, In The Blackwell Encyclopedia of Sociology, Malden. pp. 1-3.

Hartstichting (2019). Hart- en vaatziekten in Nederland 2019, cijfers over incidentie, prevalentie, ziekte en sterfte

Hartstichting. (2021). Nieuwe manieren om een gezonde leefstijl lang vol te houden. Ambitie en strategie anno 2021

Huber, M., Knottnerus, J. A., Green, L., Van Der Horst, H., Jadad, A. R., Kromhout, D., ... & Smid, H. (2011). How should we define health?. Bmj, 343. Huber, M., Vliet, van M., Giezenberg, M., & Knottnerus, A. (2013). Aanzet operationalisering gezondheidsconcept 'Health as the ability to adapt and to self-manage' tot 'Positieve Gezondheid'. Louis Bolk Instituut.

Jensen, M. (2007). Defining lifestyle. Environmental sciences, 4(2), 63-73.

Kamphuis, C. B., van Lenthe, F. J., Giskes, K., Brug, J., & Mackenbach, J. P. (2007). Perceived environmental determinants of physical activity and fruit and vegetable consumption among high and low socioeconomic groups in the Netherlands.

Health & place, 13(2), 493-503.

Kaplan, G. A., & Keil, J. E. (1993). Socioeconomic factors and cardiovascular disease: a review of the literature. *Circulation*, 88(4), 1973-1998. <https://www.ahajournals.org/doi/pdf/10.1161/01.CIR.88.4.1973>

Kelly, S., Martin, S., Kuhn, I., Cowan, A., Brayne, C., & Lafortune, L. (2016). Barriers and facilitators to the uptake and maintenance of healthy behaviours by people at mid-life: a rapid systematic review. *PloS one*, 11(1), e0145074.

Kim, B. (2015). Game mechanics, dynamics, and aesthetics. *Library technology reports*, 51(2), 17-19.

Knudsen, M. V., Laustsen, S., Petersen, A. K., & Angel, S. (2014). Lifestyle after cardiac rehabilitation: did the message come across, and was it feasible? An analysis of patients' narratives. *Health*, 6(19), 2641.

Koop, Y., Wimmers, R. H., Vaartjes, I., & Bots, M. L. (2021, december). Hart- Vaatziekten in Nederland 2021. Hartstichting, Den Haag.
Laustsen, S., Oestergaard, L. G., van Tulder, M., Hjortdal, V. E., & Petersen, A. K. (2020). Telemonitored exercise-based cardiac rehabilitation improves physical capacity and health-related quality of life. *Journal of Telemedicine and Telecare*, 26(1-2), 36-44.

Lawson, P. J., & Flocke, S. A. (2009). Teachable moments for health behaviour change: a concept analysis. *Patient education and counseling*, 76(1), 25-30.

Likert, R. (1932). A technique for the measurement of attitudes. *Archives of psychology*.

Limpens, M. A., Gürgöze, M. T., Lenzen, M. J., Roest, S., Voortman, T., Kavousi, M., ... & Boersma, E. (2021). Heart failure and promotion of physical activity before and after cardiac rehabilitation (HF aPProACH): a study protocol. *ESC Heart Failure*, 8(5), 3621-3627.

Marlatt, G. A. (1979). the Relapse Process. Behavioural analysis and treatment of substance abuse

Maslow, A., & Lewis, K. J. (1987). Maslow's hierarchy of needs. *Salenger Incorporated*, 14(17), 987-990.

Michie, S., Jochelson, K., Markham, W. A., & Bridle, C. (2009). Low-income groups and behaviour change interventions: a review of intervention content, effectiveness and theoretical frameworks. *Journal of Epidemiology & Community Health*, 63(8), 610-622.

Mills AL, Pierce JP. Using teachable moments to improve nutrition and physical activity in patients. *Am Fam Phys*. 2008;77(11):1510–1.

Murphy, B. (2015). Social: Why Our Brains Are Wired To Connect. By Matthew D. Lieberman. Pp. x, 374. Oxford, Oxford University Press, 2013,£ 18.99. *Heythrop Journal*, 56(3).

Nieuwenburg-van Tilborg, E.M., A.M. Horstman, B. Zwarts, and S. de Groot, Physical strain during activities of daily living of patients with coronary artery disease. *Clinical Physiology and Functional Imaging*, 2014. 34(2): p. 83-89

Pampel, F. C., Krueger, P. M., & Denney, J. T. (2010). Socioeconomic disparities in health behaviours. *Annual review of sociology*, 36, 349-370.

Pan, S. Y., Cameron, C., DesMeules, M., Morrison, H., Craig, C. L., & Jiang, X. H. (2009). Individual, social, environmental, and physical

Preventie en zorg chronische aandoeningen – Hart-en Vaatziekten en hypertensie. (2018, oktober). *Pharos*. Geraadpleegd op 3 mei 2022.

RIVM. (2018). Gezondheidsverschillen | Volksgezondheid Toekomst Verkenning. VTV. Geraadpleegd op 10 mei 2022.

Ryan, R. M., & Deci, E. L. (2017). Self-determination theory: Basic psychological needs in motivation, development, and wellness. Guilford Publications.

Sailer, Michael; Hense, Jan Ulrich; Mayr, Sarah Katharina; Mandl, Heinz (2017). "How gamification

motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction". *Computers in Human Behaviour*. 69:

Schwartz, T., Luiten, W., Kok L. (2021). Gezondheidsproblemen personen met een lage sociaal economische status, 2021-07, SEO Economisch Onderzoek <https://www.seo.nl/publicaties/gezondheidsproblemen-personen-met-een-lage-sociaal-economische-status/>

Sebastian Deterding; Dan Dixon; Rilla Khaled; Lennart Nacke (2011). From game design elements to gamefulness: Defining "gamification". *Proceedings of the 15th International Academic MindTrek Conference*. pp. 9–15

Sharma, T., & Sharma, S. (2021). A study of YouTube as an effective educational tool. *Journal of Contemporary Issues in Business and Government Vol*, 27(1).

Siriaraya, P., Visch, V., Boffo, M., Spijkerman, R., Wiers, R., Korrelboom, K., ... & Goossens, R. (2021). Game Design in Mental Health Care: Case Study–Based Framework for Integrating Game Design Into Therapeutic Content. *JMIR Serious Games*, 9(4), e27953.

Sørensen, K., Pelikan, J. M., Röthlin, F., Ganahl, K., Slonska, Z., Doyle, G., ... & Brand, H. (2015). Health literacy in Europe: comparative results

of the European health literacy survey (HLS-EU). *European journal of public health*, 25(6), 1053-1058.

Sunamura, M., Ter Hoeve, N., van den Berg-Emons, R. J., Boersma, E., Geleijnse, M. L., & van Domburg, R. T. (2020). Patients who do not complete cardiac rehabilitation have an increased risk of cardiovascular events during long-term follow-up. *Netherlands Heart Journal*, 28(9), 460-466.

Sweet, S. N., Fortier, M. S., Strachan, S. M., & Blanchard, C. M. (2012). Testing and integrating self-determination theory and self-efficacy theory in a physical activity context. *Canadian Psychology/ Psychologie Canadienne*, 53(4), 319.

Ter Hoeve, N. (2019). Optimizing Cardiac Rehabilitation. *Journal of Rehabilitation Medicine-Clinical Communications*, 2.

Tsui, J. I., Dodson, K., & Jacobson, T. A. (2004). Cardiovascular disease prevention counseling in residency: resident and attending physician attitudes and practices. *Journal of the National Medical Association*, 96(8), 1080.

Van Gastel, W. & A. Sluijter (2015). Kennissynthese 'Gezonde leefstijl lang volhouden'.

Visch, V. T., Vegt, N. J. H., Anderiesen, H., & Van der Kooij, K. (2013). Persuasive Game Design: A model and its definitions.

Visser, C. (2020, 21 november). 4 Differences between Maslow's Pyramid and the basic psychological needs from self-determination theory. Progressfocused. Geraadpleegd op 3 maart 2022.

Y. Francillette, A. Gouaïch, N. Hocine, J. Pons, A gameplay loops formal language, in: 2012 17th International Conference on Computer Games (CGAMES), Louisville, KY, USA, 2012, pp. 94–101. Doi: 10.1109/CGames.2012.6314558.

Zuckerman, M.; Porac, J.; Lathin, D.; Smith, R.; Deci, E. L. (1978). "On the importance of self-determination for intrinsically motivated behaviour". *Personality and Social Psychology Bulletin*. 4

APPENDICES

APPENDIX 1: DATA ANALYSIS BOARD

Page 4: Intro Welkom bij de Capri-acties. Het doel van deze acties is om de fysieke en mentale gezondheid te verbeteren en de kwaliteit van leven te verbeteren.
Page 5: Doel Het doel van deze acties is om de fysieke en mentale gezondheid te verbeteren en de kwaliteit van leven te verbeteren.
Page 6: Doel Het doel van deze acties is om de fysieke en mentale gezondheid te verbeteren en de kwaliteit van leven te verbeteren.
Page 7: Doel Het doel van deze acties is om de fysieke en mentale gezondheid te verbeteren en de kwaliteit van leven te verbeteren.
Page 8: Doel Het doel van deze acties is om de fysieke en mentale gezondheid te verbeteren en de kwaliteit van leven te verbeteren.
Page 9: Doel Het doel van deze acties is om de fysieke en mentale gezondheid te verbeteren en de kwaliteit van leven te verbeteren.
Page 10: Doel Het doel van deze acties is om de fysieke en mentale gezondheid te verbeteren en de kwaliteit van leven te verbeteren.
Page 11: Doel Het doel van deze acties is om de fysieke en mentale gezondheid te verbeteren en de kwaliteit van leven te verbeteren.
Page 12: Doel Het doel van deze acties is om de fysieke en mentale gezondheid te verbeteren en de kwaliteit van leven te verbeteren.
Page 13: Doel Het doel van deze acties is om de fysieke en mentale gezondheid te verbeteren en de kwaliteit van leven te verbeteren.
Page 14: Doel Het doel van deze acties is om de fysieke en mentale gezondheid te verbeteren en de kwaliteit van leven te verbeteren.

Motivation during rehabilitation

Belongingness

"Ik voel me eenzaam en heb geen vrienden."

"Ik heb geen vrienden en heb geen vrienden."

"Ik heb geen vrienden en heb geen vrienden."

"Ik heb geen vrienden en heb geen vrienden."

Regaining confidence

"Ik heb geen vertrouwen in mezelf en heb geen vertrouwen in mezelf."

"Ik heb geen vertrouwen in mezelf en heb geen vertrouwen in mezelf."

"Ik heb geen vertrouwen in mezelf en heb geen vertrouwen in mezelf."

"Ik heb geen vertrouwen in mezelf en heb geen vertrouwen in mezelf."

Physical improvement

"Ik heb geen fysieke verbetering en heb geen fysieke verbetering."

"Ik heb geen fysieke verbetering en heb geen fysieke verbetering."

"Ik heb geen fysieke verbetering en heb geen fysieke verbetering."

"Ik heb geen fysieke verbetering en heb geen fysieke verbetering."

Safe environment

"Ik heb geen veilig milieu en heb geen veilig milieu."

"Ik heb geen veilig milieu en heb geen veilig milieu."

"Ik heb geen veilig milieu en heb geen veilig milieu."

"Ik heb geen veilig milieu en heb geen veilig milieu."

Authority

"Ik heb geen autoriteit en heb geen autoriteit."

"Ik heb geen autoriteit en heb geen autoriteit."

"Ik heb geen autoriteit en heb geen autoriteit."

"Ik heb geen autoriteit en heb geen autoriteit."

What they missed after Capri

"Ik heb geen vrienden en heb geen vrienden."

"Ik heb geen vrienden en heb geen vrienden."

"Ik heb geen vrienden en heb geen vrienden."

"Ik heb geen vrienden en heb geen vrienden."

Motivation before intake

Long Waiting time

"Ik heb geen tijd en heb geen tijd."

"Ik heb geen tijd en heb geen tijd."

"Ik heb geen tijd en heb geen tijd."

"Ik heb geen tijd en heb geen tijd."

Low motivation

"Ik heb geen motivatie en heb geen motivatie."

"Ik heb geen motivatie en heb geen motivatie."

"Ik heb geen motivatie en heb geen motivatie."

"Ik heb geen motivatie en heb geen motivatie."

Worrying

"Ik heb geen zorgen en heb geen zorgen."

"Ik heb geen zorgen en heb geen zorgen."

"Ik heb geen zorgen en heb geen zorgen."

"Ik heb geen zorgen en heb geen zorgen."

Motivation after rehabilitation

No motivation

"Ik heb geen motivatie en heb geen motivatie."

"Ik heb geen motivatie en heb geen motivatie."

"Ik heb geen motivatie en heb geen motivatie."

"Ik heb geen motivatie en heb geen motivatie."

Injury

"Ik heb geen verwondingen en heb geen verwondingen."

"Ik heb geen verwondingen en heb geen verwondingen."

"Ik heb geen verwondingen en heb geen verwondingen."

"Ik heb geen verwondingen en heb geen verwondingen."

Phycological problems

"Ik heb geen psychische problemen en heb geen psychische problemen."

"Ik heb geen psychische problemen en heb geen psychische problemen."

"Ik heb geen psychische problemen en heb geen psychische problemen."

"Ik heb geen psychische problemen en heb geen psychische problemen."

Health expert

"Ik heb geen gezondheidsdeskundigen en heb geen gezondheidsdeskundigen."

"Ik heb geen gezondheidsdeskundigen en heb geen gezondheidsdeskundigen."

"Ik heb geen gezondheidsdeskundigen en heb geen gezondheidsdeskundigen."

"Ik heb geen gezondheidsdeskundigen en heb geen gezondheidsdeskundigen."

Belongingness

"Ik heb geen vrienden en heb geen vrienden."

"Ik heb geen vrienden en heb geen vrienden."

"Ik heb geen vrienden en heb geen vrienden."

"Ik heb geen vrienden en heb geen vrienden."

eHealth tools

"Ik heb geen eHealth tools en heb geen eHealth tools."

"Ik heb geen eHealth tools en heb geen eHealth tools."

"Ik heb geen eHealth tools en heb geen eHealth tools."

"Ik heb geen eHealth tools en heb geen eHealth tools."

Intrinsic motivation

"Ik heb geen intrinsieke motivatie en heb geen intrinsieke motivatie."

"Ik heb geen intrinsieke motivatie en heb geen intrinsieke motivatie."

"Ik heb geen intrinsieke motivatie en heb geen intrinsieke motivatie."

"Ik heb geen intrinsieke motivatie en heb geen intrinsieke motivatie."

Loved ones

"Ik heb geen geliefden en heb geen geliefden."

"Ik heb geen geliefden en heb geen geliefden."

"Ik heb geen geliefden en heb geen geliefden."

"Ik heb geen geliefden en heb geen geliefden."

Working out

"Ik heb geen sport en heb geen sport."

"Ik heb geen sport en heb geen sport."

"Ik heb geen sport en heb geen sport."

"Ik heb geen sport en heb geen sport."

eHealth attitude

"Ik heb geen eHealth attitude en heb geen eHealth attitude."

"Ik heb geen eHealth attitude en heb geen eHealth attitude."

"Ik heb geen eHealth attitude en heb geen eHealth attitude."

"Ik heb geen eHealth attitude en heb geen eHealth attitude."

Nutrition

"Ik heb geen voeding en heb geen voeding."

"Ik heb geen voeding en heb geen voeding."

"Ik heb geen voeding en heb geen voeding."

"Ik heb geen voeding en heb geen voeding."

What they disliked

"Ik heb geen afkeer en heb geen afkeer."

"Ik heb geen afkeer en heb geen afkeer."

"Ik heb geen afkeer en heb geen afkeer."

"Ik heb geen afkeer en heb geen afkeer."

APPENDIX 2: MOTIVATION DURING REHABILITATION

Motivation during rehabilitation

Belongingness

"Omdat je in zo'n groep bent, ben je veel gemotiveerder"
P10 Quote Rehabilitation

"Het als groep met elkaar te doen en in kleine stapjes werken heeft mij geholpen"
P9 Quote Rehabilitation

"Weet je wat het is, dan ben je met een paar mensen. Met bepaalde mensen kun je dan een band krijgen. Daar, en dan ga je met elkaar, dan ga je in principe met elkaar trainen. Dat is en Dat is het mooie eraan. Je wordt geaccepteerd"
After Infarct P12 Quote Rehabilitation

"In principe heb je helemaal geen contact meer met Capri, dat vind ik erg zonde. Kom weer een keer met het hele groepje bij elkaar maar dat is weer een geldkwestie"
Daily life P12 Quote

"Ik heb de cardioloog gevraagd of ik er nog een keerje heen mag, naar de training"
Daily life P8 Quote

"Ik ben altijd met plezier gegaan. Altijd lieve en leuke mensen."
P12 Quote Rehabilitation

"Bij de Capri, waren het A LE MAAL toppertjes, dat zijn allemaal wereld mensen"
P12 Quote Rehabilitation

"Na de 26e keer moet je afscheid nemen, en dan denk je verdraaid dat nou jammer"
P8 Quote Rehabilitation

"Ik was daar ook met andere mensen he, allemaal met hetzelfde probleem"
P10 Quote Rehabilitation

"Dan kom je bij elkaar met allemaal ex-hartpatiënten en dan heb je het er met elkaar over"
P8 Quote Rehabilitation

"Het gevoel dat je even weer onder de mensen bent is fijn"
P12 Quote Rehabilitation

"Mensen hangen vaak hun vuile was buiten bij de training, omdat ze hier natuurlijk met mensen zijn waarmee ze erover praten"
P12 Quote Rehabilitation

Regaining confidence

"Dat vertrouwen. Dat je weer het goede vertrouwen terug krijgt, dat"
Daily life P8 Quote

"De eerste keer geloofde ik eigenlijk niet zozeer in sport. De tweede keer dacht ik JA, ook omdat ik wist dat je"
P8 Quote Rehabilitation

"Niks was eigenlijk teveel voor die mensen. Dan ga je even naar de cardioloog en die geeft je dan een pilletje of ze gaan even je bloeddruk meten. Dan krijg je toch wel het vertrouwen dat je weer kan"
P8 Quote Rehabilitation

"Het is wel leuk dat iemand ook zegt"
P10 Quote Rehabilitation

"De fysio heeft me aangeleerd hoe ik moet omgaan met de"
P8 Quote Rehabilitation

"Ik kreeg steeds meer motivatie om"
P8 Quote Rehabilitation

Physical improvement

"Ik voelde me eigenlijk steeds beter opknappen tijdens de revalidatie. Dat je ook veel meer zin had om wat te doen en gewoon alle dagelijkse dingen die werden weer makkelijker"
P8 Quote Rehabilitation

"Ik merkte dat ik een betere conditie kreeg, daardoor kon ik alles beter overzien, ook met die ademhalings technieken"
Daily life P8 Quote

"Ik voelde mijn lichaam vooruit gaan en de gesprekken die we met elkaar hadden, je maakt ook een lolletje"
P8 Quote Rehabilitation

"Tijdens het Capri gebeuren, kreeg ik wel veel motivatie om het bewegen in gang te houden"
P10 Quote Rehabilitation

"Na een paar weekjes werden dagelijkse dingen makkelijker"
P8 Quote Rehabilitation

"Ik merk toch wel dat ik iets meer conditie heb door de revalidatie"
P12 Quote Rehabilitation

Safe environment

"Het geeft wel rust dat daar mensen zitten die jou direct kunnen helpen"
P10 Quote Rehabilitation

"Ja, maar je wordt ook goed begeleid, dus dat was ook wel fijn. Als het dan een beetje teveel was dan zeggen ze even rustig aandoen weer"
P8 Quote Rehabilitation

"Als je een vraag had, of whatever, kon je daar direct terecht"
P10 Quote Rehabilitation

"De sportinstructie was erg belangrijk, en die zusters in de zaal"
P8 Quote Rehabilitation

Authority

"Als je gewoon naar de sport zou gaan, dan wordt je zeg maar gepusht"
Daily life P8 Quote

"Omdat dit verplicht is motiveert het"
P12 Quote Rehabilitation

"Als de doctor dit zegt, dan is het zo, daar is geen discussie over mogelijk, hij heb ervoor geleerd, ik niet"
P12 Quote Rehabilitation

APPENDIX 3: MOTIVATION AFTER REHABILITATION

Motivation after rehabilitation

No motivation

Injury

"Ik kreeg aan mijn lies pijn en in mijn been pijn. Toen moest ik 4 maanden stoppen met sport en alles en toen ben ik wel in verval geraakt en daar ben ik dan nog steeds niet uit weetje wel"
P8 Quote Rehabilitation

"Ik werd eerder al gedemotiveerd. Het kwam niet door corona, dat kwam later. Ik weet dat even niet meer"
Daily life P10 Quote

"Als je ergens op visite gaat dan wil je ook gewoon een wijntje drinken en wat eten"
Daily life P10 Quote

"Ik heb ook wel een paar keer gelopen, ik heb ook gewoon loopschoenen, maar dan krijg je het toch niet op de rit. Je moet echt een doel hebben om ergens heen te gaan"
P8 Quote Rehabilitation

Phycological problems

"De staat waarin ik verkeer, dat gaat nooit beter worden"
Opinion P12 Quote

"Het was beetje een rottijd toen het niet zo goed ging"
Daily life P10 Quote

"Ik ga niet echt zelf iets ondernemen als de revalidatie voorbij is"
Daily life P12 Quote

Physical improvement

"Mijn conditie is niet zo best, door dat gewicht ben ik snel kortademig. Maar door sochtends 10 en savonds 10 min fiets op de crosstrainer heb ik dat niet meer"
Daily life P10 Quote

Corona crisis

"Ik wou daar 1,5 jaar geleden al mee beginnen maar het ging niet door met die gekke corona allemaal"
Daily life P12 Quote

"In de revalidatie tijd was ik 120 kg, pas later bij de dieetiste ben ik 15 kg kwijt geraakt, maar door corona kwam het er weer aanvliegen"
Daily life P10 Quote

Stimulation of motivation

Health expert

"Ik loop nu ook bij een leefstijlcoach, dat duurt 2 jaar"
Daily life P12 Quote

"Toen zat ik in het traject om de 6 weken bij elkaar te komen voor de voeding"
P8 Quote Rehabilitation

"De schijf van 5 volg ik precies, dat is van de dieetiste, die kon je opvragen bij het voedingscentrum"
Daily life P10 Quote

Belongingness

"Door Capri ben ik lid geworden van de Harttrim groep op elke maandag avond"
Daily life P8 Quote

eHealth tools

"Goverdikkeme ik ben nog niet aan die stappen gekomen. Eigenlijk word je dan gedwongen door het horloge, het beste was tot die 10000 stappen"
P12 Quote Rehabilitation

Intrinsic motivation

"Zelf moet je die knoop doorhakken, dat is wel moeilijk omdat dat ook breken met je vrienden is. Nu heb ik eigenlijk geen vrienden meer".
Before Infarct P12 Quote

"De tactiek is streng zijn voor jezelf, want ik woog wel echt 124kg he"
Daily life P10 Quote

"Ik ben de beste coach voor mijzelf"
Daily life P10 Quote

"Sinds de hartaanval ben ik bewuster van mijn gezondheid, daarvoor deed ik maar wat"
P12 Quote Rehabilitation

Loved ones

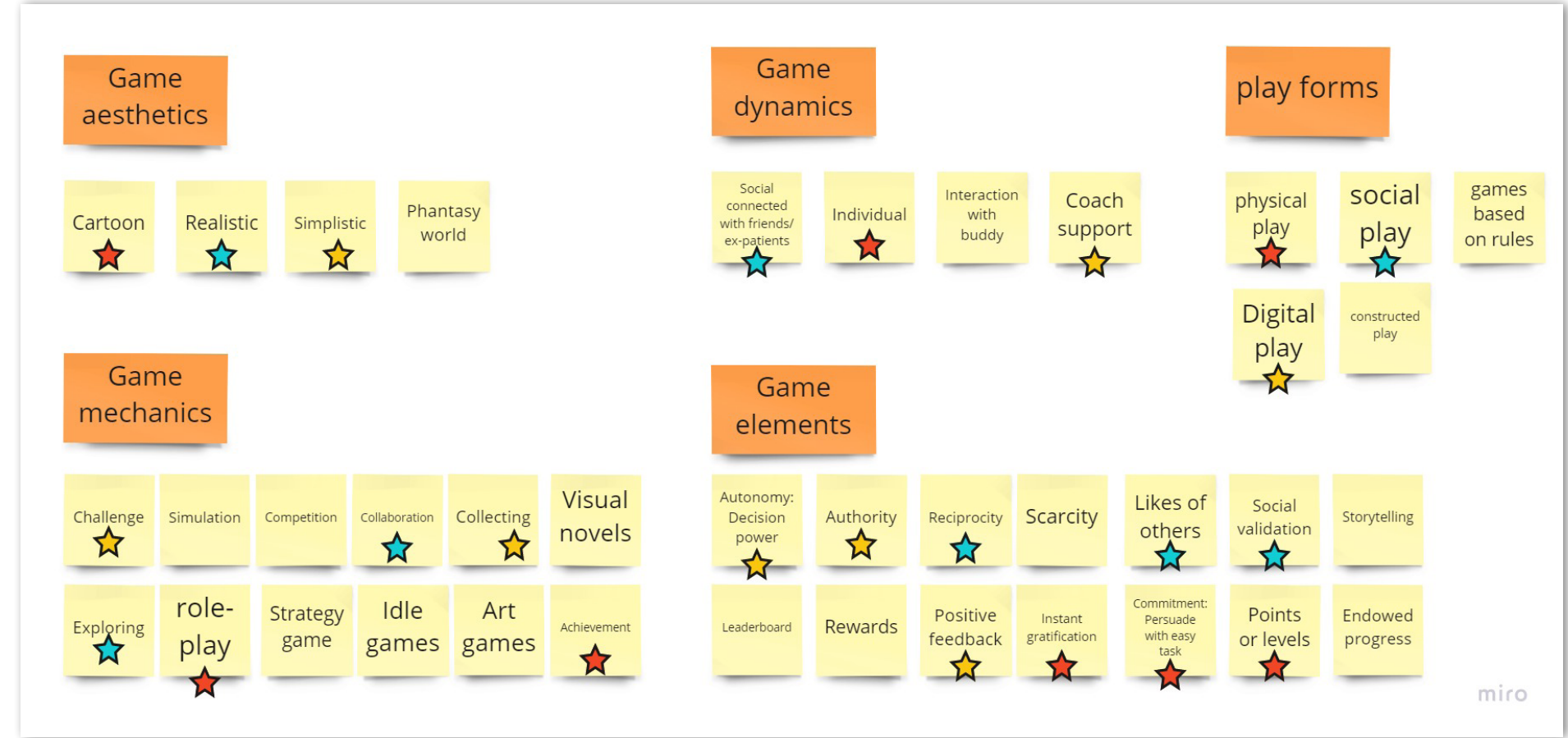
"Mijn vrouw en ik zijn al een paar jaar bezig om gezond te leven, daar zijn we het wel over eens"
Daily life P8 Quote

"Mijn vrouw zit er ook achteraan, die wil vaak wandelen. Dat helpt"
Daily life P12 Quote

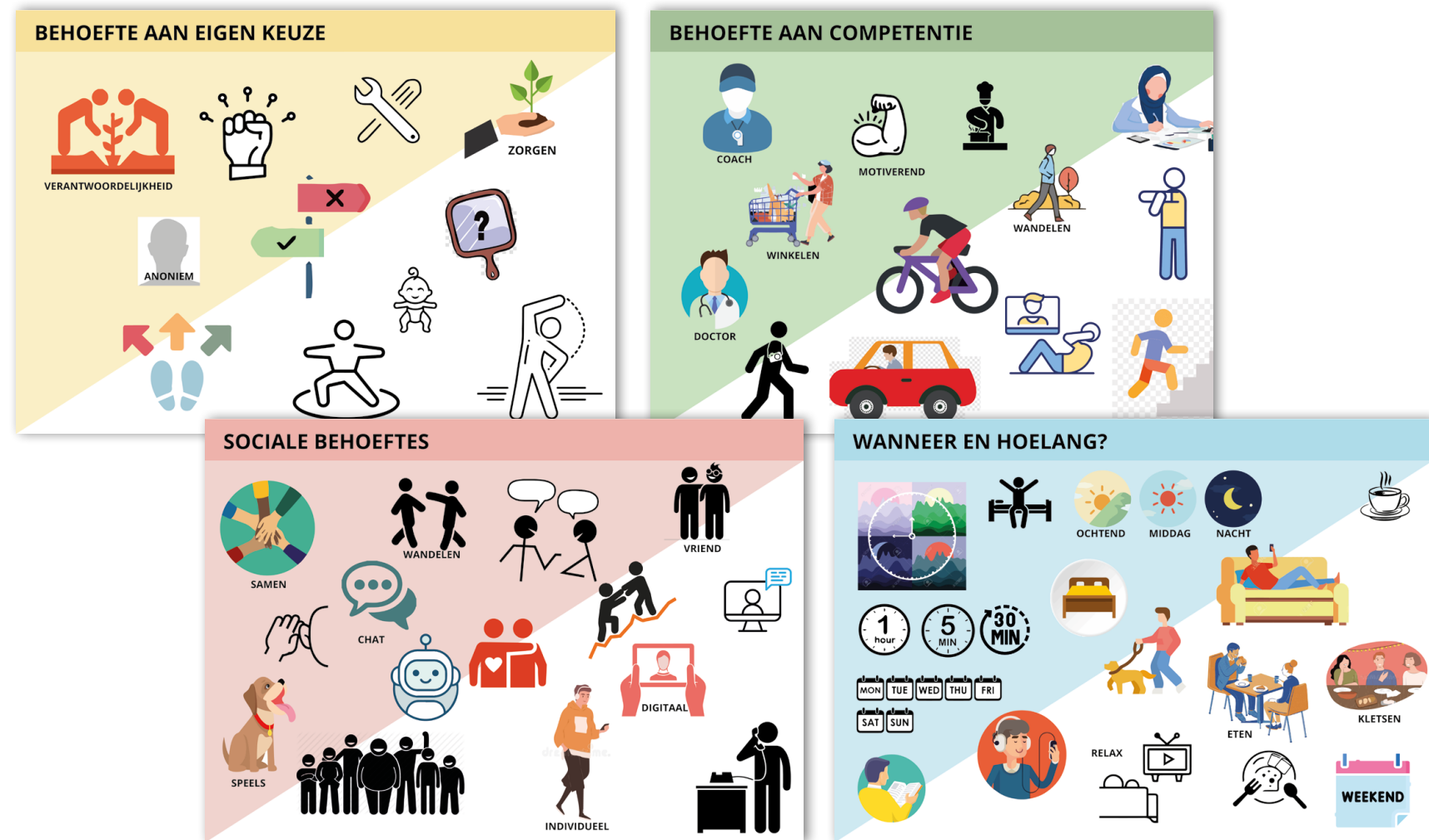
"Mijn vrouw houdt mijn eten bij. Houd jij het maar in de gaten, ik geloof het wel"
Daily life P12 Quote

"Ik kom elke week bij 38 klanten, die zien me al jaren, en die waren er ook bij toen ik mijn eerste infarct kreeg. Die houden mij ook in de gaten"
Daily life P8 Quote

APPENDIX 4: BRAINSTORM



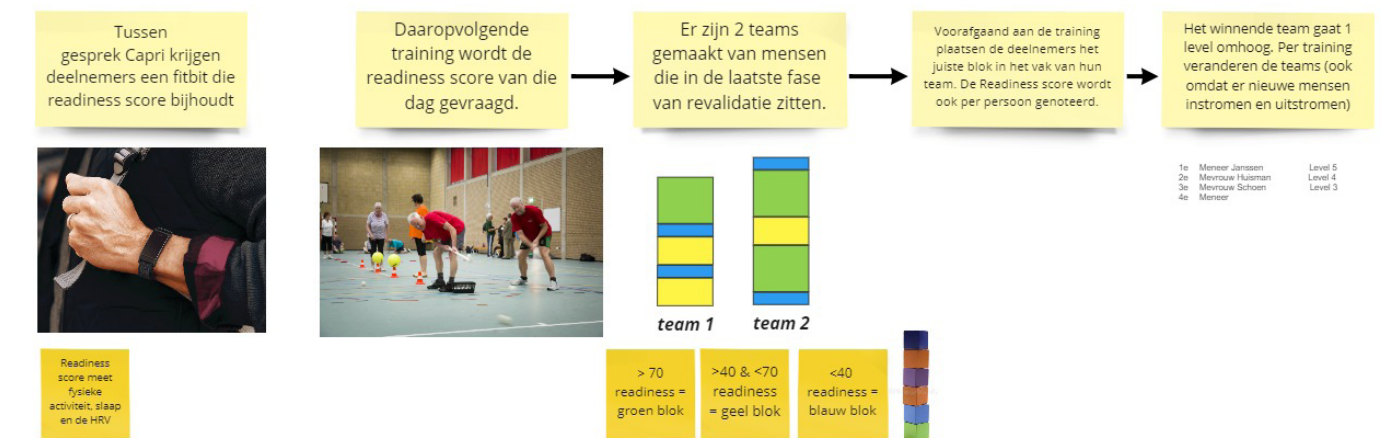
APPENDIX 5: CO-CREATIE ELEMENTS



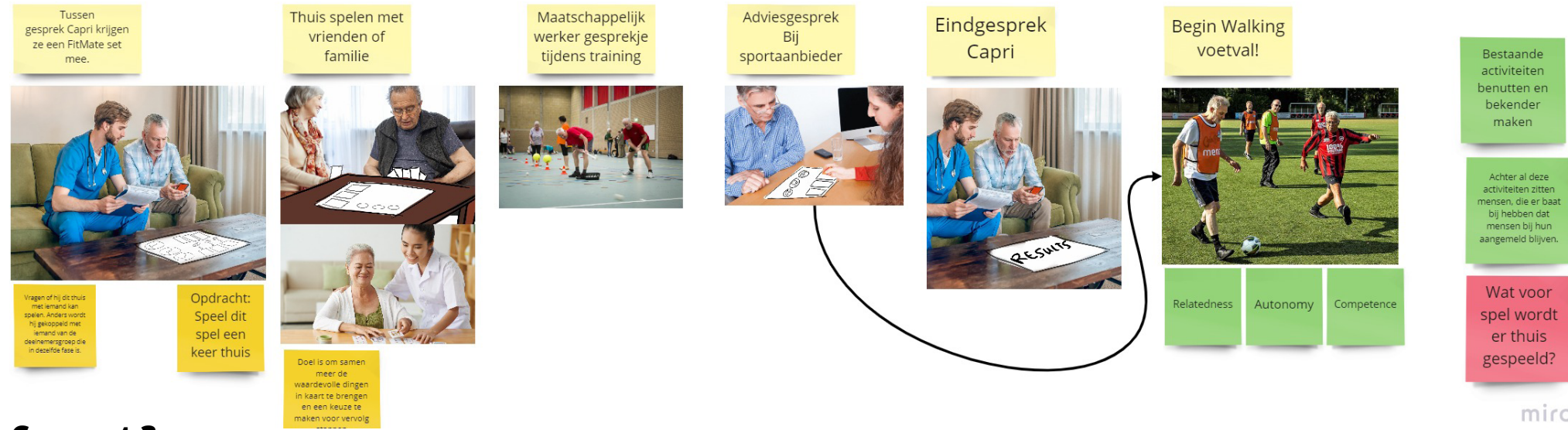
APPENDIX 6: CONCEPTUALISATION

Concept 1

Scenario



Concept 2



Concept 3

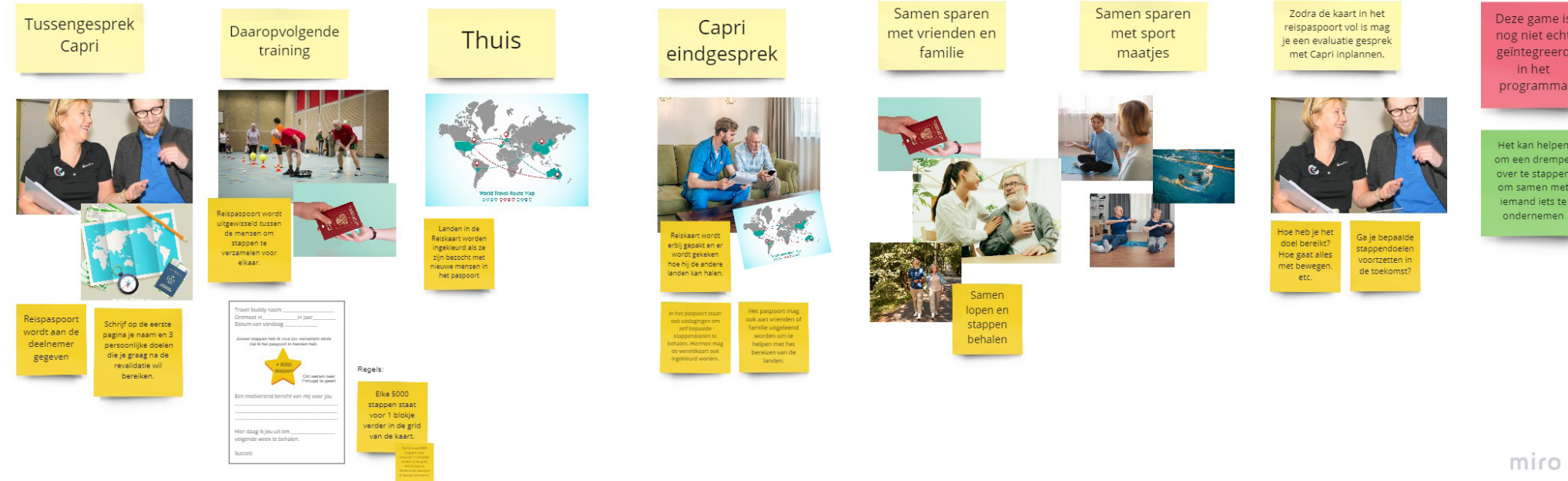
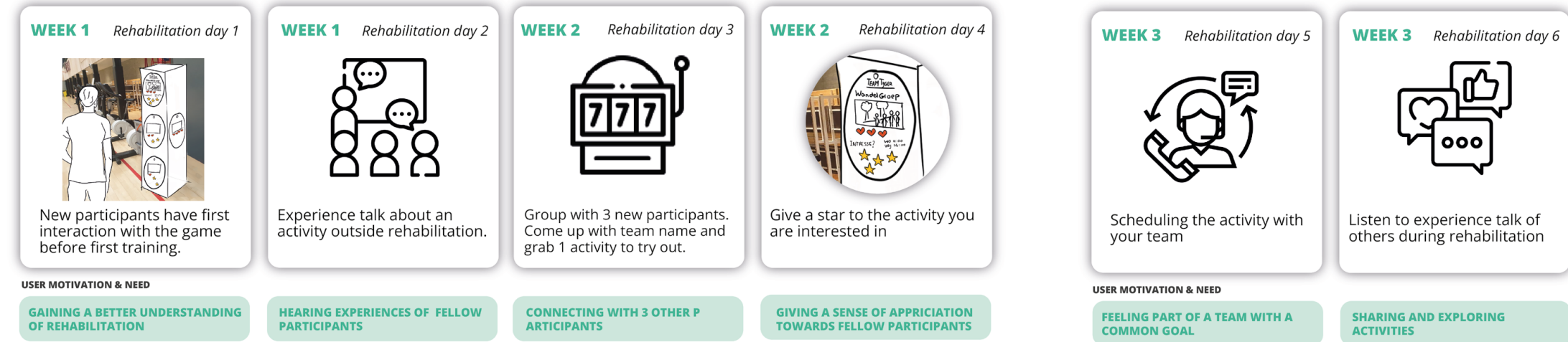


Figure 20: Detailed concept

Phase 1: Group formation & Introduction to the activities



APPENDIX 8: FUEL CARDS

WEEK 4

Rehabilitation day 7

The physiotherapist asks if the team already scheduled a date for the activity.

BEING VALUABLE FOR THE REHABILITATION OF OTHERS

WEEK 4

Rehabilitation day 8

Listen to experience talk of others during rehabilitation

SHARING AND EXPLORING ACTIVITIES

Phase 3:
Share your activity experiences with the other participants

WEEK 5

Rehabilitation day 9

The physiotherapist compliments the team with their achievement. They can now prepare their own experience talk

ACHIEVING GOALS

WEEK 5

Rehabilitation day 10

The team tells about how it was and where they can do it. Others can give a star to this activity when they are interested.

HELPING OTHERS AND FEELING COMPETENT

WEEK 6

Rehabilitation day 11

Connecting with people and finding people who are interested in joining an activity together.

SUPPORTING EACH OTHER

WEEK 6

Rehabilitation day 12

Knowing what activity to pursue after this last rehabilitation training.

HIGHER SENSE OF SELF-EFFICACY

DOEL: Maak deze week 4 wandelingen van minstens 20 minuten	DOEL: Doe mee met de gratis wandelgroep van Sportief Capelle op maandag of woensdag om 9:30 bij Fiolet Studios in Oostgaarde (010-25288787)	DOEL: Doe mee met een gratis fietstochtje met 't Fietsbelletje (010-4422716) op dinsdag of donderdag om 9:30 bij HSB de Vijverhof in Middelwateringen	DOEL: Doe een proefles bij een sportschool bij jou in de buurt, dit kan samen of alleen
DOEL: Schrijf een eigen weekdoel op om brandstof te verdienen voor de space shuttle	DOEL: Doe mee met een gratis proefles bij Walking Voetbal van Sportief Capelle op woensdag van 10:00 tot 11:00 bij VV Capelle aan de B.C. Boutensingel 1 (010-25288787)	DOEL: Doe mee met een gratis sport avond van de harttrimgroep Krimpen op dinsdag 19:45 in De Populier sporthal aan de Populierenlaan in Krimpen aan den IJssel	DOEL: Ga deze week 4x wandelend of fietsend naar de supermarkt of op bezoek bij iemand
DOEL: Doe elke dag 10 squats als je de was doet of iets oppakt van de grond	DOEL: Loop ten minste 6 trappen op deze week	DOEL: Besteed deze week 1 uur per dag aan het schoonmaken/opruimen van je huis. Dit is erg goed voor je dagelijkse beweging	DOEL: Doe mee met de Jeu de Boule competitie bij KCC/CK kozijnen op dinsdag of donderdag om 13:15 bij de Capelseweg 39a

APPENDIX 9: MANUAL FOR PRACTITIONERS

DOEL: Zit deze week niet meer dan een half uur in dezelfde positie. Sta op en beweeg tussendoor, geef de planten water of loop een stukje	DOEL: Schrijf je in bij SportMEE deze week en plan een gratis beweeg advies afspraak in via de volgende QR-code of bel 010 282 11 11	DOEL: Probeer deze week elke dag je balans te houden terwijl je 5 meter in 1 rechte lijn loopt, dit kan zowel in huis of buitenshuis	DOEL: Voer samen met jou Space Missie team buiten de revalidatie gezamenlijk een fysieke activiteit uit (wandeling of gratis sportles bij Sportief Capelle etc.)
DOEL: Begin deze week elke ochtend met 10 minuten fysieke oefeningen	DOEL: Doe mee met een gratis golfles bij golfclub Kralingen door je aan te melden bij sportMee Rotterdam via de volgende QR-code of bel 010 282 11 11	DOEL: Pak een fles water en lift deze 10x met beide armen elke dag deze week	DOEL:
DOEL: Schrijf een eigen weekdoel op om brandstof te verdienen voor de space shuttle	DOEL: Doe deze week mee met een sportles van iemand in je omgeving	DOEL: Doe een gratis les mee met de harttrimgroep Rotterdam van 19.30 - 21.00 uur in de sporthal van het Melanchthon Wilgenplaslaan tegenover Teldershof 10, 3053 TA Rotterdam (010 422 13 32)	DOEL:



Space Mission Sanitas Practitioners' guideline manual

Kort speloverzicht

Space Mission Sanitas is een game dat inspeelt op het behalen van fysieke week doelen in de hartrevalidatie zorg. Tijdens het spel wordt een beroep gedaan op de mensen in de hartrevalidatie om als astronaut bij te dragen aan Space Mission Sanitas. Als astronauten zijn zij verantwoordelijk voor de brandstoftoevoer aan boord van de space shuttle richting planeet Sanitas. De astronauten zijn in teams verdeeld van 3 tot 5 spelers waarmee ze het brandstofdoel voor die week moeten behalen. Deze brandstof doelen staan zijn gekoppeld aan fysieke activiteiten die de spelers buiten hun revalidatie kunnen oppakken. Door iedere week een ander doel te selecteren kunnen de spelers exploreren wat voor fysieke activiteit na de revalidatieperiode bij hun past. Het is de verantwoordelijkheid van de astronauten om tijdens hun revalidatieperiode Space Mission Sanitas in goede banen te leiden en verschillende fysieke activiteiten uit te proberen.

Doel van het spel

Het doel van het spel is om de deelnemers in de hartrevalidatie meer kennis te laten maken met de fysieke activiteiten die ze in hun dagelijks leven op kunnen pakken. Dit zorgt ervoor dat mensen beter weten wat ze aan fysieke activiteiten kunnen doen als de revalidatie periode voorbij is. Dit draagt bij aan het volhouden van een fysieke levensstijl.

Spel materialen

6x Space shuttle blokken
6x Brandstofkaarten decks met 25 brandstofkaarten per deck
6 x White board markers
A1 information poster
Deze handleiding



Eerste keer spelen

Eenmalige voorbereiding

1. Lees deze handleiding door.
2. Bekijk de deelnemerslijst en maak groepjes van 3 tot 5 mensen die in dezelfde week zijn begonnen met de revalidatie training.

Voorbeeld: Mensen die net gestart zijn worden samen in een team ingedeeld (week 1 van de revalidatie). Als een team uit minder dan 2 mensen bestaat, voeg ze dan samen met een groep die een week eerder begonnen is. Op deze manier is de groep verdeeld in 5 of 6 teams.

Opmerking: Als sommige mensen langer dan zes weken trainen, laat deze dan met andere teams meedoen.

3. Hang de Space Missie Sanitas poster op in de zaal.
4. Bouw de Space Shuttle ergens op in de zaal en vraag of de deelnemers eromheen komen staan



Eenmalige fase 1: Eerste introductie en groepsvorming (15 minuten)

In deze fase wordt het spel voor het eerst aan de deelnemers uitgelegd. In de volgende stappen staan richtlijnen hoe dit aangepakt kan worden (maar er is ook ruimte voor eigen invulling):

1. Prik een geschikt moment tijdens een revalidatie training. Bijvoorbeeld voor of na een voorlichtings sessie of aan het eind van een revalidatie training.
2. Vertel kort waar deze game over gaat:
Dit is een spel dat jullie aanmoedigt om bepaalde week doelen buiten de revalidatie training te voltooien. In het spel is het jullie verantwoordelijkheid om op deze manier de brandstof toevoer van de space shuttle op pijl te houden. Hoe dit precies in zijn werk gaat zie je in het volgende filmpje.
3. Laat op een laptop of scherm het Space Mission Sanitas **Introductie filmpje** zien aan de deelnemers. Vertel dat ze deze ook terug kunnen zien door de QR-code op de poster te scannen met hun mobiele telefoon.
4. Vertel de deelnemers hun teamindeling en laat ze met hun team bij elkaar staan.
5. Vraag de teams om per team een Shuttle blok te pakken en daar hun namen op te schrijven met een whiteboard marker.
6. Geef ieder team 1 deck met brandstofkaarten, en vraag ze om ieder 1 kaart uit het deck te trekken.
7. Vertel dat ze uit de 3 getrokken kaarten, 1 kaart mogen selecteren om uit te voeren die week.
8. Laat de teams de gekozen brandstofkaart op het Shuttle blok bevestigen en de Space shuttle weer opbouwen.
9. Vertel de deelnemers dat ze volgende week gaan kijken welk team hun brandstofdoel heeft weten te halen en dat ze dit iedere week zullen herhalen.

Wekelijks spelverloop

Wekelijkse voorbereiding

Haal de Space Mission Sanitas materialen uit de opslag en plaats deze op de uitgekozen plek in de zaal aan het begin van iedere revalidatie training. Hang de introductie poster vlak bij de Space Shuttle materialen, op een zichtbare plek voor de deelnemers.

Spelverloop

De volgende fases worden allemaal op 1 trainingsdag in de week doorlopen. Kies 1 dag in de week waarin dit spel gespeeld wordt. De andere dag mag de Space Shuttle wel in de zaal staan maar worden er geen acties uitgevoerd binnen het spel.

Fase 1: Introductie en groepsvorming

In deze fase wordt er aan de nieuwe deelnemers uitgelegd hoe het spel werkt.

1. Vertel tijdens het intakegesprek aan de nieuwe deelnemers dat ze aan X aantal nieuwe deelnemers gekoppeld zullen worden. Noem hierbij de namen van zijn/haar teamgenoten.

Opmerking: Zodra er in een week 2 of minder deelnemers instromen, moeten deze worden aangevuld met mensen die langer dan zes weken trainen of zullen deze deelnemers worden toegevoegd aan het team dat een week daarvoor is gestart.

2. Na de intake gesprekken zullen de deelnemers elkaar ontmoeten.

Fase 2: Applaudiseren voor behaalde brandstofdoelen

Doorloop de volgende stappen aan het begin van de training:

1. Breng de deelnemers bij elkaar
2. Laat per team overleggen of ze het brandstofdoel hebben gehaald deze week.
3. Het team mag hun Shuttle Blok pakken en deze op de Space Shuttle zetten als de meerderheid van het team het heeft gehaald.
4. Geef het Shuttle Blok van het team dat klaar is met revalideren aan het team met de nieuwe deelnemers en laat ze een teamnaam opschrijven.
5. Zeg tegen het nieuwe team dat het handig is om een groeps chat aan te maken an de training.
6. Initieer een applaus voor de teams dat het wekelijkse brandstofdoel hebben gehaald en Space Missie Sanitas hebben voortgezet.
7. Vraag aan een van de teams hoe ze het hebben ervaren.
8. Initieer een applaus voor het team dat deze week nieuw is in de revalidatie training.
9. Laat de Space Shuttle in de sporthal staan en begin met de reguliere revalidatie training.

Fase 3: Selecteren van een nieuw brandstof doel

Doorloop de volgende stappen aan het eind van de training:

1. Breng alle deelnemers weer bij elkaar rondom de Space Shuttle.
2. Vertel dat ze Missie Sanitas met zijn allen voort moeten zetten en daarom weer 1 brandstofdoel moeten selecteren.
3. Loop naar het nieuwe team en leg uit dat ze 1 kaart per persoon uit het team kaarten deck mogen trekken. Hiervan mogen ze 1 kaart kiezen om die week uit te voeren
4. Herinner iedereen eraan dat de meerderheid van het team dit doel moet uitvoeren om als team bij te dragen aan de missie!
5. Vertel de deelnemers dat het handig is om een foto te maken van de gekozen kaart en deze in hun groeps chat te sturen.
6. Wens iedereen succes met het nieuwe brandstofdoel en sluit de training af.
7. Berg de materialen van het spel op bij de rest van de revalidatie materialen.

In deze week wordt het brandstofdoel per team uitgevoerd. Elke week worden de 3 vorige fases herhaald, en zullen de teams beter weten wat voor fysieke activiteiten ze buiten de revalidatie trainingen kunnen oppakken.

Einde van het spel

Zodra de deelnemers klaar zijn met hun revalidatie periode hebben ze het spel voor minimaal zes weken gespeeld.

Benoem de volgende dingen in het eindgesprek:

1. Vraag of ze een idee hebben van wat ze van fysieke activiteit na de revalidatie gaan oppakken.
2. Geef de tip aan de deelnemers om hun groups chat te bewaren om te kijken wat voor fysieke activiteiten ze tijdens de revalidatie periode hebben opgepakt.
3. Bedank de deelnemer voor het bijdragen aan de Space Missie.

Colofon

Dit spelconcept is gemaakt door Megan Chan, in samenwerking met de TuDelft en Capri Hartrevalidatie.



APPENDIX 10: EVALUATION FORMS



Space Missie Sanitas evaluatie vragen

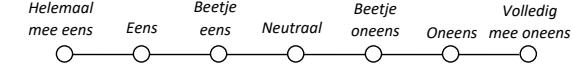
1. Zou ik u binnen 7 dagen mogen bellen voor een nagesprek van 10 minuten? Zo ja, wilt u dan uw naam en telefoonnummer invullen?

Naam: _____

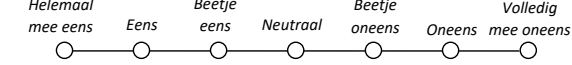
Telefoonnummer: _____

Kruis aan wat voor u van toepassing is:

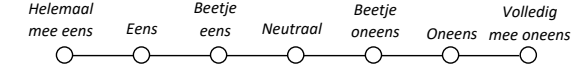
1. Ik vind het leuk om het weekdoel samen met anderen te halen:



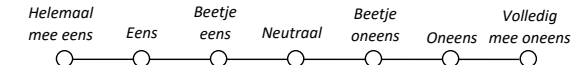
2. Door de brandstof doelen weet ik beter wat ik kan doen na de revalidatie:



3. Door het weekdoel te halen heb ik meer vertrouwen in wat ik kan:



4. De Space Missie is een goede toevoeging aan het Capri programma:



Brandstofdoel gehaald



Space Missie Sanitas evaluatie vragen

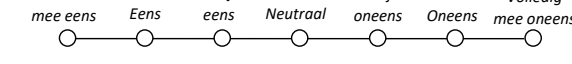
1. Zou ik u binnen 7 dagen mogen bellen voor een nagesprek van 10 minuten? Zo ja, wilt u dan uw naam en telefoonnummer invullen?

Naam: _____

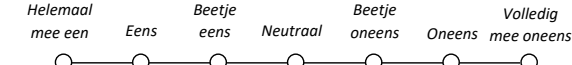
Telefoonnummer: _____

Kruis aan wat voor u van toepassing is:

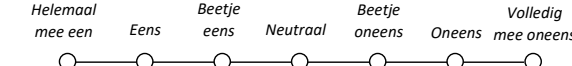
2. Ik vind het leuk dat je het weekdoel samen met anderen probeert te halen:



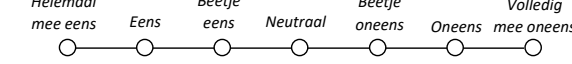
3. Door de doelen op de brandstof kaarten weet ik beter wat ik kan doen na de revalidatie:



4. Door het halen van een weekdoel zou ik meer vertrouwen krijgen in wat ik kan:



5. Ik vind de Space Missie een goede toevoeging aan het Capri programma:



Brandstofdoel X



