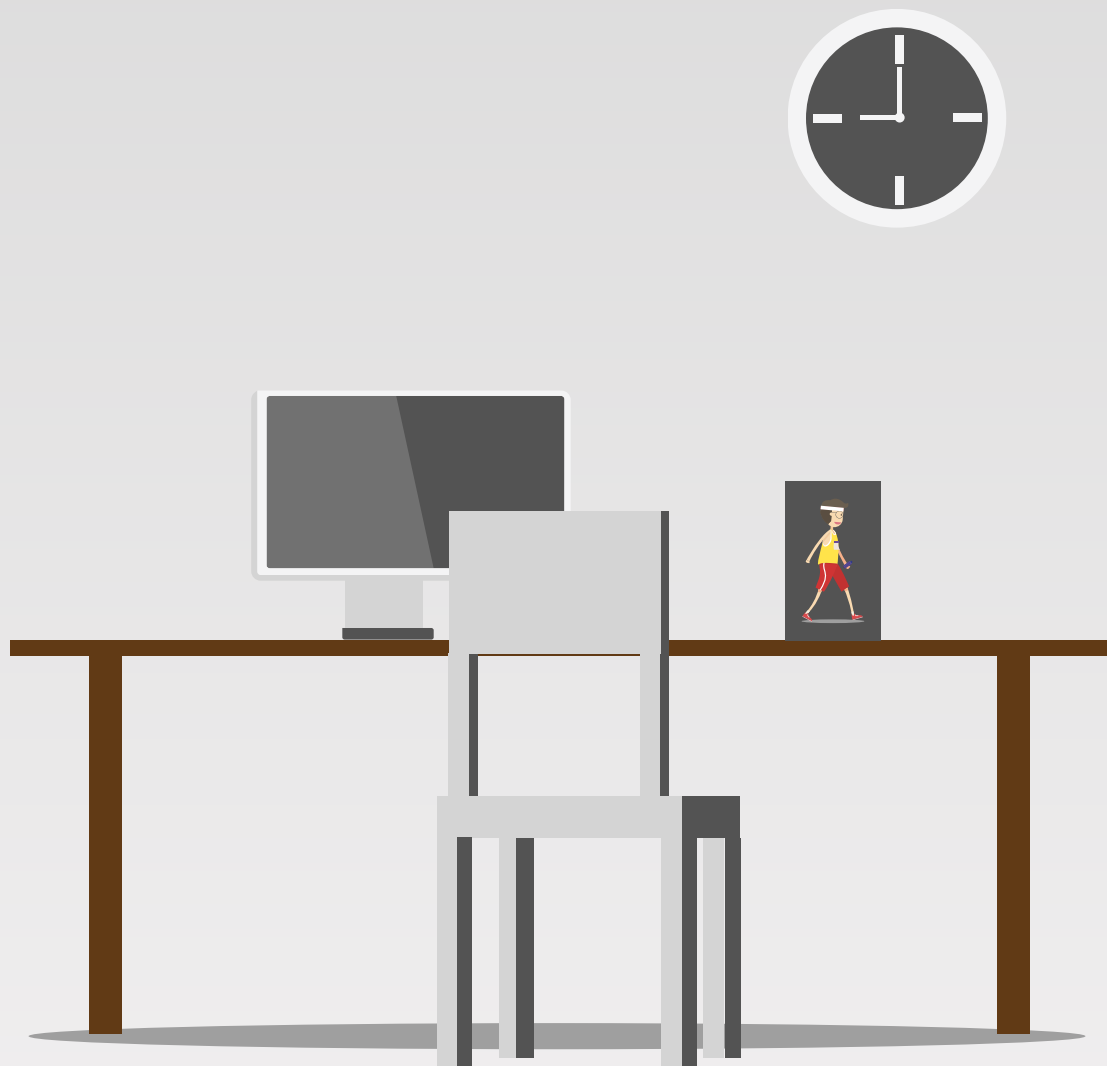# Sports Avatar

Persuasive support of physical
activity in the office environment

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DDM110 - Design for Behavioral Change

# 1. Analysis

## 1.1 Introduction

This report describes an attempt of reducing sedentary lifestyle among inactive individuals in their adulthood through the design and application of an interactive behaviour change intervention. The first part of the report revolves around the analysis and selection of a target group and its behaviour, followed by a three-iteration design process using behaviour change theory and frameworks. This results in a proposal for an behaviour change intervention. The report finalises with a suggestion of evaluating the intervention's effectiveness.

## 1.2 Challenge

The value of an active lifestyle is closely linked health and well-being. However, many people in the Netherlands have adapted a more sedentary lifestyle. This way of living is becoming more common around the world to the point where one in ten deaths worldwide are caused by extensive sedentary behaviour, sitting for 7-10 hours daily (Lee et al., 2012). The build up of these sedentary hours affect health and decrease lifespan of the individuals who engage in sedentary behaviour.

In the Netherlands a study by the Dutch Health Council states: '*adults should be physically active at moderate or vigorous intensity for at least two and a half hours every week spread over several different days*'. Furthermore, the study found that only 44% of the Dutch population actually meets these requirements. Failure in meeting these guidelines increases 'the risk of chronic diseases, such as diabetes and cardiovascular diseases, depressive symptoms and, in older adults, frac*tures.'* The same study found that *'the most health gains are made when changing from being physically inactive to being physically active'* (*Dutch physical activity guidelines 2017, 2017*). Figure 1 depicts an overview of the complete guideline.
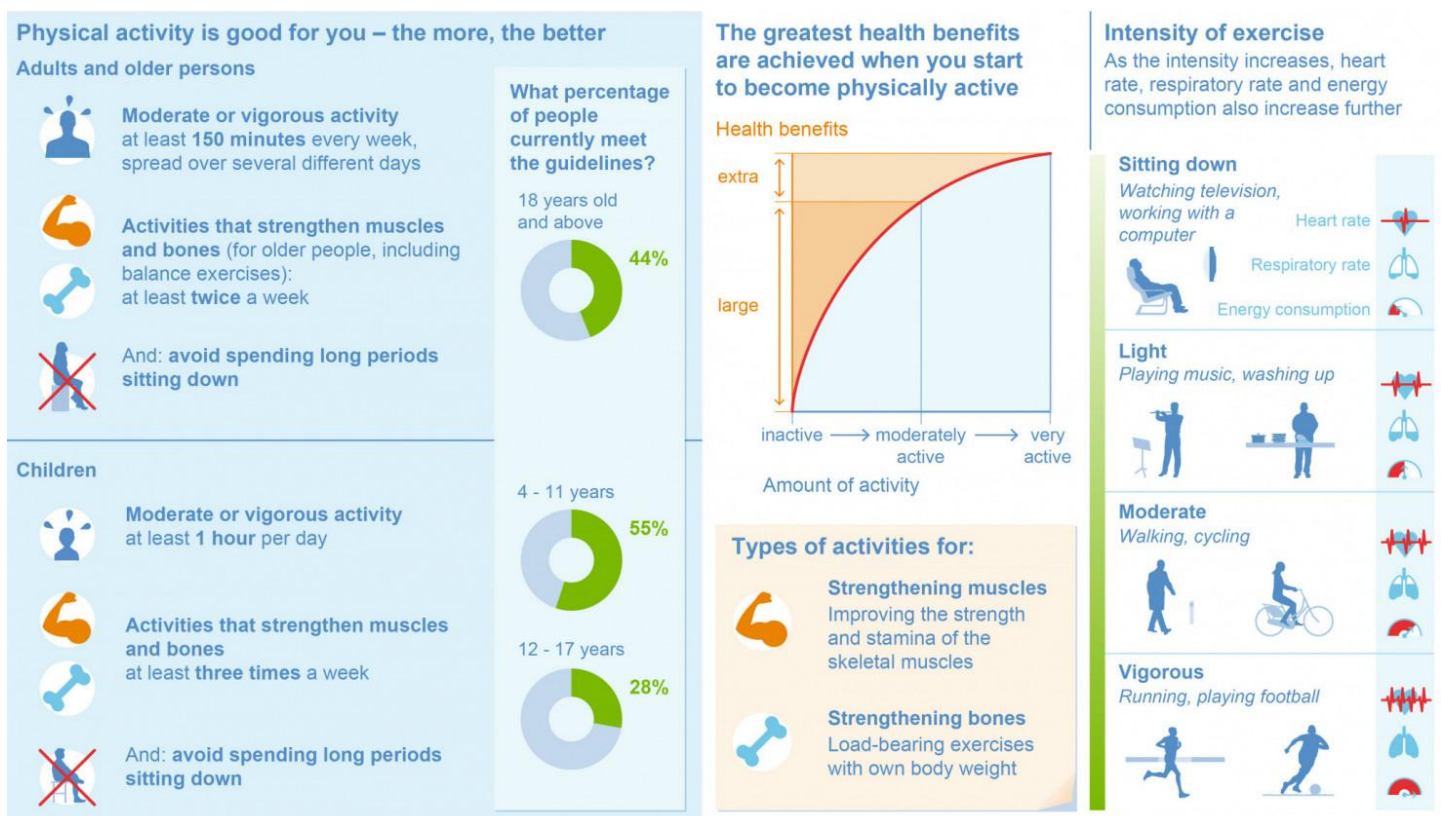


Figure 1: Physical Activity Guidelines 2017 (Dutch Health Council, 2017)

When people attempt to adapt to a healthier lifestyle they encounter various obstacles such as, demographic (e.g. age or gender), psychosocial (e.g. motivation or social support ) or environmental (e.g. weather) that may prevent the person from getting active. Current efforts to change this sedentary behaviour in the form of wearables, applications or changes in the environment to promote behaviour change have experimented with various techniques. However, it's still unclear what the effectiveness is of these lifestyle interventions is.

## 1.3 Problem Statement

With 55% of the Dutch population performing less than the recommended amount of movement on a frequent basis, how can current sedentary office habits be altered to increase movement in a 9 to 5 workday?

## 1.4 Benchmark

Existing solutions for promoting an active lifestyle are examined as a first step of addressing the prob-

lem. The overview can be found in appendix A. Currently solutions appear to mostly rely on either goal setting, self-monitoring, feedback, rewards, social support, and coaching. They seem to be especially helpful in increasing activity and healthy behaviours. Please note that some examined methods do not intend to address a sedentary lifestyle, but do trigger the behaviour as a side effect (i.e. Pokemon Go).

## 1.5 Target Group

To successfully tackle the problem of sedentary lifestyles, the office space was chosen because it deals with people who work from nine to five and often sit for long periods of time. In the initial exploration, the possible targets were broken down by age ranges. This was later changed to lifestyle habits because age group does not necessarily have connection to the amount of activity one performs. Thus, the groups of active (non-sport), non-active, and completely sedentary were created.



Active (non-sport)
-Set time to exercise
-Active for the sake of being active

Non-active
-Likely to choose the 'easiest' exercise

Completely Sedentary
-'Easiest' exercise is not to exercise at all
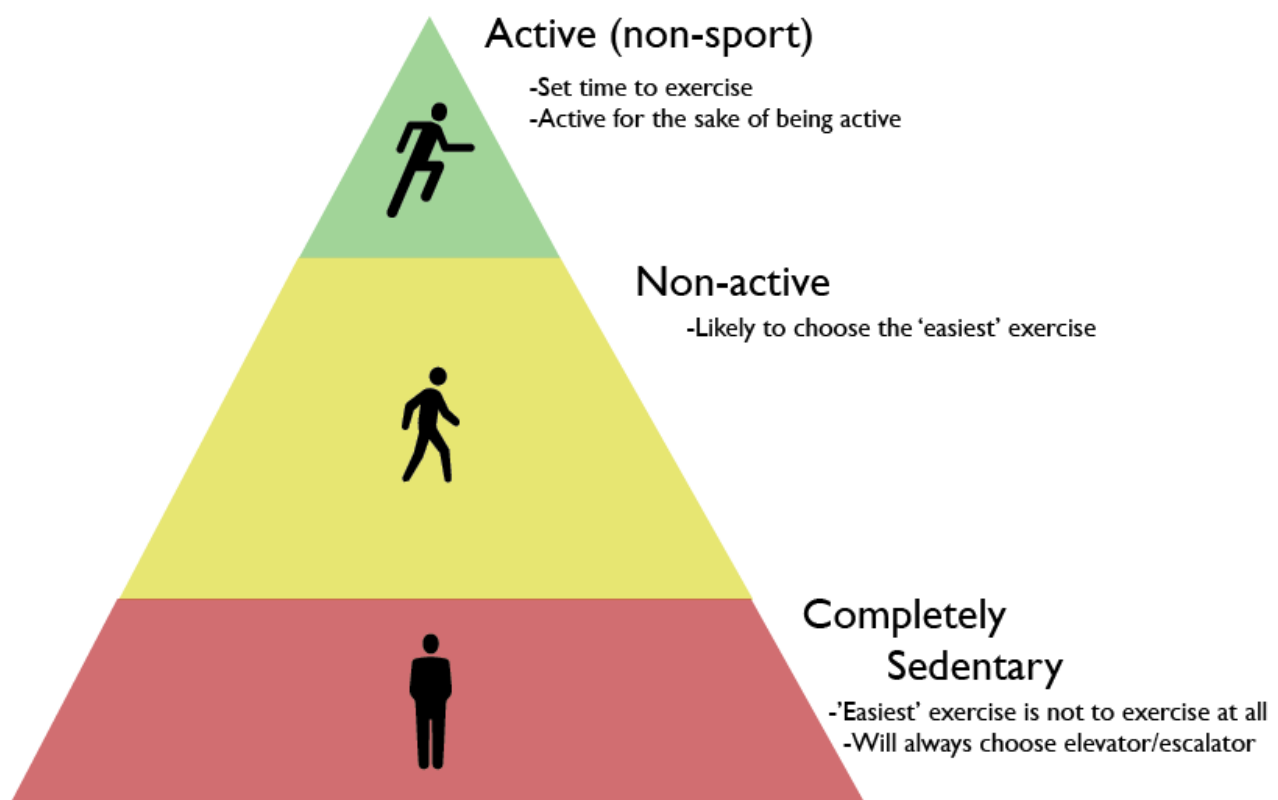-Will always choose elevator/escalator

Figure 2: Defined activity groups

The active (non-sport) group is classified for this study as individuals who have set times for activity. They do not view exercise as a chore but as something that they must do without negative connotations. The activities chosen are not based on an end goal such as winning a game but being active for the sake of being active. Their motivation is to stay in shape and maintain the social life of the gym. This group finds frustration with individuals who come to the gym for New Year's resolution and crowd the gym but tend to not keep up with their goals. Within the Transtheoretical Model, this group is settled in the action phase, in which the user frequently engages in the activity with small chance of relapse.

The non-active group is classified for this study as individuals who will participate in a gym class every now and then; intervals of three months. Often make plans with friends to commit to an active lifestyle but has trouble keeping this commitment. This group is not opposed to taking the stairs but would not consider running as a first choice for exercise. General lifestyle is often relaxed and mental challenges are more welcomed than physical challenges. Non-active individuals are in between two phases: the contemplation phase, individuals are aware they need to change behaviour but have not made the necessary steps to change, and the preparation phase, in which they begin to plan how they will change and will start the change within the upcoming day.

The completely sedentary group is classified for this study as individuals who choose to make no effort in an active lifestyle. Often very stubborn and set in their initial habits. Frustrated by society's remarks of being labeled as lazy and do not find motivation in being 'nagged' for their lack of movement. This group is within the precontemplation phase with no effort to improve or change behaviour.

Active (non-sport) was found to be people who fit in the 45% of individuals who already make the effort to move and, therefore would not be a necessary target group. With the lack of motivation to move, the completely sedentary group was deemed not fit to be a target group. If this group were to be chosen, the approach would need to be completely different to be successful. Out of the three groups, the target group non-active group was chosen for being a larger scope of people and for the motivation to do some form of movement already present. Thus, this group shows the most potential for success.

## 1.6 Identified Barriers

In this section, an attempt is made to understand what withholds the non active office target group from performing active behaviour. This may be different for every individual, but there may be a general consensus within the overall group.

A common barrier for non-active behaviour is a sheer lack of time in schedule, or the feeling of not having time. Furthermore, feeling too tired for exercise after of work was also identified as a most common barrier. Also, In regards to health, rewards are not known to be instantly gratifying. Thus, the barrier of having to do a lot of work before it starts to pay off may also prevent them to perform active behaviour. Other external barriers could include factors such as bad weather, a lack of people to do sports with or a lack of facilities. (Sullivan & Lachman, 2017). Additionally, motivation to engage in physical activity is dependent on the individual. Therefore it's still suggested to identify and address the barriers specific to the sample of the target group.

## 1.7 Moments of the day

As one of the identified barrier is the sheer lack of time or the feeling of lacking time, the common division of time within a regular office day is analysed. The purpose of the analysis is to identify time slots that would be available for active behaviour. Figure 3. Graphically depicts the analysis.

The moments that show most potential for activity are lunch breaks, in the morning prior to going to work and regular movement prior or between tasks at the office. Weekends are neglected in the analysis as they vary highly for each person. Of course they also have potential for activity.

## 1.8 Behavioural map

Making a behavioural map acts as a perfect starting point for analysing behaviour. It provides overview of possible influential factors of the behaviour. As the target group is far from uniform, there is none that applies to all. For this reason, several scenarios were created. The map identifies positive and negative influences, as well as direct and indirect connec-

tions. The behavioural maps can be found in Appendix C. Each mind map represents a different persona, with four main branches: Other, Personal, Work, and Environment. The three main branches then split into specifics of each category. The hexagon contains possibilities of positive and negative influences from that source. For example, 'Personal' would contain the 'Friends' tab which would include influences like clubbing or video games.

*Persona One* expresses possible factors in the life of a non-active individual, through personal, work and other aspects. For example, owning a dog increases the amount of movement in persona one's life while friends who enjoy video games decrease the amount of movement. When examining work life, the pressure to meet deadlines provided by the boss often decreases movement while breaks to get coffee or use the bathroom increase movement by a small amount.

*Persona Two* lives a different life, thus different aspects vary movement levels. Friends who fall into the active (non-sport) group have possible influence over persona two's activity levels. Environment also
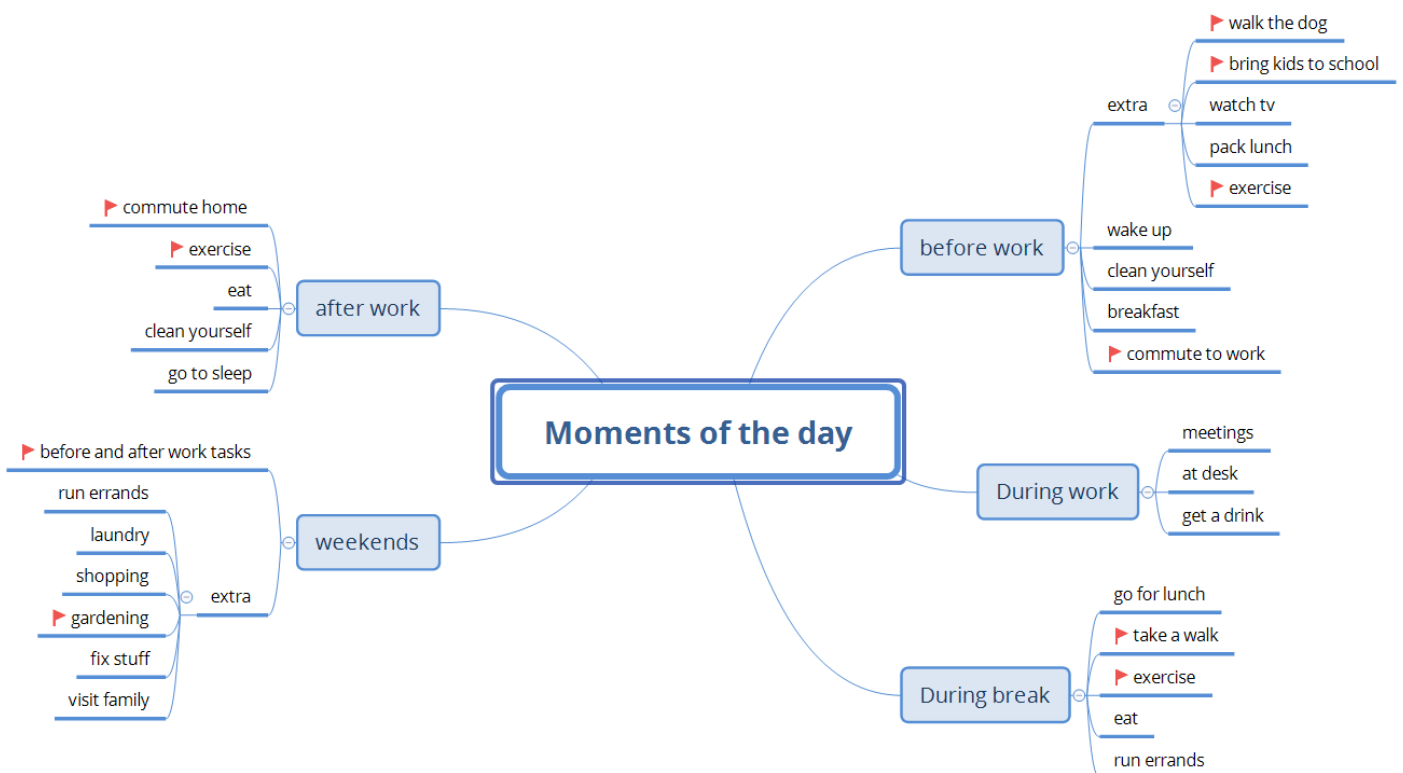
Figure 3: Moments of the day analysis

plays a role in movement levels. Whereas persona one had the ability to bike to work, persona two drives and therefore decreases movement levels. Though it can be argued that active friends and raising a child could balance out daily movement.

*Persona Three* expresses an individual who lacks active friends and family members. The difference with this individual is they choose to walk during lunch, indicating personal effort to better themselves activity wise.

All three personas face social pressures and normatives that can create external motivators or barriers depending on individual outlook and experiences. Using the behaviour map, the development of the concept can adapt to meet possible types of individuals within the non-active target group.

## 1.9 Design Intent

The intent of this exploration is to increase movement within the non-active target group of office workers despite possible internal or external barriers.

In the following sections, a variety of iterations will be executed, in which behaviour change theories and frameworks will be applied to analyse and provide possible solutions towards a more active lifestyle for office workers.

# 2. Iteration One

## 2.1 Introduction iteration one

With the analysis as a solid background, the first iteration of the behavioural intervention can be initiated. This chapter starts of with a summary of criteria that the intervention should fulfil. Prior to this, the ideation process and the concepts that are derived from that are shown. Selection of the concept and points of improvement finalise this iteration.

## 2.2 Selection criteria

It is hard to measure the expected behavioural change impact of an idea. One can only make an estimation of its effectiveness using the mechanics described in renowned theories. Among those theories are the Transtheoretical model (Prochaska, J & Velicer, W, 1997), Self determination theory (Gagné, M & Deci, E., 2005), Theory of reasoned action/ planned behaviour (Montaño E, Kasprzyk D, 2008) and elaboration likelihood model (Petty, R & Cacioppo, J , 1986). Of these theory sets, only two are limit the amount of overlap. The TTM and SDT were selected. The TTM provided good insight in different stages of change and what forms of help would fit with these different stages. The SDT provided insight in different possible motivational mechanics of users and internalisation of behaviour. Furthermore, the idea can also be evaluated on the fit with the target group. These two selection criteria, along with technological feasibility, form the basis for selecting the best idea

## 2.3 Ideation

The ideation shows a wide variety of ideas ranging from earning screen time to trying to incorporate movement throughout a normal office day. Appendix B shows a brainstorm from during this ideation phase. The best ideas were then bundled into the following concepts;

## 2.4 Concepts

### 2.4.1 Beat the Hurdle
Attempts to address the barriers that people face when trying to become more active by trying to let the decisional balance lean more toward the pros than the cons, which is likely to result in actual behaviour.

The digital platform (likely in form of an app) has access to your agenda and that of other users. When seeing a free timeslot, it may notify you that the weather is great for a run; thus adding a pro to the balance. In the event that you and a friend/colleague have time off and are in close proximity of each other, it could suggest doing an active activity together. The feeling of it being a chore could thus be reduced, again changing the decisional balance to the

Figure 4: Beat the hurdle

positive side. To summarise, it raises awareness for opportunities for action.

On the other hand, it could motivate people where cons still outweigh the pro's through a social platform element by showing friends that have done sports despite the decisional balance leaning more to the cons. For example, someone went for a run despite the rain. This person that 'Beat The Hurdle' can then show it on the online platform by posting a picture of their achievement. This could then provides incentive to go running anyway, despite their decisional balance leaning to the cons.

### 2.4.2 Sports Avatar

Results of sedentary lifestyle mostly show in the long term. Focus of this concept is on making these effects obvious in the short term through visualisation. Each user is represented by a personal avatar within a digital platform. This figure acts much like a tamagotchi. It is 'fed' with movement. Not moving results in a fat, unhappy avatar. Movement does the exact opposite. Users can then sport together for bonus points or compare among each other.

A smartphone forms the basis for accessing your avatar and seeing all the stats, whilst wearables allow you to quickly glimpse at how he or she is doing. Basic motion tracking would be done by smartphone. Wearables provide more advanced tracking.

Figure 5: Sports Avatar

### 2.4.3 Wake up Cardio

It is difficult to find time to work out in a busy schedule, and it might feel like a chore when coming home from a busy day at work. This concept addresses this issue by trying to create a habit at the very beginning of your day. The basic idea is that your alarm requires sit ups to be turned off. It then tries to persuade you to continue a 10 minute workout since you're already awake and active. By showing that morning's success / fail rate of all other users after the initial situps, people that failed can still join the successful group by doing the extended exercise.
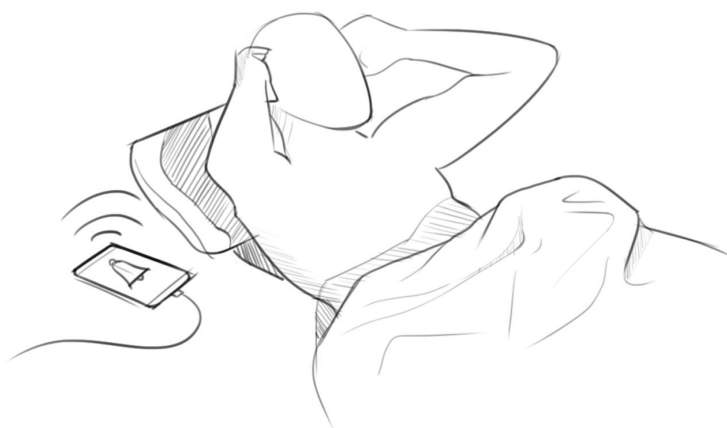
Figure 6: Wake up Cardio

### 2.4.4 Office Walks Platform

The 'moments of the day analysis' identified the break during work as a potential moment for movement. In *Office Walks,* an online platform facilitates connection between people with the goal to have a walk together. This walk could be together with colleagues from your own office, but also people of other companies in close proximity. In the app, one can select different types of intent of today's lunch walk. It could be to meet someone new or talk about the news. However, work intent could also have a place; options such as requiring a second opinion or an expert on a subject (competence) can also integrated. People can be linked both profile and selected intent.

Obviously, design intent is to get people moving more by providing extrinsic motivation. User intent differs. Reason of use for the user will be to both expand their professional network and/or meet new people.

Stakeholders such as the company executive could consider real rewards within the system as the walks increase inter company relationships (relatedness) and may lead to new assignments and projects. Coherence can be further improved by visualising all new connections in a map or counting the total distance walked.



Figure 7: Office walks platform

## 2.5 Concepts linked to theory

The 'Beat the Hurdle' concept uses the decisional balance described in the TTM (Prochaska, J & Velicer, W, 1997) to change behaviour. Furthermore, the 'behavioural processes of change' are utilised as this concept focuses on people in the preparation and action phase. 'Helping relationships' can be seen in planning activities together, working towards the goal of being active together. 'Reinforcement management' comes back in positive self-statements and group recognition through the 'beat the hurdle social aspect' and 'self liberation' in this concept is the dedication of becoming fit regardless of the conditions and being able to show this to yourself and others. Furthermore, the named concept may increase feeling of autonomy as it shows that activities can in fact be incorporated in the current lifestyle. The bullet points list sums up the pros and cons as a means of comparing the concepts. The plus symbol is defined as a pro, minus represents a con.

+ Could support user to overcome relapse and increase autonomy by providing different ways to overcome the barriers

+ Fits within the busy schedule of our target group by identifying opportunities

− Requires a more direct connection to the target group

− Risk of demotivation and negative emotions through seeing others doing things that you did not achieve

− Requires user's agenda to be correct

− 'Activity together' proposal may be intrusive

The Sports Avatar's core element of showing long term effects in the short term could highly enhance the feeling of 'competence', as the direct feedback about the completed activity increases sense of effectiveness (what I did had an actual result) and control over the outcome (different type of exercises have different results, effects vary depending on duration and intensity). Several processes of change are recognised. 'Consciousness raising' (by providing this direct feedback), dramatic relief (increased emotional experience that can be countered with doing an activity) and self reevaluation (assessment of future self with and without activity) are mostly active in the contemplation and preparation phase. In the action and maintenance phase, 'reinforcement management' and 'self liberation' mechanisms are assumed to be active. Reinforcement management is utilised as the platform provides consequences for taking steps in a particular direction as the user is being rewarded by direct change; in app rewards but also peer pressure through wanting people to see your avatar healthy. Self Liberation can fit as this app makes you believe you can change and the commitment to act on that belief. The pros and cons of this concept are:

+ Could invoke behavioural change as described by mechanisms above

+ Addresses users in the contemplation, preparation, action and maintenance phase

+ Exposing the user's level of well-being could evoke helping relationships at the office

+ When the user cares for the wellbeing of the avatar it increases own well being for yourself

− Showing people an exaggerated version of their behaviour might be demotivating/stress inducing as it might understate the assumption that people already have of themselves or someone else.

− Is not yet tailored to the target group, but shows potential of tailoring

− Users might be reluctant to show their level of well-being to others

The Wake up Cardio concept is relatively simple and thus has less mechanisms than the other concepts. From STD perspective, it uses relatedness to all the people that struggle to wake up in the morning and start active. It mostly uses behavioural processes of change such as counter conditioning (through initially forcing behaviour to create a habit) and helping relationships. It is active in the action phase. The pros and cons of this concept are:

+ Attempts to create a strong habit

+ Easy learning curve through simplicity

− Requires a steep dedication up front

− Forces the user

− Only for users in the action phase

− No connection to the target group, hard to connect

The Office Walks has a direct connection to the target group. It may strongly support relatedness as it directly brings people in touch and functions throughout multiple companies. It does not focus on the activity itself but provides many forms and types of motivation, as described by (Gagné, M & Deci, E., 2005). First off, the activity can be (1) extrinsically motivated by the boss providing rewards, gaining advice from one's walking partner or expanding your network. It could also boost (2) introjected regulation of meeting and or helping new people of the opposite sex. Furthermore it could work with (3) identified motivation as one may identify with being a social, helping person. (4) Integrated regulation can be valuing that you have helped people or met new people. Lastly, one can just (5) just like giving advice, walking or meeting new people during the break. The pros and cons of this concept are:

+ Potential to expand user's network by create community with co-workers or other companies increasing relatedness.

+ Doesn't feel like workout (positive), incorporates several different motivations

+ Avoids the schedule barrier

+ Fits well for the boss as a stakeholder

− Occurs during time when people might not want to participate

− Motivation stays external

## 2.6 Selection of concept

Out of all the concepts the Wake up Cardio appears to have least potential for change due to its few change mechanisms and forceful nature. This concept is thus non preferable. The Office walks provides a great way of getting people to move during their break, but may not lead to internalisation of the active behaviour. The con of occurring during a personal, much needed break was the reason to drop this concept. Of the remainder of concepts, the 'Sports Avatar' was deemed most favourable due to its functioning in multiple 'stages of change' and promise to be tailored to the target group. This concept is further elaborated in the coming concepts

# 3. Iteration Two

## 3.1 Introduction

The second iteration in this project is based of of the most promising concept from Iteration One, "Sports Avatar". This concept shows a lot of potential, but definitely needs a stronger and more defined link to literature to get to a point where it can structurally cause behaviour change among our target population.

## 3.2 Theory

In the elaboration of the chosen concept two theories were mainly addressed; Self Determination Theory (Gagné, M & Deci, E., 2005) and the Transtheoretical model (Prochaska, J & Velicer, W, 1997). While criteria were determined before choosing this concept, we continued to refine these criteria to more specifically apply to the Sports avatar.

### 3.2.1 Self Determination Theory

*Competence*
Primarily this concept aids a need of competence by showing long term effects on the short term. By providing more direct feedback on a process that is usually hard to notice, Sports Avatar aims to increase the perceived effectivity of positive actions and therefore provide an increased sense of competence.

*Autonomy*
A sense of autonomy is noteworthy to mention autonomy, as it is the key factor for internalisation of the behaviour. The office worker that is addressed wants to become active but may experience having too much barriers. This application may provide the extra motivation necessary to get people to move,

thus adding to the feeling of autonomy as it is part of taking control of one's life.

Relatedness
The sports avatar concept allows for interesting opportunities concerning the sense of relatedness an office worker has. Because the avatar permanently exists even when the owner is absent, the avatar can be used to relay messages to colleagues. The knowledge that your current behaviour is always in the periphery of your colleagues adds an extra dimension to performing on the short term and creating a habit out of this performance.

### 3.2.2 Transtheoretical Model
An attempt is made to move people from the contemplation to the preparation and action phase and keeping them there. These are the strongest mechanics in the concept

*Moving from contemplation to preparation & action*
- Consciousness raising: increasing awareness through providing direct feedback to the user, initially confronting them with the consequences if they do not do anything.

- Dramatic relief: Negative behaviour is immediately fed back to the user in an attempt to enhance and increase positive behaviour.

- Self Reevaluation: Sports avatar works in the periphery of a user, because it is constantly there it allows for a more opportunities to reflect on one's behaviour.

*Action & maintenance*

- Reinforcement Management: Sports avatar provides consequences for taking steps in a particular direction. The concept rewards by showing change directly on the avatar, in app rewards and social feedback by peers that see the avatar

- Self Liberation: Sports avatar supports the belief of a user that they can change and makes it possible to commit to that act.

## 3.3 Mutation of the concept

The largest change that iteration two brings is the location in which the avatar is displayed. A personalised avatar is placed on the desk of each office worker and displays the future consequences their short term behaviour could have, available to be seen by any colleague. This system assumes that every worker within a company uses this system, making it a mandatory company wide system.

The location of the avatar allows for a few extra functionalities that could give it more merit to claim the valuable desk space of each office worker. The avatar could, as added benefit, display when a worker is on vacation or sick.
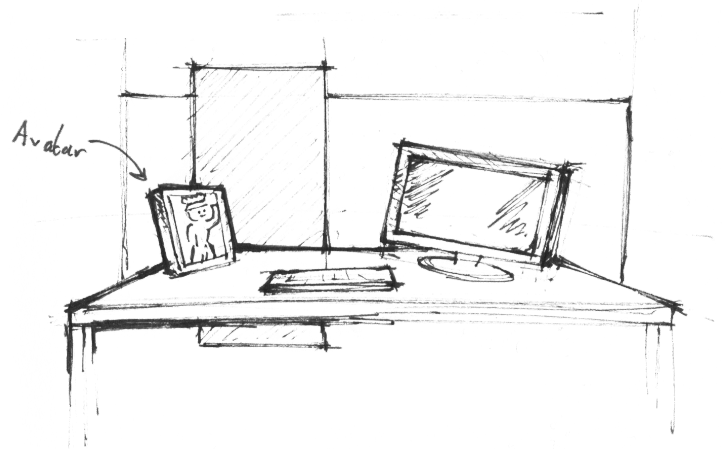


Figure 8: Sports avatar placement

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# 4. Iteration Three

## 4.1 Introduction

To further rationalise the concept, generalised persuasive mechanisms, created by Oinas-Kukkonen, were applied based on the four sectors: primary task support, dialogue support, and social support. Initially, the principle of social proof, from *Influence* by Cialdini, was to be analysed for the project, however, the themes mentioned in the principles match those mentioned in Oinas-Kukkonen's work. These overlapping themes are prevalent in Social Support. First, the possibilities per sector are discussed. After that, the final concept elaboration describes the exact method of implementation.

### 4.1.1 Primary Task Support

According to Kukkonen, tailoring the concept to fit a wide variety of personality types within the target group could work persuasive-enhancing. Features such as setting a goal (self-monitoring) and creating an avatar version of one's self (personalisation), be it clothing or facial features, have an impact on the user's opinion of the concept. By combining the aspects of self-monitoring and personalisation, the connection between an individual's actions and consequences can be connected through simulation.

### 4.1.2 Dialogue Support

The concept is advantageous in rewarding the user because the main goal of the avatar is to show long-term effects in the short-term, by adjusting the personalised avatar's weight in relation to the amount of movement. This aspect of meaningful fulfilment is also known as similarity, in which the user finds a connection through the behaviour of the product. With traditional workouts, be it with the aid of an application or not, the emotional reward of progress is not often seen right away. This can make keeping to a workout plan difficult because the benefits are not instantly gratifying. While the Sports Avatar is not created for the use of intense workouts or as weight loss program, it does help show users that even the smallest amount of movement will help them in the long-term.

While this reward provides many benefits, there is a possibility that the reward will have the reverse effect. If the user neglects to meet their goals or move, the avatar will increase in size which may deter the possibility of motivation. With this in mind, the decision to make all 'negative rewards' humorous was instated. By implementing this, 'negative rewards' will not be seen as morbid and the possibility of deterring user's motivation of using the product will be reduced.

The possibility of emotional attachment to the avatar is relevant and was considered in the human-behavioural aspect of the product. Currently, there are only studies on children and their relationship to inanimate objects. For this is be an issue for our product, research will need to be done on the emotional relationships adults have with inanimate objects. There is a chance that an emotional bond will form between the user and the avatar, however, whether this bond will produce negative emotions is unclear.

## 4.2 Social Support

For the product to succeed, social integration must be examined. To easily integrate the product into the intended environment and promote cooperation, a feature with the sole purpose of aiding the workplace, such as the office communication, was added. The communication system allows for the product to play a social role in the office, this encourages everyone in the office to use the device. However, it does not mean all users will use the movement measurement aspect of the device. To

protect the privacy of the users, only coworkers who are using the device to track their sedentary lifestyle can see the personalised, weight shifting avatars. However, it is not possible to fully hide an avatar. The decision to bar users from the ability to hide their avatar stems from social comparison and social learning. To create similarity between users and enhance social proof, the ability to look at coworkers' avatars was installed. By opening this ability to users, a sense of community and social support to do better has what it needs to develop. While being able to see coworkers results is possible via their avatars weight, the ability to compete is not available. This aspect was removed from the concept because it forces individuals to compare each other in an intense, possibly negative manner.

## 4.3 Final Concept Elaboration

The final concept developed is a office communication system that makes use of a digital avatar. This avatar shows the status of the office worker. For example if the user is available, in a meeting or away. It also 'hand delivers' messages to coworkers (i.e. internal mail or an invite for coffee). The design intent of the project is to create a system for the workplace that raises awareness of sedentary lifestyles in the non-active target group. The goal for the concept is to implement this awareness despite the internal and external barriers. The animated avatar lives on the desk of the user in a digital frame and does not communicate using words, but body language. In the case a colleague is on holidays, a person laying in a hammock may be depicted. By connecting the digital frame to a wearable, the user can send requests and other notifications to their coworkers, as well as track their own movement patterns.



Figure 9: Sports avatar placement

Avatar        In a meeting        busy
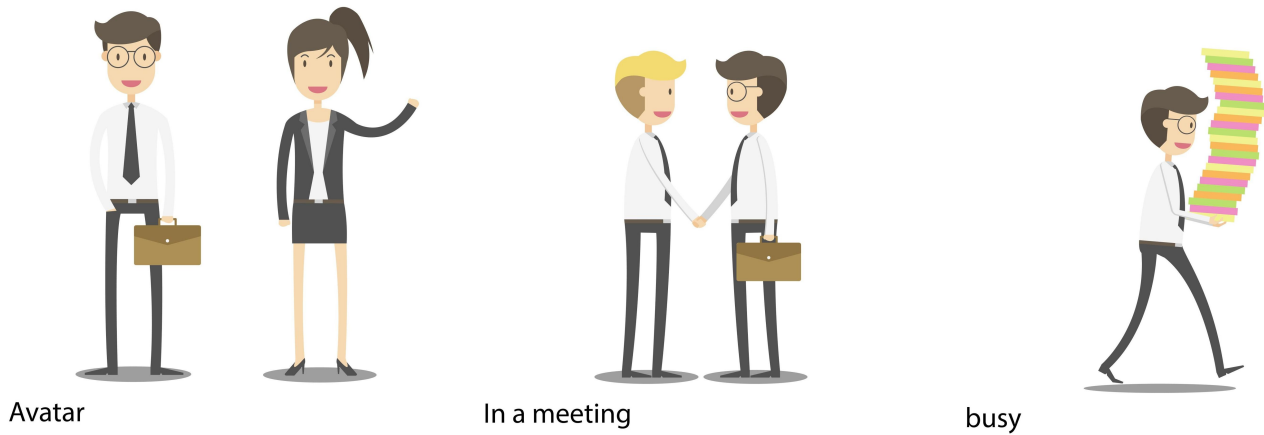
To enter the sedentary tracker function, office workers must turn the track function on. They are then directed to personalise their avatar and set behaviour characteristics. The product is designed this way so that all workers of the company must use this communication system, but are not forced to use the system as a sedentary tracker. The avatars on the level of office communication are visible to everyone as an outline or greyed out version of the avatar, however, only coworkers who use the sedentary tracking function are able to see the health of other users. Health is shown through the body weight of the avatar. The more an individual moves, the more 'fit' the avatar gets. If the individual leads a more sedentary lifestyle, the avatar will gain weight. When the user has not moved over a period of time, the avatar will begin to show signs of agitation

through body language, such as throwing tantrums and looking bored. By using body language instead of words, the communication develops into taking care of the avatar rather than nagging the user. This gives the user a sense of autonomy in the interaction. At the highest level of poor progress, the avatar will not die or decay because the image of a corpse would be too negative to motivate the user to continue using the system. As mentioned in Dialogue Support, 'negative rewards' will not be seen as morbid and the possibility of deterring user's motivation of using the product will be reduced. To reduce demotivation when the user is not succeeding in their goals and the avatar gaining weight does not motivate, the concept will take a more comical turn rather than a realistic turn. While it has not been established how this will be accomplished, several ideas were created, such as 'couch potato points'



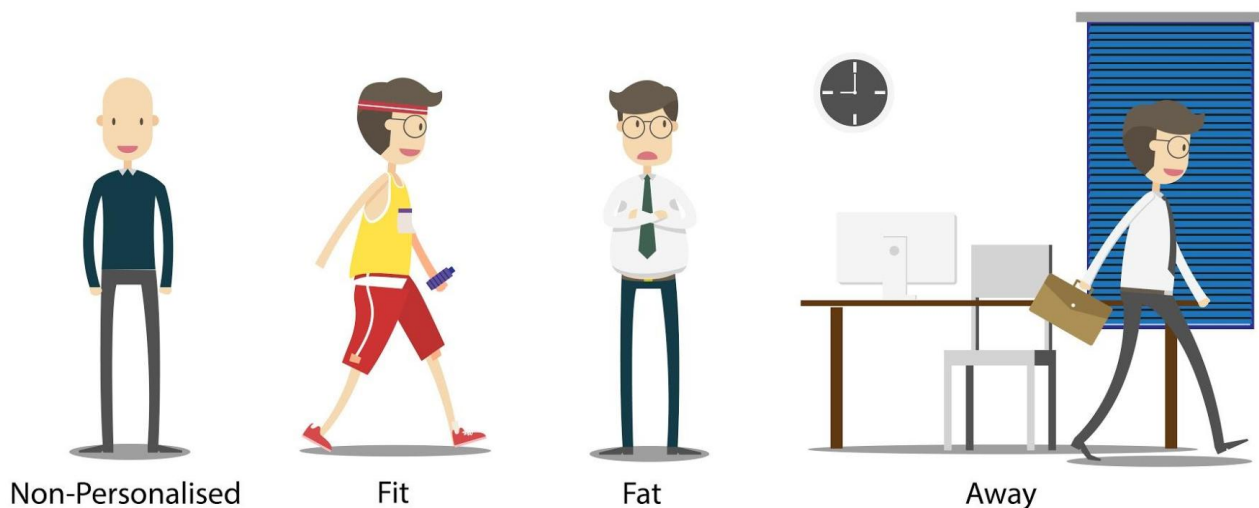Non-Personalised        Fit        Fat        Away

Figure 10: Sports avatar examples

where potatoes appear on the avatar's desk or environment.

For personal development, the user can set goals for themselves. These goals can be anything from how much movement they made during the workday to how often they take the initiative to move without being reminded. A progress bar will be displayed on the digital screen to show how the individual has met their goals, though this is only aspect of the program that users have the ability to keep private from coworkers. It was decided midway through the iterations that there would be no possibilities for competitions or leader boards because their presence would increase social pressure. By choosing to eliminate the competition aspect, users become more comfortable and forgivable towards themselves during failure because it is not displayed on a high public platform. This level of privacy was created so that user's success or failure is not openly on display. It is not possible for users to completely hide their avatar when using the track function because there needs to be a level of accountability so the system is not abused or ignored.
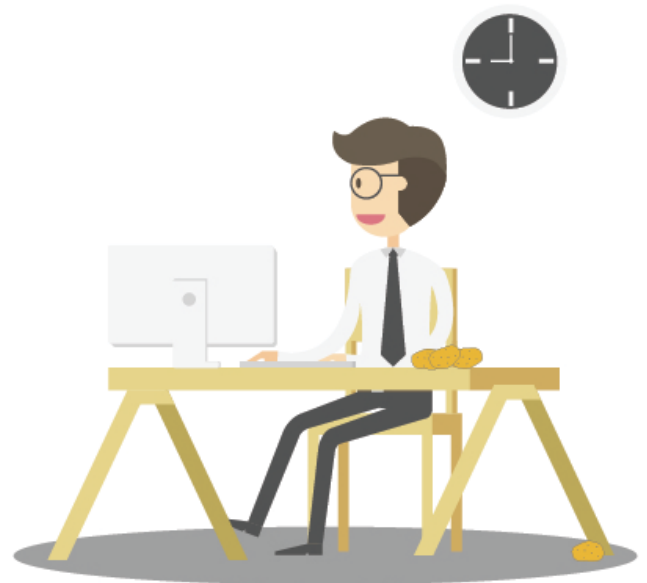


Figure 11: Sports avatar examples

# 5. Evaluation

## 5.1 Heuristic evaluation by group 8

The sports avatar concept was evaluated by group 8. Following the heuristic evaluation criteria by Nielsen. The full evaluation and concept description used during this evaluation can be found in Appendix D. The evaluation by group 8 addressed a number of themes, these will be discussed in the section below.

### 5.1.1 Functionality
effectiveness in user's environment is described as easy to use and easy to integrate in daily routine. With regards to mobility inside as well as outside of the office some of the concepts functionality the specificity to the office context was not completely clear. The feedback and status functionality of the sports avatar are mostly relevant for the office environment. Not giving people proper credit for exercise after work might not justify wearing a wearable just at work and might give a more distorted view of someones activity levels.

Individuals are motivated in different ways the option to display and allow access to spouse, a doctor or a coach is implemented to increase the motivation through authority. The office worker could use this as form of motivation, but also has the option to enable or disable this access.

### 5.1.2 Visual exposure and privacy
With regards to privacy the concept allows for silent participation through an avatar that isn't personalised. This way the users are not obliged to participate, but invited to participate through playful user interaction. When the office worker decides to personalise the avatar there will be public information visible. Through general and privacy settings the user will be in control to enable to which extend their public information is shared and visible. However, when the user decides to keep a personalised version of the avatar it will always be visible to some extend to keep a form of liability.

### 5.1.3 Indication of progress
In the evaluation the concept is described as passive image. This is not the intention of the sports avatar and a limitation of the medium the concept was presented in, also this should have been better described. Indication of progress is not only explained from physical appearance, but also through body language and mood. Which is proposed to increase interest and user engagement. The representation of someones fitness as feedback is described as stigmatising further effort need to be directed at a more nuanced and accurate representation of physical activity.

With regards to positive motivation strategies the sports avatar needs to show progress toward goals as well as how and to which extend movement influences the avatar. The progress can be displayed through a progress bar or nicer looking environments in which the avatar is displayed. The lather can be achieved through more specific feedback on the type and level of intensity of the activity. For example, visualisation of specific activities (walking, running, cycling) or how the avatar recovers from physical activity. Also the the user is rewarded with further personalisation of the avatar when goals are achieved leading to a richer experience.

Also the sports avatar currently provides continuous feedback to promote an active lifestyle. The interval at which feedback is given on physical activity needs to be further investigated through an empirical study.

### 5.1.4 Connection feedback and goals to activities

The effect of certain behaviour does affect the displayed avatar and can therefore lead to the user perceiving connections between activities and their effects. The concept can be enhanced by including a personal overview that shows the office worker how his/her goals and achievements are connected to the physical well-being avatar is missing. Additionally the accuracy of this information could be enhanced by allowing the possibility to add data afterwards.

in summary this evaluation has lead to some valuable points for improvement of the concept and the way the way the story is told about the concept.

## 5.2 Heuristic evaluation of team 6

A heuristic evaluation was also performed for group 6. This followed the same evaluation criteria as in the previous evaluation. The concept HØNS is aimed at phone addiction. The most significant points of the evaluation were: support of enactive attainment, contextual relevance of  and mobility, strategies to address triggers, encouragement of its own use, personalised positive reinforcement, visibility of long term progress, customisability of device and strategies to educate users about smartphone addiction. The full evaluation and concept description used during this evaluation can be found in Appendix E.

## 5.3 Evaluation plan sports avatar

### 5.3.1 Introduction

The present study investigates the effectiveness of a sports avatar on physical activity(PA) of office workers to reduce sedentary behaviour and is part of the project for 'Design for behaviour change.' This evaluation plan describes the procedure and criteria for this study.

The objectives for this study are twofold, first a baseline test will be performed to understand the current activity levels of office workers as well as their motivations to engage in physical activity.

Second, a study will be conducted to evaluate the effectiveness and experiential qualities of different rewards of an avatar that persuade office workers to get more physically active. The parameters that will be investigated are physical activity and motivation.

The intent of the intervention will be to increase movement to meet PA guidelines within the non-active target group of office workers despite motivational barriers.

The outcomes of the study will support a firmer understanding of the effectiveness, experiential and motivational qualities of the sports avatar.

### 5.3.2 Variables

The study will investigate the variables within the following categories: movement, intervention level, rewards and interaction level. The variables within these categories are addressed more specifically below (Ainsworth et al., 2013).

*Movement*
*Frequency*: number of times physically active per workday.
*Intensity*: light, medium or heavy.
*Duration*: length of each session of the activity in minutes.

*Intervention level*
*Motivation*
In order to assess motivation the Physical Activity and Leisure Motivation Scale(PALMS) is used (Roychowdhury, 2012). This framework is based of the Self-Determination Theory (SDT) and includes a questionnaire that addresses the following aspects: (intrinsic) mastery, enjoyment; (extrinsic) psychological condition, physical condition, appearance, other's expectations, affiliation, competition/ego.

*Rewards*

*unfit-fit*

When PA increases or decreases the user is rewarded/challenged with a fit or unfit avatar, respectively.

*outfits*

When PA increases or decreases the user is rewarded with different outfits and gear(sports, leisure or job related).

*bad vs good mood*

When PA increases or decreases the user is rewarded/challenged with a good or bad mood, respectively.

*Interaction level*

The participant will score the concept on the 10 criteria of the heuristic evaluation (Nielsen, 2015) namely, functionality, not irritating or embarrassing, users' privacy, motivation strategy, usability, accuracy, appropriate time & place, visibility of user's status, customisability, educate.

### 5.3.3 Materials & Methods

*Location*

To study the influence of the sports avatar and identify the parameters. The first experiment will take place at the Industrial Design faculty of the TU/e. The open working culture makes this location an appropriate setting for this study. Internal working culture in particular has been shown to be the main barrier to compliance.

*Data Collection*

The quantitative data will be collected through a wristband (accelerometer), this device measures physical activity as well as movement intensity throughout a day for a longer period of time. It is a low burden for participant and relatively inexpensive(Sylvia, Bernstein, Hubbard , Keating, & Anderson, 2014).

*Participants*

A total of 30 office workers will be participate from a group of 500 TU/e employees. They will be recruited by telephone and through direct e-mail containing general information about the study and a questionnaire.

| study# | |
|--------|-------------------------|
| 1 | 30 |
| 2 | 30 divided over 3 groups |

In order to be recruited, the participants need to meet the following inclusion criteria:

• The participant is 18 years or older.

• The participant has a sedentary, or lightly active lifestyle (Physical activity level between 1.40-1.69) (Energy requirements of adults, 2001).

• The participant works at a desk in an office for at least 6 hours excluding breaks (office worker).

Exclusion Criteria:

• The participant has an active to vigorously active lifestyle (Physical activity level above 1.69) .

• The participant has medical conditions that may interfere with testing.

*Detailed Study Procedure*

*Part 1*

Before the study every participant will be asked to fulfil a questionnaire in which data regarding his or her anthropometric characteristics, physical activity level, current experience with feedback and current motivation level regarding physical activity. Most importantly the participants write down every activity they do during a typical week including hours that they are physically active in a day. This will ensure that the participants meet the requirements and will

help to understand to which extend the participant performs regular behaviour. Additionally, the participant will be asked to sign a form of informed consent. Once the questionnaire has been fulfilled participants will receive a wristband and an explanation how to operate the device. It will measure frequency, intensity and duration of movement for 1 week.

*Part 2*
During the second part of the study the participants will be randomly divided over 3 groups. Every participant will keep wearing the wristband, but will additionally receive the experiential prototype of the sports avatar for 1 week. During this week each group will receive a different kind of feedback. After this period the wristband will be returned and a questionnaire will be fulfilled by the participant to assess the concept at intervention level as well as interaction level.

### 5.3.4 Conditions
Particular motivation, opportunity for physical activity is highly specific to the context and the individuals in the sample. Consequently, this small sample wouldn't be representative of the population of office workers. Additionally, it can be assumed that individuals in this study are ready for behaviour change, because they voluntarily agreed to participate in the current study. Results from this study therefore may only be generalisable to individuals ready for change. Nevertheless, the study may give valuable insight into the impact of such a system. (Bice, Ball & McClaran, 2016)

The activity tracker can already be seen as an intervention in itself. Participants know that their watched and show a higher physical activity than that they would normally Therefore it's important that a indication of physical activity is during the first questionnaire. This will typically depend on people's ability to recall. However, the time that people are physically active will provide a reference to the baseline.

In order for the measurement to represent an individual's physical activity it's important this measurement is at least one week. A longer period would of course give more detail, but will also increase the burden on the participants as well as the cost of study.

Every participant will be tracked and receive the during the same week. This should ensure that participants experience the feedback in a similar fashion. For example, one participant at the start of a semester while the other is in a week full of deadlines. This is important for the data to indicate "regular" PA rather than PA in extreme scenarios.

The current study doesn't have a control group, because the focus is on examining if motivation change can be established over a 1 week period. Results of this study can support further comparison of motivational impact of the rewards of the sports avatar on physical activity.

### 5.3.5 List of Requirements
- Experiential Prototype of Sports avatar

  - Status system

  - 3 different rewards

- 30 Wristbands

- pre/post Questionnaires

- Consent Forms

# 6. Ethics

In this chapter the sports avatar is assessed from an ethical perspective. The following section will elaborate on ethical guidelines, value/stakeholder analysis, critical questions and ethical risk analysis. These considerations will support a firmer understanding the ethical impact, and will look at the concept from the perspective of the various stakeholders.

## 6.1 Ethical guidelines

In order to realise these ethical guidelines the five heuristic principles from Berdichevsky (Berdichevsky, 2015) were followed, these include: equivalency, reciprocity, privacy, disclosure and reasonable predictability.

With regards to equivalency, the goal of the sports avatar is to support people to work on their physical activity throughout the day. The methods of persuasion will be respectful of ethics regardless of the context the system is placed in.

Taking into account reciprocity, the sports avatar will not persuade the users of the sports avatar to do something that the creators themselves wouldn't consent to be persuaded of. For example, be respectful of the deadlines or other critical events that might explain temporary lack of physical activity.

Additionally the sports avatar will not demean, devalue, or "put down" individuals or groups for not reaching their physical activity goals. Nevertheless, through the avatar we want to support and offer tools for office workers to accomplish their daily physical activity goals.

With respect to privacy, confidentiality is the main theme. The personal data that is generated by the system will only be gathered with prior consent of the user. The user can opt out at any point in time

and will keep full ownership and control over his or her data.

In relation to the disclosure principle, the application of the sports avatar should provide a link to that discloses the motivation behind the system, the behaviour change methods that are used and intended outcomes of the concept from the perspective of its creators as well as the company that implements it.

After further analysis and extensive testing the creators of the sports avatar assume responsibility for all reasonably predictable outcomes of its use. Additionally, the creators will communicate the intent, benefits as well as the consequences of using the system in a transparent manner.

## 6.2 Value and stakeholder Analysis

Following the seven step stakeholder analysis (Fogg, 2003) an investigation was performed to identify the stakeholders and evaluate gains and losses from the perspective of the various stakeholders as well as the creator.

the following figures show an overview of the stakeholders during the initial analysis. Internal and external stakeholders. In the office context as well as. The focus of the analysis will be on the stakeholders within the context of the office building.
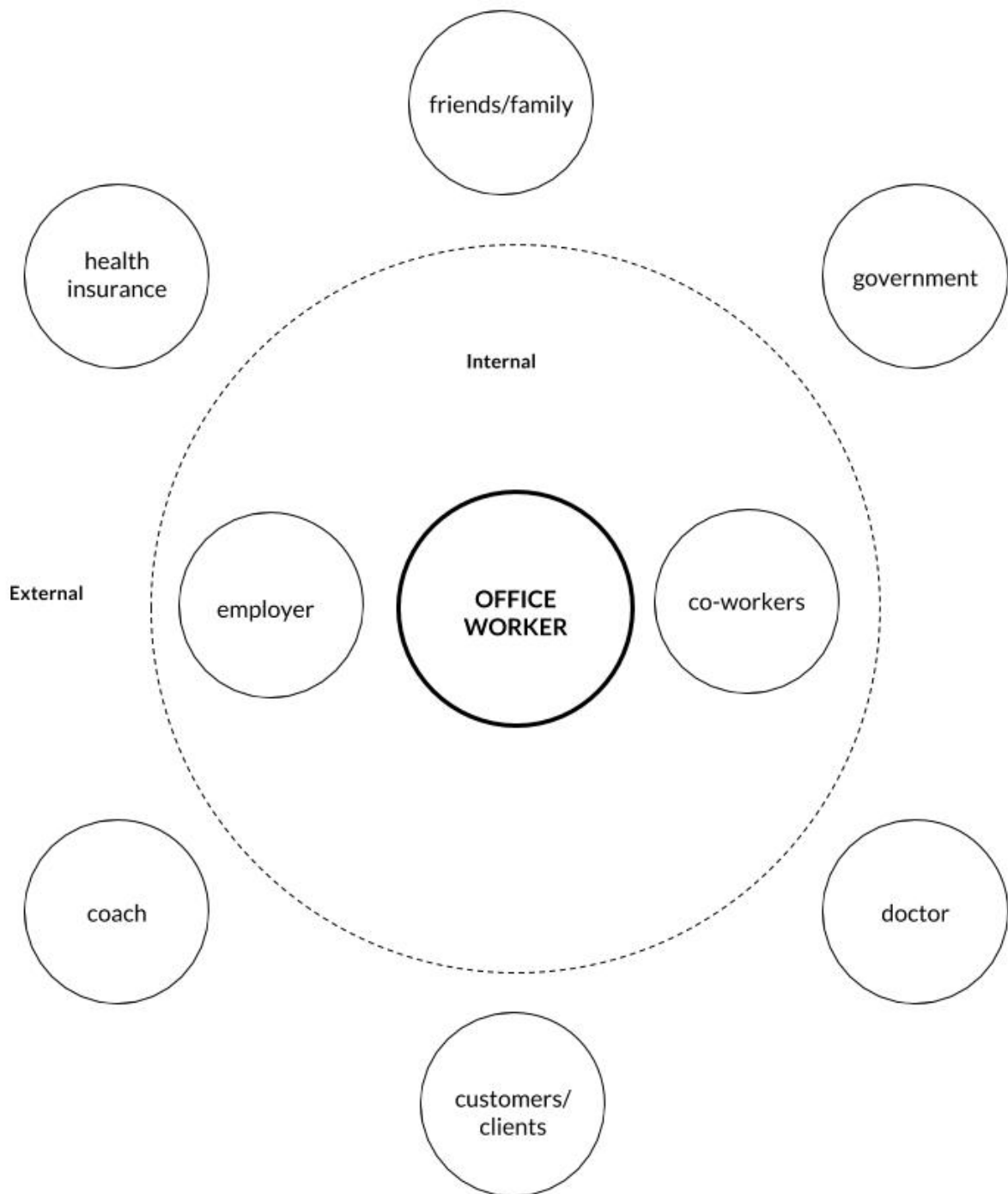
Figure 12: Internal and external stakeholders of the sports

## 6.2.1 Gains and losses

The following section will give an overview of the gains and losses from the perspective of the internal stakeholders.

*Office worker*

| gains | losses |
| --- | --- |
| potentially support user to increase physical activity and adapt to a healthier lifestyle | might emphasize the image that users have of themselves |
| potentially motivates user to increase physical activity and adapt to a healthier lifestyle | exposure of physical activity to people they might not want to share it with |
| increased productivity through status function | might lead to extra stress, negative emotions over the lack of physical activity during work. |

*Co-worker*

| gains | losses |
| --- | --- |
| might result in (new) collaborations between co-workers to establish more physical activity within the company. | might emphasize or bias the image that people have of co-workers. Which could lead to bullying |
| meaningful indication of status and increased productivity through status functionality | Might get distracted by co-workers using their avatar |

*Employer*

| gains | losses |
| --- | --- |
| healthier staff | different levels of participation among staff members due might lead to inequality and competition (comparison of avatars). unintended |
| increased productivity of staff through status functionality | might bias the perception of staff/ employer towards staff |
| | might be distracting during work |

As can be concluded from this investigation of gains and losses. On a micro level office workers themselves could experience most benefit as well as disadvantages from using the system. On a larger scale the direct impact of the system (positive or negative) are most notable for the employer. As the impact of the system could change dynamics within the company for good or bad.

This shows the importance of encouraging the human value within the system and help individuals as well as companies to arrive at a healthier lifestyle. Rather than a system being the authority that makes these ethical judgements.

## 6.3 Critical questions

From the critical question presented in the presentation on ethics the following five critical questions were selected and reformulated to fit the sports avatar concept.

- Does showing long term effects of physical activity in the short term result in an increase in motivation to become more physically active?

- Are there alternative ways of promoting a more physically active lifestyle?

- Does promoting an individual's physical activity in the office have a side effect which denote the value of ... ?

- Does promoting an individual's physical activity in the office preclude some other action which would promote some other value.

- Is an office with motivated and physically active employees believed by office workers to result from displaying physical activity?

*Specific ethical aspects and consequences*
From the ethical analysis three themes were obtained. These themes will be discussed in the following section.

*continuous feedback on physical activity*
People might not want to show their well being to others, which would prevent them from using the avatar. The approach however doesn't force office workers to personalise their avatar which leaves them in charge of the process. Users can use the system as a status indicator. Consequently, the sports avatar makes feedback on physical activity easily accessible through a device that employees are familiar with and use on a daily basis. This allows employees to join in a later stage when they are more comfortable using the system or more people are using the system to track their physical activity.

This public exposure could allow office workers to put the liability outside of themselves and have social control that might support them to work on their PA. people encouraging others to get more physically active as well.

Users have the option to share their avatar publicly within the company, spouse, coach and doctor. On the one hand the avatar might understate the image that people already have of themself or others. For example, a fat person has a fat avatar the fit person has a fit avatar. On the other side through this system the users also have the opportunity to break free from this perception and show progress towards a healthier lifestyle in an early phase.

*Showing the long term effects of PA in the short term.*
In order for the avatar to give a realistic representation of overall well being by just measuring the measured physical activity is tricky. As this approach consequently might bias the perception of the user's actual well-being towards the user itself as well as to the rest of the company.

Additionally, an exaggerated version of one's physical activity could be motivating or demotivating and stress inducing depending on the person. This requires a lot of nuance and subtle from the system

*Different levels of participation/progress among staff members might lead to unintended competition and inequality within companies*

Although the system doesn't promote competition (through for example a leaderboard) and tries to address physical activity in an individual manner it is inevitable that different levels of participation and progress might lead to competition and inequality. Depending on its users and the company this could lead to healthy competition in which employees encourage each other the become more physically active. On the other hand the intervention of the sports avatar could lead to unintended bullying, shaming people with different levels of progress. Which might influence the relationships between employees that have a fat or fit avatar within the company. Overall this could decrease participation and impact the effectiveness of the system's intervention.

# 7. Conclusions

## 7.1 Limitations

While visualisation of a realistic image of one's future self is proven to motivate behaviour change, there has been only a few studies done on avatar-human relations (Hersfield et al.,2011). In a study mentioned in the book *Avatars at Work and Play,* humans were tested to see if their level of communication changed between realistic and non-realistic looking avatars (Axelsson, A., & Schroeder, R. (2006). *Avatars at Work and Play*. New York: Springer.). It was found that higher-realism avatars created increases in inferred-gaze. Meaning that communication responses increased when the human was being tested with the higher-realism figure. It is possible to hypothesis that combining lower-realism avatar with human behaviour and body language could also increase avatar-human relationship. Therefore, it isn't possible to suggest this method will have a similar effect on the user's motivation but could be developed through further testing the hypothesis.

In a perfect office space, active participation and openness in personal insecurities would not be a problem. One of the challenges of the concept is its openness in the truth of one's actions, which has the possibility of making user's feel vulnerable around their co-workers. This is can influence the amount of participants willing to participate, reducing the benefits of changing current sedentary habits.

## 7.2 Recommendations

During the development of this concept, the focus continuously has been on the office worker. However, an adjusted version with just the smartphone app and optionally wearable as tracker may also be interesting for a wider target group. If successful, the impact of the intervention is expanded, which is of course favourable.

Both the detailed interface design and tracker design and accuracy have been left out of the scope of this project in order to focus on behavioural change aspects. If this concept were to be further elaborated, these aspects could profit from extensive elaboration and testing.

Furthermore, the Sports Avatar uses the office messaging system to get every user involved on the same level. However, it may appear that the personalisation aspect may cope with different levels of participation. Future development could profit from close examination of why this is the case and how it could be addressed.

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