OBECITY
Graduation thesis OBECITY
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OBECITY
“A brainstorm is... when it gets all cloudy and dark outside,
and when the clouds are full,
no rain but brains start to fall out of the sky...”

*Participant XX on the definition of ‘brainstorm’*
Throughout the almost 8 years of study at TU Delft I have learned how express that critical view and create a spatial design from that search. This thesis is the cherry on that cake. The research of the last 1.5 years of study is dedicated to improving children’s health in cities. In this research the master Urbanism and the master Science Communication are combined. For the master Urbanism I made a design for the neighbourhood Beverwaard. For the master Science Communication I used this design as a mean to answer to the needs of the children. I found myself in the middle of a debate during this process, referring to myself on the one hand as a social scientist collecting data and on the other hand as a designer in a creative process.

The complexity of the topic and of the process was what kept me intrigued. However I could never have done this without the support and cooperation of many parties. First I’d like to thank the Veldacademie. When I approached you January last year I was lucky to find you at the starting point of a very interesting research project. You trusted me in developing the first lesson program for this project and introduced me to a very talented group of researchers. The approach and research topics of the Veldacademie caught my attention already in my bachelors. For me what you’re doing is the essence of good urbanism, looking for the best we to involve the inhabitants in shaping their environment. I was very happy to be a part of your research and thankful for the great experience in New York as well.

As a mentor the experience of Pieter was of great help in developing the lesson program, understanding the target group and translating the data. Andrea and Sander helped in the classroom, where the creative process with the children
was often a challenge. Andrea made most of the pictures used in this thesis, which capture the essence of what we did in the classroom. Great to experience this together with all of you.

This research took place at primary school RK De Regenboog. I’d like to thank all the children that we have worked with in the process. You’re questions, talents and open-minded view on urbanism was amazing. I’d also like to thank the teachers Annemarie and Koen, who were willing to spend the precious time they had in the class on this project and give us all space we needed to work with these children. They helped me develop the lesson program in a way that was applicable in the school schedule. I admire your energy and expertise to work with these children everyday, believing in everyone of them. The school directors Kitty and George were brave enough to start this project with us. They knew had little experience on primary schools but took a chance with us. Thanks for your trust!

One person that tutored me through this project is my main mentor Ulf Hackauf. I want to thank you for your great sense of quality. Your sharp view guided me from the practicalities of this research to the essence and back. When I had the feeling I was lost completely you knew the next step. I admire that greatly, I couldn’t have wished for a better first mentor.

My second mentor Machiel had the difficult job to join this project halfway in. First my mentor Marta guided me through the first year, showing me the philosophical essence of this thesis. Machiel helped me distinguish where research ended and design began. He knew the critical parts of the design and helped me define what urbanism meant to me. It meant thinking through the scales but also practicalities like parking and lighting.

At the Science Communication faculty Maarten en Caroline introduced me to true scientific research. I knew the creative process but here I came to understand the true meaning of research. The description and validation of every step of the process was new to me but opened my eyes to the importance of a well designed process. Caroline you really helped me get the project to land on it’s feet. I got hold of the structure, essence and research questions because of your sharp view. Maarten you taught me the philosophy of communication, throwing me off guard sometimes but making me reflect on the meaning of Science Communication to me as a professional.

Hanna, you experienced my struggle with all this from very, very close. Your critical view, understanding both my laziness and my drive, showed no mercy and pushed me to give it my best. Thanks for helping me through this, I’m very proud to be your friend.

I feel very grateful to have been given the opportunity and the time to explore my personal fascinations. I could never have done that without the support of my environment. My family watched my process closely, supported me when I struggled and inspired me to keep going. My mum who gave me my strong moral compass, my dad who showed me the world. My two sweetest aunts that are my main inspiration and the embodiment of true strength and intelligence. My brother and my sister who keep me with both feet on the ground.

You all inspired me to keep exploring and keep my spirit lifted. Now, at the beginning of my career, a new beginning is marked. I believe that I have acquired a sound base of knowledge at TU Delft to start making the world prettier, healthier, a place for all people to live to the fullest.

(Soon to be) Ir.drs. Lisa ten Brug, Rotterdam 2017
Figure 1. The chaos of a brainstorm lesson (picture by Andrea Fitskie)
Obesity is appointed as a pressing 21st century public health threat by the World health organization. Current sedentary behaviour in Western society is key in fast spread of the obesity epidemic. Children are most vulnerable to obesity because overweight children have a 50% chance to become obese as an adult. Latest research pleads for the approach of obesity as a contagious disease. The obesity epidemic spreads to social ties by shared social norms on eating and activity behaviour. The urban environment had played a role in the stopping contagious diseases from spreading in the beginning of the 20th century. Now urban design should find a way to stop the spread of this social epidemic, obesity.

In this research four methods were used. The first method is a literature study. Through studying literature the approach of obesity in the last 30 years, the new approaches in social epidemiology and the approach through urban design were studied. Additional semi-structured interviews with experts in both The Netherlands and New York gave more insight in the latest trends and future challenges for this approach of obesity. The literature study formed the base for the ObeCity model, containing essential urban design intervention that would reduce the obesity spread among children.

Solutions in this model are general and not yet applicable to a specific design location. Through a context analysis in Beverwaard, the second method used in this research, a more in depth understanding of the local context was obtained. The ObeCity model was adjusted and prioritized based on this local context. In Beverwaard active transport is already well integrated in the urban structure. However means to prevent the social epidemic from spreading, like surprising elements in the streets, were lacking.

Research suggested Participatory Action Research (PAR) as a sufficient method to strengthen health perception and encourage the use of public space. Through this method the participants are involved and gain control over their environment. Also the involvement of community members when designing public space increases the chance for the community to use this space for physical activity. So this method on the one hand served the community. On the other hand it served the research and gave more insight in the needs of the target group to become physically active in the urban environment. Through this data the ObeCity model was adjusted for the last time. The creative ideas of the target group during the PAR process were direct design inspiration. These designs were adjusted to the guidelines of the model and applied in the neighbourhood through drawings and models in the final design process.

So the ObeCity model involves both trends in research, spatial context and social dynamics in the neighbourhood. The use of this model when designing public space is therefore likely to stimulate physical activity in the neighbourhood among children. The in the translation of the model to spatial design, interpretation of the designer and inspiration from the PAR process eventually create the design. In Beverwaard playgrounds for functional, dramatic and explorative play contribute to the reduction of obesity. Pedestrian lanes were transformed in thematic spaces for social bounding and bridging and testing social norms. Further research is needed to monitor the effects of this design and specify the applicable elements of the ObeCity model and PAR process in order to stimulate physical activity among children even better.
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1. INTRODUCTION
1.1 PROBLEM

The year 2010 was the first year in history that not contagious diseases but non-communicable diseases (NCD’s) caused the biggest amount of deaths globally. Obesity is an NCD and the most pressing 21st century health threat. Obesity rates are rising globally and new approaches need to be found to stop this epidemic from spreading effectively.

At the beginning of the 20th century, during the Industrial Revolution, hygienic challenges in Western cities caused a threat to the public health of citizens (Kruize et al., 2015). Inhabitants of cities risked catching a contagious disease like Cholera, Yellow Fever or Tuberculosis. The combined implementation of the Housing Law and the Health Law in 1901 were fundamental in improving the housing situation for lower income households and by that improving public health. Urban design developed as a profession starting with these public health solutions fighting contagious diseases in inner cities. Urban design plans creating a more hygienic environment helped to stop the diseases from spreading.

In 1948 the World Health Organization defined health as:

‘a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity’ (WHO, 1948).

Health was not just about physical aspects, but also mental and social aspects were added to the definition. Health was seen in a broader context of increased complexity. In this time period contagious diseases were not the most pressing health threat anymore. Health related problems in the Western world shifted from contagious towards non-communicable diseases (NCD’s) (Center for Active Design, 2013). The causes of these diseases are more complex than the causes of contagious diseases. NCD’s are often chronic, individually developed (not passed person to person) related to for instance lifestyle factors and genetics. The complexity of these diseases results in not one clear cause of these diseases and therefore not one clear cure. Cardiovascular diseases, diabetes and obesity are examples of NCD’s.
1.1.1 The obesity threat

The year 2010 was the first year in history that not contagious diseases but NCD’s caused the biggest amount of deaths globally (Cummins, 2015). Obesity in itself is a risk factor for the development of multiple other diseases like cardiovascular diseases, diabetes, hypertension and stroke and certain forms of cancer. These effects make obesity one of the most pressing NCD’s.

Obesity rates have risen rapidly over the past thirty years (Smith & Cummins, 2009). The World Health Organization (2011) called the global obesity threat ‘globesity’, for it is not restricted to developed countries anymore but occurring everywhere is the world. The rapid rise of obesity not only has consequences for the populations’ health but also for economy. Financial losses are counted in directly treatment cost for the people suffering from the condition. Indirectly costs are taken into account on the loss of productivity, sickness absence and premature mortality. Estimations are made that obesity already costs billions worldwide (Smith & Cummins, 2009).

In The Netherlands we see a trend of rising obesity rates over the past thirty years as well (“Overgewicht, cijfers & context,” 2016). In 2015 in The Netherlands 16% of the adults is obese, this seems not very much but in addition 50% of all adults is overweight. The number of overweight adults grew rapidly in the past 30 years from an amount of 33% in 1981 to the current 50% if adult population (see Figure 2). Research shows that our behaviour has changed over the past 30 years. Approximately half of the Dutch population exercises less than thirty minutes per day (Dagevos & Munnichs, 2007).

Among children we see a rise in obesity rates in the past thirty years as well (see Figure 3). There is a rise of overweight rates among children from 10.1% in 1981 to 12.1% in 2015. Obesity rates among children fluctuate between 2.1% and 2.8%. Evidence however suggests that weight status tracks into adulthood, causing a higher risk for obesity in adulthood and developing chronic diseases like diabetes or cardiovascular disease later in life (Williams, 2011). This make children an important target group to start prevent obesity among adult population.
1.1.2 The approach to fight obesity

The rapid rise of obesity rates has raised questions in research. It is very unlikely that individual genetics causing weight to rise have changed over this relatively short biological timescale (Smith & Cummins, 2009). Our behaviour however has changed (Dagevos & Munnichs, 2007). Physical inactivity is one of the key risk factors in developing an NCD. Researchers were urged to look for determinants that influence our physical activity behaviour in order to design interventions that stop the spread of obesity (Blok, 2016). Blok describes the course on the fight against obesity in three specific research shifts: individual guidance, physical environment and social contagiousness.

**Individual guidance**

The first approach to obesity was through the individual. The individual was guided in making healthy choices for healthy eating and exercising habits. In this approach the individual was addressed and guided in changing his or her lifestyle. The main determinant for behavioural choices of the individual is intent. In a free country like The Netherlands attitude, subjective norms and experienced control determine the intent of the individual (Dagevos & Munnichs, 2007). One should have a positive attitude, believing the positive effects of certain behaviour. The individual should believe that important others in their environment support their choice of behaviour. And the individual should feel that they can control their own choices.

These aspect of choice were mainly addressed by health education to the individual. Through health education information was spread on the benefits of healthy behaviour. However many people experienced a big gap between what they want to achieve and what they are able to achieve. When the intent was negative, the healthy behaviour was guaranteed not to succeed. When the intent however was positive, this was no guarantee for success. The individual approach seemed to fall short on that matter so the environment was incorporated in the approach to fight obesity. The consumer is still seen as the main person responsible for weight problems, but the influence of the environment and processes in society have a very big influence on the behaviour of the individual.

**Physical environment**

The approach of obesity shifted to promoting physical activity incorporating urban design in the mid-1990s.

“The technological revolution of the 20th century has left in its wake an ‘obesogenic environment’ that serves to expose the biological vulnerability of human beings.” (Butland et al., 2007)

Urban design solution like the integration of active transport in large scale spatial plans and the proximity of healthy food and recreation areas were adopted in urban design. Evidence is still emerging on the effect of the proximity of a healthy urban environment on physical activity behaviour. Design solutions like active design guidelines (Center for Active Design, 2013) help to adjust the physical environment to the health promotion needs of the inhabitants.

**Social contagiousness**

Because the obesity rates continued to rise of globally, research shifted focus for the third time recently. Now research on obesity has expanded to studying the influence of the individuals’ social network on the physical activity behaviour.

Recent epidemiological research states that the condition obesity behaves the same way as a contagious disease (Christakis & Fowler, 2007). Christakis & Fowler suggest that obesity should be approached the same way as contagious diseases because the behaviour of someone’s social network is contagious to the behaviour of the individual. Obesity spreads through a social network like a contagious virus. Individuals, especially children between 6 and 12 years old, adjust their norms and behaviour to their social environment (Feldman, 2005). This leads to the rapid spread of obesity among social groups. Becoming obese is therefore a more passive activity than is often assumed; to be at healthy weight levels you need to use active coping strategies to fight the general course of your surroundings.
1.1.3 Intervention

Block suggests the research on obesity stops the attempt to proof the causal relation between social contagiousness and rising obesity rates for the relation between social networks and obesity is already widely noticed. Instead research should start with designing interventions that capture the complexity of the causations. Interventions have a direct effect on the obesity epidemic and give insight in research data. The Foresight Framework Report (Government Office of Science, 2007) studied the complex causation of obesity extensively and provided a framework of causation that is still seen as leading in obesity research (Smith & Cummins, 2009). They plead for interventions that are not separated approaches but integrated in one solution. They state that the separation of factors does not help to tackle the complexity of the problem.

“... approaches to obesity prevention are likely to fail unless the complex interaction of people and place is understood and intervention is targeted at a specific group in a specific setting at specific scales.” (Smith & Cummins, 2009)

The urban environment has played an effective role in fighting contagious diseases in the past. Pre World War II hygienic solutions stopped contagious diseases in cities. However these diseases were clinically contagious while obesity is socially contagious. The increased complexity of obesity causes compared to clinically contagious diseases should be incorporated in new urban design interventions (Cummins, 2015). Cummins pleads for a new approach of health in the urban environment: the complex system health approach (see Figure 4). In this approach the complexity of the NCD is integrated in the design of the urban environment. The goal of this research is to stimulate physical activity behaviour in order to reduce obesity rates among children by design of the urban environment.

In this ObeCity research a more integrated approach to stimulate physical activity behaviour in the urban environment is researched. The importance of the three main disciplines affecting physical activity behaviour is incorporated but not separated. In the development of the design of the urban environment individual guidance, physical environment and social contagiousness are combined in one pattern language. Every pattern within that pattern language is a spatial solution that stimulates physical activity among children. The language consists of a network of these patterns. The language is translated to the applicable design of the urban environment.
Rotterdam
Obesity rates rise faster in among populations in cities than in rural areas (Cummins, 2015). In 2011 GGD Rotterdam published research on Rotterdam health data stating that Rotterdam is the most unhealthy city of The Netherlands (Nabielek & Hamers, 2015; Van den Berg-de Ruiter, Schouten, Smit, & Van Veelen-Dieleman, 2014). Children are the main focus in this research because they are vulnerable to the effects of obesity as an adult. When a child suffers from an NCD, chances are that this disease extends to adulthood. In general 1 in 4 children in Rotterdam suffers from obesity or is overweight. This is far above the national average of 13,6%. Besides the risk of developing other NCD’s, these children often find it harder to concentrate, tire easily and are more lonely than children of a healthy weight (Williams, 2011).

Within city boarders data show areas in the city with a population with a lower socioeconomic status have bigger health problems than in areas with a higher socioeconomic status. Rotterdam struggles with the biggest health differences among the neighbourhoods of all cities in the Netherlands (Van den Berg-de Ruiter et al., 2014). Data show that most health related problems appear in the south of Rotterdam. For the amount of physical activity and weight related problems Beverwaard stood out as an unhealthy neighbourhood. More children in this neighbourhood are overweight and they are less likely to play outside then children in other parts of the city. While Rotterdam is actively fighting child obesity with educational programs, the number of overweight kids has increased in this area over the past 5 years.

This area was chosen as the research area. Data collection and interventions are situated in Beverwaard.

Figure 5. Beverwaard in Rotterdam context (TU Delft maproom)
1.2 RESEARCH QUESTIONS

Physical activity among children should be stimulated more effectively in order to reduce obesity rates. Urban design has played a role in improving public health in the past, especially contagious diseases. Beverwaard is among the neighbourhoods in the Netherlands with the highest child obesity rates. In this design research requirements for urban design are studied in order to create an urban environment that stimulates outdoor physical activity among children in Beverwaard.

In order to stimulate physical activity among children in Beverwaard a complex dynamic approach of the environment is essential (Cummins, 2015). As explained in the introduction, the complexity of the relation between the individual and their environment related to physical activity behaviour should be understood in order to propose a sufficient urban design solutions.

In this research first the general requirements for designing for obesity are collected using theory on communication strategy, social epidemiology and urban design. From this theory the first ObeCity model for spatial implementation can be formed. In this phase of research subquestions A, B, C and D are answered.

The first ObeCity model is than applied in the design context. The model is adjusted, elements are prioritized based on the morphological and social situation in Beverwaard. In this phase subquestion E is answered.

After that the ObeCity model is adjusted a second time. This time the data collected in the together with the children in Beverwaard cuases a priority shift in the model. In this phase subquestion F is answered.

The final subquestion, G, is answered when the information provided by the ObeCity model is turned into a spatial urban design. In this phase of research a spatial and applicable design translation of the ObeCity model is designed for Beverwaard. Here creative input from the designer and the children are combined with the ObeCity model.
The main research question answered in this thesis is:

How to design the urban environment to stimulate physical activity among primary school children in Beverwaard?

This main question is answered through the following subquestions:

A - Which communication strategy stimulates outdoor physical activity behaviour among children?
B - Which social epidemiological requirements stimulate a child’s outdoor physical activity behaviour?
C - Which urban design requirements stimulate a child’s outdoor physical activity behaviour?
D - How can these requirements be combined in one model for urban designers to use in the design process?
E - How can this model be adjusted to fit the Beverwaard context?
F - How can this model be adjusted to fit the needs of children in Beverwaard?
G - How to apply this model in the design of the urban environment in Beverwaard?
1.3 READING GUIDE

The linear structure of the report indicates that the course of this process was linear as well. However the process was iterative and different research elements complimented each other in every stage. Through the process the pattern language ObeCity is adjusted to the context. This resulted in a final set of patterns to be applied in the design of the urban environment of Beverwaard.

In Figure 6 to the right the setup of the thesis is visualized. Four types of methods are used to answer these research questions and presented in the related chapters. Sub questions A–B–C are answered in chapter three using literature study (method 1). A literature study was also conducted on child participation in urban design. This resulted in the design of the PAR process (method 3). The results of this research is discussed in chapter 2, methods. Answers to sub questions A–B–C result in the elements that are later turned into ObeCity model #01, sub question D. The model is adjusted to the local context of Beverwaard using context analysis (method 2). In ObeCity model #02, chapter 4 subquestion E is answered. After that the data is collected through the PAR process (method 3). The model is adjusted to the data provided by the children answering sub question E, resulting in ObeCity model #03. This final ObeCity model serves a the final set of requirements, a pattern language. This is translated to an applicable urban design in a creative process (method 4), answering question F. The combination of requirements in the model and the applied urban design will answer the main research question in the conclusion.

The children are engaged in the research and design process during a Participatory Action Research process in a lesson program. The target group primary school children in Beverwaard plays an active role in this phase of research. The lesson program was constructed in sub question A. From this research a communication strategy was chosen. The data collected in the PAR process was used to answer subquestion E as well, adjusting a wide range of ObeCity elements. Lastly the PAR process was a source of inspiration used in the creative process to answer sub question F: translation to design.
Figure 6. Structure of the report (author)
2. METHODS
In this chapter we explain why and how the four different methods were applied in this research. We validate the methods based on previous research and explain the effect of this methods on the answers of the research questions.

First method used was a literature study, supported by semi-structured interviews. This gave more insight in the theoretic knowledge on the subject. The second method used in this research was a context analysis. In this method the morphological situation and social situation in Beverwaard are studied. The third method used in this research is Participatory Action Research. The children in Beverwaard are involved in the design and research process.

All these methods together formed the ObeCity model. This model functioned as the base for the design process. The final step in the process was to apply the model to the design of the urban environment in Beverwaard. The creative design process was the last method used in this research.
1. LITERATURE STUDY
   - social contagiousness
   - obesogenic spaces
   - ObeCity model #01

2. CONTEXT ANALYSIS
   - morphology
   - social interaction
   - play environment
   - ObeCity model #02

3. PARTICIPATORY ACTION RESEARCH
   - data collection and analysis
   - ObeCity model #03

4. DESIGN
   - child participation
   - lesson program
   - inspiration
   - personal style
   - urban design intervention

RESULTS "chapter 3"
METHODS "chapter 4"
THEORY "chapter 5"
CONTEXT "chapter 6"
CHILDREN "chapter 7"
URBAN DESIGN "chapter 7"
REFLECTION "chapter 7"

discussion

references
additional design requirements
2.1. LITERATURE STUDY

The theoretic research for this project consists of two main methods. The first is literature study on different disciplines that come together in this thesis. The second is interviews with experts on these topics giving an in depth explanation of the literature. In this paragraph these methods are explained and validated.

In this thesis three different research disciplines are combined: science communication, social epidemiology and urban design. In the process of establishing the theoretical framework physical inactivity among children is the problem addressed in all fields. These fields of research are studied establishing a theoretic framework for design to stimulate physical activity among children.

2.1.1 Literature study

So in order to understand the topic of physical activity among children the three fields of research were combined. Before the relation was established we started by analyzing the different fields individually. We with urban design, second communication and after that social epidemiology.

Literature on the three research fields was sought in three phases using the snowball method (Wuite-Harsema & Braaksma, 1995). This method of literature study starts with a key relevant or high praised document. From that documents’ references or key words new or more in depth information is found. The three phases of this literature study are:

phase 1. Orienting and framing
phase 2. Snowball search
phase 3. process evaluation

Phase one: orienting and framing

At the start of this research project literature was collected on the relation between urban design and health. A very wide range of research documents were found on all elements of urban design in the Science Direct data base. The search term ‘health’ in relation to ‘urban design’ lead to
research topics like air pollution, effects of water and nature, noise, building density and mixed use in cities and the health consequences these had for inhabitants. The research was not very focused yet. The research therefore later focused on The Netherlands.

One specific government document of this search gave insight in current and historic research on the relation between urban design and public health in The Netherlands. The found key document was ‘Ruimte en gezondheid, een vanzelfsprekende combinatie?’ by Kruize et al. (2015). The research was conducted by the public health government body (RIVM). This document gave a historic overview of the relation between public health and urban design in The Netherlands throughout the twentieth century considering all related aspects. From this document current further studies were found on the relation between public health and urban design. From this document I started focusing on modern diseases. Obesity was one of the most pressing modern health threats according to the World Health Organization.

During phase one the documents in were found using a database search on TU Delft Repository, Science Direct and Google Scholar. TU Delft Repository was used to view both student material of recent research as well as look for experts on this topic in Delft and library books. Google Scholar was used to find relevant research documents for the Beverwaard context or high cited documents of the last 10 years. Science Direct was used as a starting point for the snowball effect for they relate articles of compatible topics clearly to each other. It is in the last 10 years that the research on obesity shifted towards the influence of the social environment and the adaption of obesity became more complex and focused on the environment. In this phase the articles were collected based on their abstract, if the research had an environmental approach on obesity applicable in the Dutch context they were selected and saved to read later.

**Phase two: snowball search**

In this phase the literature was not only selected by abstract but also studied by conclusions and results. When literature fit the context of obesity and urban design they were selected. Now the layer of the target group children was added. If an article was selected the snowball method led to more in depth information on the topic.

In the RIVM document obesity as a modern disease is named as one of the most pressing public health issues of current times. Searching for the combined terms ‘obesity’ and ‘urban design’ Google lead to the inaugural speech of Cummins (2015). In this speech he addressed the new approach to health in the urban environment. He wrote ‘Obese cities: how our environment shapes overweight’. In this article he wrote that health was an issue to be addressed through urban design, but citizens played a big role in the establishment of this process. In ‘The relationship of urban design to human health and condition’ by Jackson (2003) the relation between health and urban design on different scale levels is studied. Here she concludes that the involvement of citizens in the process of increasing health is key in the development of healthy urban environments.

Smith & Cummins (2009) praised the Foresight research that made according to him the most extensive document on obesity causes so far. This document became my main source for the understanding of obesity causes and possible cures.

Topics on how to involve citizens with the goal to both shape the environment and contribute to health prevention were searched from this point in Google Scholar. Communication strategies on how to involve citizens in the urban design process on health were found in the process of Participatory Action Research (PAR) by Wang (1999). Wang proposed different strategies specified to the urban environment that were later combined with educational aspects provided by Van Loon (2016) of the PAR process. Van Loon wrote a book on the strengthening of confidence in education recommended by the principal of the primary school. Literature was selected for the development of the intervention at the primary school after the case was formalized and during a study trip to New York. In New York several different programs with children are developed in order to stop the obesity epidemic in this city. Experts in New York pointed out the importance of empowerment and creativity. The Wetenschapsknooppunt of TU Delft was later contacted to see their work on the combination of child education and empowerment.
On the relation between children and urban design the book by Liane Lefaivre (2007) formed the base for research. She described the role of children in the city throughout the 20th century. This and a documentary on Dutch playground design, taught me that in the 1920s and the time period right after WOII most inventive playground design was developed. From WOII until the 1970s Van Eyck developed the PIP model for designing playgrounds which I adapted in this research. The playgrounds of Van Eyck were well praised by Lefaivre. In the period from 1970s till 2000 focus shifted towards safe play environments. The philosophy of 1920s time period caused me to deepen the framework on theory from that time. Lefaivre mentioned Freud and Huizinga as promotors of absurdism and play as a way of life against mass consumerism.

The social epidemiological layer was added after a consultation with professor Burdof from the research group Gezond in IJsselmonde. Through his network more literature on social epidemiology was provided, the research of Christakis was highly recommended by his researcher Blok, who told me this was the most extensive research on this topic so far. Data from TNO data base, GGD Rotterdam and PBL provided insight in the current state of obesity rates in The Netherlands.

Phase three: process evaluation
In the last phase of literature study an overview of the found literature gave insight in the different types of literature. A combination of government documents, physical books from libraries, scientific research and news articles gave a complete spectrum of literature types. The completeness of the literature process was reviewed through the found requirements. When there were no new requirements to be added from the found literature, a selection was made to specify the requirements to the problem context: physical activity and children.

This toolbox was later compared to Dutch toolboxes on healthy urban design found via the Dutch platform ‘Platform voor Gezond Ontwerp’. An overview of all requirements provided by these sources is made, these were later specified to the requirements for physical activity among children in Beverwaard. Examples of the requirements provided by the platform were mix of use in neighbourhood, walking distances and ground markings.

2.1.2 Expert opinion
The variety of searched literature helps to avoid ‘cherry picking’ or tunnel vision when literature research is conducted. An addition to avoid these phenomena is to consult expert on the found literature and ask their expert opinion (Aveyard, 2014). The snowball method could lead to a biased interpretation, tunnel vision of found literature. Therefore a series of interviews provided more in depth information or a wider view on topics. The interviews in itself often led to additional literature as well. Experts were consulted on all three different fields of research: communication, urban design and social epidemiology. On every topic at least one interview provides insight in the current situation in research and practise.

Urban design expert
For urban design two external experts were consulted: Joanna Frank, Executive Director from the Center for Active Design in New York during a research trip and Hanneke Kruize from the RIVM during a Healthy Design conference. The interviews were semi-structured and an addition to the found literature. The interviews on this topic did not lead to new literature however they did confirm the current state of research. The Center for Active design is a global leader in active urban design interventions. The RIVM Is the Dutch institute for public health. The combination of both institutions is adds to the relevance of the literature.
Social epidemiology expert
For social epidemiology researcher David Blok was interviewed. Blok is researcher at Erasmus MC public health, social epidemiology and infectious disease expert, specialized in the social spread of obesity. In the interview a more in depth view on this approach of obesity was discussed. In addition to the existing literature Blok provided new literature and an overview of historic research on this topic.

Communication expert
For communication interviews on the PAR process in New York and The Netherlands gave more insight in the existing literature. The initiators of three different healthy school programs were interviewed in their New York offices. In order to understand the applications of this kind of program an expert meeting with practitioners of the program at the schools was attended. We were able to ask practitioners in the field their struggles and their expert tips. The interviews that were performed gave more insight in the goals of the programs and the methods that they used to stimulate healthy lifestyle choices. For instance the way they praised their students at the end of a course by handing them a diploma and celebrating their achievement. Also they involved parents in the process of the children and trained a team of volunteers to positively deal the children and build their confidence as a way of health promotion.

In order to relate the goals of the New York programs to the Dutch context, the lesson program was compared to existing programs. By telephone an interview with Lekker Fit! program developer was conducted to gain more insight in the development and goals of this program. Dutch education practitioners gave me feedback on the program I developed in informal settings during the intervention phase. They taught me how to clearly communicate the goals of the lesson program with children and teachers. We discussed the attention span of these children, how long each lesson should take and what type of materials children this age were used to.

Figure 7. Cover of documented research of Center for Active Design (2010)
2.2. CONTEXT ANALYSIS

The analysis of the sociospatial context in Beverwaard consists of two main methods: morphological analysis and data base analysis. The morphological analysis consists of the review of maps on urban design aspects. The data base analysis focuses on the social situation in Beverwaard.

Public space in cities is the space for all different types of public functions. People meet in this area, water is regulates, traffic controlled, recreational functions, ecology, sanitary etc. All types of different people and institutions use public space and it is up to an urban designer to find a way to bring all these different element of public space together in one design.

Meyer, De Jong & Hoekstra (2006) define four types of systems that define the structure of public space: greensystem, watersystem, traffic system and subsoil system. These systems form the base off public life. They do not however define all important matters of public life. When these systems are approached the designer must be aware of the dynamics on social level (Meyer, De Jong & Hoekstra, 2006). Therefore the context analysis consists of this system approach plus the analysis of the social situation. In this analysis the social layer are added to the context. Here the meaning of people to their environment and their general lifestyles are discussed in addition to the spatial patterns.
2.2.1. Morphological analysis

In order to make a precise morphological analysis of Beverwaard first a sufficient map must be found of the existing structure. From this map the system can be drawn and analyzed.

Map selection

The ‘Topografische Dienst Kadaster’ provides several types of maps on the urban environment that could form the base for morphological analysis. Choice can be made between maps of different time periods. The map was chosen showing most differentiation in the urban layers. This map was however quite old, by comparing the map to more recent maps the differences in urban structure can be found. The TU Delft maproom provided official maps of the neighbourhood and historical maps. Analysis of historical maps together with the historical development of the area explained the urban structure and earlier design choices.

Extracting the morphology

The structure of the different networks is examined using TOP10 maps and extracting different urban elements. The relevance of different infrastructures for the children is determined after data analysis. Green and blue networks, traffic networks and the occupational network (housing, employment and recreation) together give meaning to the space for the specific target group. Considering the characteristics of these networks both separately and in their mutual relation helps to re-evaluate the purpose of the design location. On street level the neighbourhood was analysed using photographs. Students of the Veldacademie extensively analysed the existing playground stock in Beverwaard. They captured playgrounds and traces of play on maps for me to use as a design base.

2.2.2 Data base analysis

Municipality of Rotterdam and other partners collected big data on the social, health and economic situation of the municipality. These databases are used in this context analysis to understand the social situation in Beverwaard. First the data sources were selected based on availability and validity, after that the relevant data was used in research.

Open source data on health, demographics, livability etc. are provided by government institutions. ‘Onderzoek en Business Intelligence’ (OBI) Rotterdam is a department of municipality Rotterdam doing research through questionnaires on these themes. They provide open source data in a database called ‘gezondheidsatlas’ or ‘rotterdamincijfers’. They perform research, analyze it and make it available to the general public. More specific data on lifestyle of inhabitants, reputation and association is provided by SmartAgent, a commercial company doing research on livability.

Data from these databases is selected on the specifics of the Beverwaard region. Filters were added to gain insight in physical activity related behaviour of children in Beverwaard. Their home situation, economic status, education and safety perception play a role and data of the Beverwaard region is provided on these topics. This data is compared to the situation in the rest of Rotterdam to understand pressing matters in the area.
Chapter [02] Methods

2.3 PARTICIPATORY ACTION RESEARCH

The PAR method in this research had two specific goals. The first was to involve the children in the design process in order to stimulate the use of public space for physical activity behaviour. The second goal was to gain insight in the current behaviour of the children in the neighbourhood and dreams for using public space in the future.

One way to fight contagious diseases is by vaccination (Blok, 2016). A vaccination is a small amount of a certain disease exposed to the possible victim. After they receive the vaccination, the individual will create antibodies and become immune for that disease. When we make sure to vaccinate the population, the contagious disease stops spreading.

Obesity is not clinically but socially contagious so vaccination works a little differently. The vaccination would not exists of a medical procedure, but a communication procedure. One could systematically inform people on healthy exercise. Like in vaccination: making people aware of the problem and systematically implement that in every part of society. This way you could call the communication process the ‘vaccine’ to stop the disease from spreading.
2.3.1 Communication as a vaccination

Informing citizens on the healthy lifestyles has started in the 1970s. In the 1970s the WHO used upcoming mass communication means like television to inform people on the importance of healthy lifestyle (Sallis et al., 2006). They communicated the ‘exercise guidelines’ to citizens in order to stay healthy. Exercising three times a week, for at least 20 minutes was promoted as an important mean to avoid the risk of developing an NCD. Rising car use and increasing sedentary behaviour however caused for the rise of obesity in Western countries.

The person that is more contagious then others is called the super-spreader and is most important to be vaccinated (Blok, 2016). The super-spreader can be seen as the role model for behaviour among a certain social group. They could be celebrities, parents, teachers or any other person important for a group. When this person is identified ‘vaccination’ could start there and this person could become the ambassador of healthy behaviour. The role model ‘vaccinates’ many people in its turn by setting the example for healthy behaviour.

2.3.2 Promoting physical activity

Because of new scientific evidence in the 1990s the exercise guidelines were changed (Sallis & Ganz, 2006). Exercise guidelines became ‘public health guidelines’, losing the word ‘exercise’. The term exercise was adjusted to a more general term: physical activity. These guidelines promoted an amount of physical activity to 30 minutes each day. This new term included walking and biking throughout the day; not only fixed exercise times were incorporated in these guidelines. This changed the geography of physical activity. Professionals from the urban planning discipline realized their part in the subject and got interested in the this broader view on physical activity; from the early 1990s active urban design became an ascending field of research.

As the range of active design widened, so did the terminology health communication again. Now the term ‘active living’ was used to point out the importance of physical activity being incorporated in many aspects of the life of the individual (Sallis & Ganz, 2006). The motivation of the individual as well as the space accommodating physical activity became a central aspects in the active living process. Urban design focused on recreational facilities, transportation, exercise and occupational activities to become more active. Physical activity has evolved from just exercise to a multilevel lifestyle approach in research and practice.

Latest research states that the promotion of physical activity will be most affective when citizens take an active role in shaping their environment (Israel, Checkoway, Schulz, & Zimmerman, 1994; Jackson, 2003; Koelen & Lindström, 2005). Their active participation in planning and design of neighbourhoods adds to the sense of control and therefore enhances health and happiness.
2.3.3 Ownership

Participating in shaping your environment plays an essential role in accomplishing a positive health impact (WHO, 2011). Children that participate in the design of their environment are more likely to develop a sense of ownership and use the outdoor area to play (Karsten & Kroese, 2004). By participating they gain a sense of control over their environment that leads to taking responsibility for the collective possession. They will address each other’s behaviour when they pollute the environment or when others don’t follow the rules. Taking responsibility for collectively owned property is not automatically incorporated in modern upbringing. Every child now has its own computer or cell phone and families are not as big as they used to be. It is however an important aspect for children to feel comfortable when playing outdoors.

The participatory element is a process that offers the possibility for children to shape their environment. One format for ‘the healthy neighbourhood’ does not exist; intersectoral action and community involvement form the base of healthy urban planning process (Jackson, 2003). One of the process designs that will both involve citizens in the design process and give insight in the experiences of the individual is Participatory Action Research (PAR).

2.3.4 Participatory Action Research

The Participatory Action Research (PAR) process consists of several key elements. First is the fact that it is participatory, it is a joint process where all parties learn from each other’s expertise. The process is a dialogue between researchers and a community. The community gains insight in certain phenomena, gain control and learn (new) skills in participation. The researchers gaining insights by collecting data and learning from the local context of the community. There is a difference between the overarching research goals of collecting data and short term action goals of the process. The process should be carefully designed to fit the community and reach both research goals. Professionals, researchers and community members must all agree on the execution of the process and collectively strive to increase the knowledge on a topic for every party.

2.3.5 Conclusion

So important aspects of a communication strategy on physical activity promotion among children are raising awareness, setting a good example through role models and involving the children in design of the urban environment. This answers sub question A of this research.

These elements are combined in approach of the problem through Participatory Action Research. The children gain a sense of ownership of their neighbourhood which increases the possibility for them to use this spaces for physical activity. Awareness on the topic can be raised using the PAR process and discussing health with the children in a creative process. A role model activates children to behave in a certain way. This could be a parent or teacher, but also one of their peers in the classroom. How these elements are fitted to the context of a community differs per location and target group. The design of the process should however entail these three elements to result in increased physical activity behaviour among children.
2.3.6 Design PAR process Beverwaard

Beginning of 2016 Stichting IJsselwijs and Veldacademie cooperated to initiate a three year research program improving the health of primary school children in Rotterdam. The research intended to follow primary school children, intervening in their behaviour and test if these interventions had a positive health outcome compared to other kids. This program was called: Gezond in IJsselmonde. They actively lobbied among different primary schools in IJsselmonde, where many health related problems appear, to execute this research. Eventually they found primary school ‘De Regenboog’ in Beverwaard willing to participate.

The research was targeted to children in ‘group 6’. This is the primary school class that would leave the primary school in three years. In those three years the research would be executed. The children at this age, ranging 9–12 years old, are open to learn and adjust. When children reach the age of 12 their learning process becomes more individualized and lifestyle changes are less likely to stick (Feldman, 2005). Primary school ‘De Regenboog’ had 54 children that were in this age category. The ObeCity research would be fitted into the research of ‘Gezond in IJsselmonde’. This group of children was therefore assigned to this research as well, making this sampling type convenient sampling.

The children were divided in two groups at primary school ‘De Regenboog’, with two different teachers. Any biases by teachers or group social climate would be noticed when comparing the data between the different groups of children. one group consisted of 28 children, the other group 26.

The PAR process in this research needed to be fitted to this target group and the topic of design of the urban environment. One of the PAR models applicable to this context was the lesson series developed by the TU Delft. Through this lesson series the children gained insight in the full design process. Through this process the researchers gained insight in the daily behaviour and future design dreams of the children. Meanwhile the lesson program contained many educational and communicational aspects that helped the researchers become a role model and raise awareness on the importance of the topic.

Lesson program

The content of the lesson program is based on the 6 steps of the design cycle (Wetenschapsknooppunt, 2014). Through this cycle the children get the opportunity to complete a full design process. This process results in twelve different design concepts developed by the children. By using different methods every child got the opportunity to conduct in the research and express their own view. The mixed methods also lead the researchers towards a more to a nuanced approach of study, being new to this target group and no education professionals conclusions could not be made quickly. Also the different techniques gave insight in different scale levels of the neighbourhood, covering all types of requirements for urban environment (Matthews, 1985).

After consulting with the teachers, in each group 4 lessons were scheduled. In these four lessons I guided the children through the design process. The Veldacademie helped me in the establishment of the lesson program. When gained insight in the established lesson programs, talked to professionals in the field and adjusted the content of the lessons according to the wished of the local teachers, I performed the lessons myself. A team of researchers from the Veldacademie were present to assist during the group work.
**Word cloud**
In the PAR process it is important for children to recognize the link between the problem and the possible solution (Wang, 1999). By understanding and relating to the core problem the children will be committed to the design goal (Horelli, 1997). In the Wybertjesmodel by the Wetenschapsknooppunt (2014) this is stated that it is important to think divergently before formulating a problem. When the children think divergently before deciding on the problem or solution they are able to reflect on the possible range of answers and find a solid foundation for their choices. The Delft Design Guide (2013) suggest the mind map as a tool to encourage divergent thinking on a problem. Because in this phase of design the children do not use visuals yet the mind map is translated to a word cloud.

During the first lesson the children explored the problem. By using a word cloud, main elements of living healthy were determined by the group. In the classroom the children were divided in groups of 4 to 6 children. In these groups, during a time period of 10 minutes, they wrote down as many words as they could come up with to describe what they thought was healthy. Some groups discussed with each other, others wrote down words in turns. Some groups had a hard time expressing other words than the words that first came to mind. The researchers guided them and stimulated them to think outside the box. At the end of the exercise the children were asked to share 5 words per group with the rest of the class. The researchers wrote these words down and discussed the words with the class. The analysis of the words gave more insight in how the children relate to health and to their environment.
Drawings
Cognitive mapping techniques have been suggested as useful alternatives to survey methods for exploring children’s awareness and knowledge of their environment (Morrow, 2001). Reinders (2013) states that drawings map of your environment gives insight in the value an individual assigns to their environment. The designer is introduced to the environment of the children through their eyes.

For practical reasons the drawings were made in couples of the children’s own choosing. By working in couples the children were able to help each other and stimulate the flows of ideas. Also they practiced drawing of their environment to later draw the design for their environment.

Hume, Salmon and Ball (2005) analyzed the collected drawings by counting the elements on the map and categorizing them. In this research in data analysis the elements on the maps drawn by the children were categorized as well.

Diaries
In order to get a detailed image of the daily spatiotemporal behaviour of the children every child kept a diary for a week (Karsten & Felder, 2016). This diary gives more insight in the behaviour for the researchers but also helps the child to record their behaviour and reflect on it.

During the first lesson, every child received their own personal diary which they filled out during the week at school. The lay out of the diaries was predetermined by the researchers. The children all filled out the tables that contained questions on their activities.

In analysis phase the diaries were digitalized by the researchers. Like in the maps, the activities were assigned to different categorize by color codings. The comparison of the coded activities in a certain location joined by a certain company were analyzed using Excel filter systems.

Figure 12. Lay out design of the diaries (based on Karsten & Felder, 2016)
Brainstorm

During the second lesson a brainstorm was organized. Following the Wybertjesmodel, the children were asked to gather many different ideas first and after select their main concept (Klapwijk & Holla, 2014). They were placed in groups of 4 or 5, depending on the table arrangements. Prior to the brainstorm the children play a short game to stimulate creative thinking. Researchers hand out brainstorm stencils in which ideas can be placed. The brainstorm is held in rounds of 5–10 minutes. After every round the children pass their brainstorm stencil to their neighbour who in their turn draw new ideas on the stencil.

In order to stimulate the divergent thinking small exercises were done with the children before the start of the brainstorm. These exercises did not relate to the content of the brainstorm but were purely meant to ‘wake up’ the brain and get into the brainstorm mode.

The brainstorm rounds end when every child at the table saw every stencil once. In every round a new assignment was given. Children were challenged to draw their favorite playground, their favorite playground for their favorite super hero, or for their pet. In this phase of the brainstorm the children thought divergently. The researchers guided the children through this creative process without handing them the ideas. Before the start of the class the researchers discuss their strategy: there are no wrong answers, every idea is a good idea, don’t judge and if a child is out of ideas or finds it difficult make sure to ask many questions for them to get started.
Conceptualization
According to the Wybertesmodel after this phase they convergent phase start. All children got three stickers. Per group the brainstormstencils are layed out on the table and the children explain the drawings to each other. In a couple of minutes children choose their favorite ideas that form the base for the main concept. The main concept per group is presented to the other children. Based on the Van Loon theory, after every presentation the children compliment each other and ask questions.

At the end of the lesson the children prepared a presentation of their model. A stencil with questions functioned as a base for argumentation which helped the children to support their ideas. After the final presentation the children received a diploma that expressed the learning abilities they had gained over the past weeks. The researchers expressed their pride to the children. Recognition of their contribution to the research is an important element of a PAR process (Wang, 2006). The parents were informed of this lesson program taking place. They were invited to a meeting where the course of this particular program was explained and the broader context of the research as well. They were invited to visit the classroom after the final lesson to observe the final models.

Figure 15, 16. Concept development and presentation during PAR
Pictures
Hume, Salmon and Ball (2005) and Wang (1999) suggest photographic mapping as an important instrument to explore the awareness and knowledge of the environment of children. This tool was added to the design cycle as an instrument for the children to relate their first design ideas to their environment.

Every group of kids (preferably the same groups as the brainstorm group) got a disposable camera. At the beginning of the walk, the researchers explained to the kids how the camera works and how to read the maps with walking routes. The researcher predetermines the areas they walk through the neighbourhood to get insights on the school environment. This way all kids walk a different route and the researchers were sure to be back at school on time.

The groups of children were given, besides the disposable camera, a map of the area they walked and a stencil. They photograph different elements of the environment and write on a stencil what elements in the environment they like and what elements they dislike. This way the researchers get to know the neighbourhood through the lens of the children. During the walk the researcher asks informal questions to the children about their experience of the neighbourhood.

Hume, Salmon and Ball (2005) analyzed the picture the same way as they analyzed the drawings. They categorized the main elements on the photographed joined by the commentaries of the children. This way they understood the meaning children assigned to different elements of their environment. This data analysis method is adapted in this thesis.
Models
In the fourth and final lesson the concepts that were developed in the second lesson were built in models. This was the last step in the design cycle of the Wetenschapsknooppunt (2014).

The researchers prebuild models of the environment, 6 different locations, in which the children could place their design ideas. For the children that found it difficult to draw this lesson was an opportunity to express their creative ideas in a different way. It is important to provide different expression options to address different levels of development in the group (Sanders & Stappers, 2012). The children had been collecting material for the models since the first lesson. This material functioned as inspiration for new ideas to add to the selected concept. When a group of children got stuck in the process, the researchers offered guidance the same way as during the brainstorm lesson.

Expressing thoughts through presentations, asking each other questions and recognition of the value of creative ideas were incorporated throughout the lesson program. These are important elements to stimulate the confidence and independent creativity of the children (Van Loon, 2014)

At the end of the lesson the children prepared a presentation of their model. A stencil with questions functioned as a base for argumentation. After the final presentation the children received a diploma that expressed the learning abilities they had gained over the past weeks. The researchers expressed their pride to the children. The parents were informed of this lesson program taking place. They were invited to a meeting where the course of this particular program was explained and the broader context of the research as well. They were invited to visit the classroom after the final lesson to observe the final models.
Data analysis
Data analysis was performed in three steps. Hume, Salmon and Ball (2005) defined the first step is the recording of data and the second step the categorization of elements observed to specific themes. Sanders & Stappers (2012) add a third step, conclusion based on the found categories tested to the theoretic framework.

After every lesson the materials made by the children were collected and/or photographed. First assessment of the data is used as inspiration for design input. After this the data is organized and categorized. The elements in the data contain different coding. For instance in the picture assignment elements like trees, water and grass were assigned to the category ‘nature’. In the last step main conclusions from the processed data is compared to the existing theoretic frame, leading to an interpretation of the data for design.

The first sight of the data was used as design inspiration. These first inspirational ideas were documented in sketches and discussed with mentors. The data was collected and observed to gain a general overview. Patterns, repetitions and exceptions could be recognized to gain new insights from the data forming information on the topic. In the last stage the information was turned into knowledge by reflecting it on the theoretic base. The material was digitalised and coded in Excel. For drawings the researchers counted the element drawn by the children and entered the outcomes in a table. For the diaries the program Atlas was used to code and count the activities posed by the children. Photographs were counted and turned into tables. The data is now put into context and the bigger picture is visible.

Figure 20. Phases of coding (Stappers & Sanders, 2012)
Ethics
Prior to the research I filed for a ‘verklaring omtrent gedrag’ at the municipality of Rotterdam. Because I was in charge of the lesson and in order to protect my own position. During the program, no harm was done to participants. The teacher was present in class during the lessons and a minimum number of 3 researcher were present to help with the content as well.

Consent was given by the school principal initially. Parents signed off on the sharing of information when they applied for the school. The parents were invited to join an information meeting on the project to understand what the project contained. They were also invited after the final lesson to see the results of the first quarter. A coach was hired to make the first contact with the parents after these first meetings.

The board of directors made the decision for the school to participate. The involved teachers of group six only gave their consent after the first group meeting of all researchers. They had to make sure the program did not cause any conflict with the regular program at the school since the research was conducted during school hours.

Before we started the first lesson the goal and general design of the research was explained to the children. They were informed of the fact that the research would take three years and every quarter different researchers would visit the classroom. The researchers introduced themselves and explained that this lesson program was about neighbourhood design. Formulation of the obesity problem was not expressed to the children specifically. The researchers on sight explain that they want to stimulate playing outside because this is healthy and that we need children ideas to optimize the play environment.

After every lesson the teacher of that group gave feedback on what worked or didn’t work. The lesson was adjusted for the second group when aspects were too difficult. In a workshop with next students that were assigned to join the research execution, the tips and tricks by the teachers were passed on. After every lesson a report was written by the researcher for later reflection. The researchers would informally discuss after every lesson on the good and the bad aspects. Also the notions that were made by the children were shared. The first collection of the data also functioned as a base for further theoretical research.

During the coding process a transition document was used to anonymize the data. The data could only be transcribed back to the children by the researchers involved in the three year Gezond in IJsselmonde program.
In public space many different systems and networks meet. Communication between different actors takes place in public space but is not always visible in the public space. Communication means that an urban designer uses during the process, among professionals or together with other parties, can be extensive like in a PAR process. When the urban designer finishes a design it is up to non-professionals to understand the language without the middle man. Spatial patterns give shape to this language.

Urban space is a complex combination of networks. The space is not enclosed like in architecture, making it difficult for people to comprehend (Habraken & Teicher, 2000). Assigning a recognizable type to these spaces asks for a more abstract understanding of the space. The space consists of a complex system of networks that needs to be adjusted when solving an urban design problem.

**2.4 DESIGN**

In this research the ObeCity model is developed. Through this model we looked for ways to find essential elements of design during the design process. In order to understand the complexity of the requirements a language of spatial patterns is created. This language is called a ‘pattern language’ (Alexander et al., 1977). The patterns help to understand the complex system of urban space by combining social and spatial solutions.

**A pattern language**

Christopher Alexander (1977) developed the first pattern language. Through patterns he translated the complexity of the urban environment to the parties involved in the urban design process. The pattern language is a combination of social questions and design solutions that relate to each other through spatial statements: patterns. Every pattern describes a phenomenon that appears in our environment in many different shapes. The pattern describes the core of the design a solution. This solution is described in such a way that it can be implemented in many urban systems without ever having to look the same. A pattern can be a solutions on many scale levels in the city. For every urban problem a pattern language in this structure can be created, there is no fixed content to the language (Van Dorst, 2005).
Designing with this language

In this design thesis we create a pattern language for the stimulation of physical activity among children. Theory indicates the important themes of this language and every theme indicates one or several patterns. These patterns are tested in the analysis process to the context, and to the perception of the children in the PAR process. After this process the patterns are adjusted and the language gets a different structure. A priority for the applicable patterns in Beverwaard is in the end of the research process found.

The patterns indicate the essence of the design problem. In this problem social and physical aspects can be combined. The design will function as a mean to reach a certain goal per patterns. It communicates a message through the design of the environment. The designer always looks for a combination of elements that help to solve the proposed problem. The structure of the language is complex. This allows the designer to follow different paths within the pattern language. The designs of the children and style of the designer are used as input in the language. In the design process this input is related to different patterns. Combination of several patterns can be made to in the end make an integrated urban design.
3. THEORY
In this research the influence of the environment on the physical activity behaviour of children is studied. We distinguished two main influences on physical activity behaviour of children: the social environment and the urban environment.

We start with the social contagiousness of obesity in paragraph 3.1. Here we distinguish what types of activities are crucial in fighting the spread of obesity in a social network. In paragraph 3.2 research shows a historic overview of urban design interventions that impacted physical activity behaviour among children in the past.

Based on the found requirements a model is established in paragraph 3.3 resulting in the first ObeCity model. This shows all requirements for the urban environment that stimulate physical activity among children found in theory.
OBECITY

METHODS

RESULTS

1. LITERATURE STUDY
   - social contagiousness
   - obesogenic spaces
   - ObeCity model #01

2. CONTEXT ANALYSIS
   - morphology
   - social interaction
   - play environment
   - ObeCity model #02
   - lesson program

3. PARTICIPATORY ACTION RESEARCH
   - data collection and analysis
   - ObeCity model #03
   - personal style

4. DESIGN
   - references
   - additional design requirements
   - urban design intervention

CONTEXT

CHILDREN

THEORY

URBAN DESIGN

REFLECTION

chapter 3

chapter 4

chapter 5

chapter 6

chapter 7

discussion

inspiration

personal style

urban design intervention

conclusion
In this chapter we explain social contagiousness of obesity among a social network. Norms a social group can influence the physical activity behaviour of a child. Therefore the requirements in this chapter are related to both social interaction as well as behaviour. In order to change social norms a child should play. Playing helps to create new behavioural patterns. Engaging with new social contacts helps to break ruling social norms as well. Different types of play in several social compositions help to fight the contagiousness of obesity and stimulate physical activity.

Physical activity helps child development in many ways and helps burn calories, lose weight and lower the risk for becoming obese (Poortinga, 2006). The social environment influences children’s likelihood to engage in these activities by established norms and values. By approaching obesity like an infectious disease we can understand the influence of these norms and values on physical activity behaviour.

3.1.1 Epidemiological research

Social culture partly influences how an individual is physically active, for instance in what type of transport a group prefers (Sallis et al., 2006). Recent studies have shown the influences of social networks on obesity rates (Blok, Van Empelen, Van Lenthe, Richardus, & De Vlas, 2013; Christakis & Fowler, 2007; Smith & Cummins, 2009). The social environment influences psychosocial cues to various behaviours, attitudes and values and therefore recent research approaches obesity as a social contagious disease.

Obesity is a NCD, non-communicable disease. Since 2010 infectious diseases are not world’s number one cause of death anymore; non-communicable diseases (NCD’s) became the main cause of death globally. For the past century, healthcare has studied viruses and bacteria to find medicines that could cure infectious diseases. The approach of handling an infectious disease is well known. David Blok, researcher at Erasmus MC Rotterdam explored the lessons that could be learned from the world of infectious diseases in curing obesity (Blok et al., 2013).
In his study Blok was placed in between the departments social epidemiology and infectious diseases. In a previous study, Christakis found that obesity was in comparison like infectious diseases (Christakis & Fowler, 2007). He stated that obesity as a condition behaves like an infectious disease because unhealthy behaviour spreads among social groups.

Figure 22 shows the model created by the research of Christakis and Fowler (2007). The colours of the connection between the dots indicate different social ties. Purple means a marriage or friendship, orange means a familial relationship. The size of the dots indicates the weight of the participant. Red borders of the circles indicate women, blue border men. Yellow dots are indication for obese persons, green dots for non-obese persons. An obese person is a person with a BMI of 30 or heigher. An overweight person is a person with a BMI between 25 and 30. A person at a healthy weight has a BMI between 20 and 25.

When we approach obesity like we approach infectious diseases, and we understand the impact of the social network of a child on physical activity, we could come a step closer to curing this epidemic (Blok, 2016). Christakis and Fowler (2007) studied the spread of obesity from person to person over 30 years; 12,067 people participated in his Framingham Heart Study. He studied the social network to see if weight gain at one person influenced weight gain at another person. In this study a relation between the social network and obesity was found. He noticed that people were in a likelihood of becoming obese for 57% when one of their close friends was becoming obese. This percentage dropped to a likelihood 40% if the relation was a sibling and 37% when ones’ spouse became obese. He noticed that same sex people influenced each other more than opposite sex and neighbours did not have a notable influence on each other. In his model, Christakis noticed clusters of people being obese or overweight, and cluster of people with no weight problems. He concluded that not geographic proximity but the value of social ties had an influence on the spread of obesity.
Influence of social norms and values on children

When growing up a child is exposed to many social influences, social interactions and relations that affect their social norms and values (Butland et al., 2007). Social interactions between members of a certain culture is important to the child because it forms the base of the problem solving development skills as they learn the social values and understand the priorities of their surroundings (Feldman, 2005). This aspect of child development embraces the complexity of the individual on social, cognitive and physical level, regarding the context and place of the individual in that system. Influence of the (social) environment and culture play a significant role in the physical activity behaviour. Physical activity can be part of family rituals, or it is not as important, while the rituals are impacting the child’s behaviour. The way people eat, exercise and look adds up to the norm of the social culture (Blok et al., 2013). Children adjust their norm according to their surroundings, their peers. This is a complex and often slow psychological process but influences the way people think and act.

Children between the age of 6 and 12 are able to reflect on the consequences of their social behaviour (Feldman, 2005). Self-knowledge is differentiated, the individual is able to appear in different forms of ‘the self’ according to the relevant characteristics. Children at this age are able to realize which behaviour is appropriate according to the social culture. They are able to socially compare individuals to estimate their social status and identity. Social problems are generally handled with the intention not to disrespect others and accept societal standards. This group is therefore very vulnerable to the contagiousness of obesity.

Besides the influence of social norms, the child’s behaviour is modified by approval of their surroundings (Feldman, 2005). The behavioural perspective on development psychology focuses on observable behaviour and upbringing when analyzing the development of a child’s personality. Once one understands these observations, development of behaviour could be predicted or modified. According to this perspective a child develops obesity when a healthy amount
physical activity behaviour has not been properly rewarded. External factors in the social and physical environment should stimulate the healthy behaviour and reward the child on healthy behaviour. Behaviour that is rewarded will most likely be repeated, this process is called behaviour modification. Parents play a significant role in this process.

3.1.2 Stopping the contagiousness
Playing helps children to reinvent the social values and redirect behavioural habits (Dattner, 1969). Through play values are transmitted, either consciously or unconsciously, emotions are expressed and disagreements faced. Playing helps children to become more confident and improves problem solving skills. By playing the standard behaviour of mass consumption in the developed western world could be addressed and even changed (Huizinga, 1938; Krul, 2006; Lefaivre, 2007).

In the psychodynamic perspective on child development psychology, theorists explain behaviour as something the individual cannot control (Feldman, 2005). Behaviour is in their perspective motivated by intrinsic forces that are formed by childhood experiences. They explain child obesity by the individual child fixating on a trauma in early childhood development, 12-18 months old. In this period oral satisfaction was most important because of breastfeeding and the development of lip movements and biting. Trust of the social environment in this period is very important due to the dependence of a baby on their surroundings. According to the psychodynamic perspective these are issues that should be addressed when fighting obesity in adolescence. One way of addressing these former traumas is by humour and play.

Freud was one of the first to acknowledge play as the base for the development of personality and social skills. Humour plays a central role in the development of this theories. According to Freud, funny things contain potential to re-inventing the rules, because they release inhibitions and allow us to express behaviour that otherwise would have remained hidden. Funny things stimulate the critical thinking of inhabitants, re-imagining daily routines. Play is, according to Freud, the source of creative thinking. Philosophy behind play is the manifestation of needs and wishes in a sense of freedom (Dattner, 1969). This is not bound to reality but can be extraordinary which makes the motivation for play related to dreams that differ per individual. Play creates the chance to control an imaginary world through magic and secrets while imposing your own rules. Playing is about the process of this manifestation, in many cases combined with creative expression, and not about the results. A playground is the uncertain factor in a city where efficiency and conventionalism normally dominate. This breakage of the pattern will create curiosity, opening up the neighbourhood, when designed with that intention (Willemin, 2016).

On a cognitive level primary school children learn how to solve problems based on logic (Feldman, 2005). They develop a sense of decentralization from their initial egocentric world view. They are able to look at a phenomenon from different perspectives. Their memory develops further; they are now able to code and assign value to their memories. This way they strategically use their memory and are able to recognize patterns. They are able to actively monitor their own behaviour and are able to reflect on it. In Freud’s theory this is not taken into account when explaining child’s behaviour, while their cognitive functions clearly suggest these abilities. Playing plays a big role in the cognitive development of children. When children get older, their behaviour becomes more complex and they learn to cope with that through the interaction with their environment. Children explore the city, unlike adults, without following a clear set of rules while learning to cope with totally new experiences. Outdoor playing is therefore very stimulating to cognitive development.
3.1.3 Types of play

Sobel (2008) distinguishes several motifs for children to start a certain play activity, depending on individual preferences. Motifs to start playing are: adventure and physical challenge, fantasy and imagination, access to (animal) relationships, ownership and the creation of paths and mental maps, creation of small worlds and treasure hunting and gathering. Smilansky (1968) defined five types of play: functional, constructive, dramatic, exploration and games-with-rules. Rubin (2001) created an observation scale to identify these different play types, describing the characteristics of these play types the following:

**Functional Play:** This is an activity that is done simply for the enjoyment of the physical sensation it creates. Generally speaking, the child engages in simple motor activities (e.g. repetitive motor movements with or without objects).

We can distinguish three types of motor activities: manipulative movement, non-locomotor movement and locomotor movement (Center for Active Design, 2013). Manipulative movement is fine-motor movement that involves coordination and controlled use of hands and feet. Examples are grasping, throwing and catching and ball footwork. Non-locomotor movement focuses on balance the coordination between body and object or place. Examples are balancing, pushing or pulling, twisting, sitting and rising. Locomotor movement is movement of the body from place to place. Examples are crawling, walking, running, stepping, skipping, jumping and climbing. Throughout childhood these types of movement get further developed during different kinds of play.

**Constructive Play:** The definition of constructive play is the manipulation of objects for the purpose of constructing or creating something. Pounding on playdough for the sensory experience of the pounding is considered to be functional play; however, pounding for the purpose of making a “pancake” is coded as constructive. Similarly, pouring water in and out of containers is a functional activity; however, pouring water into a series of containers for the purpose of filling each container to the same level is a constructive play behaviour. It can be seen, therefore, that one major distinction between functional and constructive activity concerns the child’s goal during play.

**Dramatic Play:** Any element of pretence play is coded as dramatic. The child may take on a role of someone else, or may be engaged in pretend activity (e.g., pouring pretend water into a cup and then “drinking” it). S/he may also attribute life to an inanimate object (e.g., making a doll talk).

**Exploration:** Exploratory behaviour is defined as focused examination of an object for the purpose of obtaining visual information about its specific physical properties. The child may be examining an object in his/her hand or may be looking at something across the room. Also, if a child is listening to a noise or listening for something his/her behaviour is coded as exploratory.
Games-with-Rules: The child accepts prearranged rules, adjusts to them and controls his/her actions and reactions within the given limits. The child and/or his/her playmate(s) prior to the onset of the game may have decided upon these rules. There must be an element of competition either between the focal child and other children, or with him/herself. To illustrate, two children who are taking turns bouncing a ball against a wall are not necessarily engaging in a game-with-rules activity even if they have decided that dropping the ball constitutes the end of a turn. However, if these children are counting the number of bounces successfully completed before the ball is dropped and are trying to beat the other child’s (or their own) previous score, then they are playing a “game-with-rules”.

### 3.1.4 Social interaction

Three types of social settings for children to play in are: solitary play, parallel play and group play (Rubin 2001). Proximity of other children and attentiveness to their presence by the playing child is important when determining the play social play setting. Rubin (2001) describes the differences between the social settings for play as follows:

**10. Solitary play**

Solitary Play: The child plays apart from other children at a distance greater than three feet (one meter). S/he is usually playing with toys that are different from those other children are using. The child is centered on his/her own activity and pays little or no attention to any children in the area. If the child is playing in a small area the three-foot rule is often not applicable. In such cases the observer must rely upon the relative attentiveness of the child to others in his/her social milieu.

**11. Parallel play**

Parallel Play: The child plays independently; however, the activity often, though not necessarily, brings him/her within three feet of other children. If the child is very attentive to others while playing independently, parallel play is coded regardless of the distance between the focal child and the other children. S/he is often playing with toys that are similar to those that the children around him/her are using. The child usually seems to be somewhat aware of, and attentive to, his/her playmates, and frequently engages in “parallel speech” (i.e., verbalizing his/her own thoughts for the benefit of the other children). In short, the child plays beside, or in the company of, other children but does not play with his/her companions.
Group Play: The child plays with other children and there is a common goal or purpose to their activity. They may be following one another in a functional activity, or they may be organized for making some material product, striving to attain some competitive goal, dramatizing situations of adult or group life, or playing formal games. Whatever the activity, the goals are definitely group-centred. In outdoor situations we distinguish two kinds of group play: group bonding and group bridging.

Children form the catalyst in public life (Karsten & Kroese, 2004). When children play outside, parents or neighbours are likely to go out as well. Parents have a consistent place at the playground either to watch their child or to meet other parents. Parents find the way other parents raise their children particularly important for the social environment they choose to surround their children (Karsten & Kroese, 2004). They want their children to connect with ‘their kind of people’ and create a safe social environment. When children play outside they often play together with other children. The play environment provides a solid social network for parents and children. Children play with children they already know or belong to the same social groups, this concept is called social bonding. Norms in these groups are often well established. Children find their peers, security and support for their behaviour in these groups. People the children relate to in these groups form an example for their behaviour. Role models can influence the behaviour of these group positively by promoting physical activity.

Lifestyle differences
The lifestyle of a social group influences the drivers behind the physical behaviour of a that group (Ouwehand et al., 2011). This impacts their movement through public space based on social preferences. Whether a group prefers certain physical or social behaviour differs per lifestyle.

Behavioural differences among certain social groups can be identified through studying differences in lifestyle (Van Vliet, 2004). Lifestyle is a spectrum of behaviour, characteristics, codes and values of a social group. The Brand Strategy Research-model of the SmartAgent Company identifies four different lifestyles. Demographic determinants restrict the options within a certain lifestyle what causes differences of lifestyle among different demographic groups. The models uses sociological and psychological factors to determine four different lifestyles: red (vitality), yellow (harmony), green (protection) and blue (control) (see Figure 24).

The red lifestyle relates to strongly individualistic people but open to trends in society. They have a progressive attitude by centralizing their own norms and values. Not their personal career is most important but personal development and independence. Red types like to be surrounded by different cultures, going out and artistic environments. The yellow type is extrovert like the red type; open and cooperative to others. They look for harmony and balance in family, career and society. They strongly believe in working together and the core values of society. They like the neighbourhood atmosphere and the ‘village’-feeling. The green type is a
group person like yellow, but believes in the strength of a self-selected group but value their privacy. They feel safe in their small circles and create their own cultural norms and values. They like a safe and quite living environment. The blue type is introvert like green, but strongly individualistic and focused on controlling their future, situations and life in general. Their personal norms and values are most important, luxury is appreciated. They are ambitious and often successful. They like the anonymity and privacy of an area. A person is never just one ‘color’, one lifestyle. There is however a more preferred, or more dominant lifestyle per individual. In research the most dominant lifestyle is used to draw conclusions.

Social bonding would be with people of the same lifestyle, familiar people with the same norms and values. Social bridging is involving with people with another lifestyle than the lifestyle that the person is used to.

3.1.5 Parental restrictions

Children that play outside a lot are familiar to dealing with ‘others’ in social bridging. Some researchers name this as the explanation for the end of ‘verzuiling’, religious segregation, in the Netherlands (Karsten, 2005). Because of the lack of space indoors children were often forced to play outside in the 1950s and 1960s. They got to know ‘other children’ instead of their parents that only involved in the same religious groups. The next generation therefore were more likely to mix with other religions and stopped the segregation. Contagiousness of obesity could be addressed by this approach. Children that live in a negatively contagious social environment have a chance to form new social bonds by social bridging. A condition of bridging during outdoor play is that parents should be assured that their child is safe.

14. Social Safety

In general now children play outdoors less frequent than in other time periods, with limited activities and for shorter time periods (Karsten, 2005). Parents interfere with their child’s behaviour more and restrict the home range of the children. Over the past generations the diversity among children has increased; Karsten distinguishes three categories of childhoods: outdoor children, indoor children and the backseat generation. Outdoor children play outdoors frequently, some out of choice, others because there is little alternative indoors. Indoor children and the backseat generation both cope with parents that intervene with their daily behaviour a lot. Indoor children are limited in their play environment the most. They have no access to outdoor public space and no alternative spaces to play inside either. The backseat generation isn’t allowed to go outside either, but their parents offer indoor play alternatives either in their own home or elsewhere. They explore their environment from the backseat of their parents’ car. They don’t engage in spontaneous meetings and variety of children they meet is limited. Parents only take them to activities or social meetings with people of the same social class.
3.1.6 Conclusion

In this paragraph we discussed the influence of the social network on the spread of obesity. We saw that clinically obesity is not contagious. The approach for obesity as a contagious disease is based on the effect of this network on the individual stated by Christakis (2007). However the one on one causal relation between your social environment and the development of obesity has not been proven yet. Obesity is caused by many different factors and therefore a causal relation is difficult to isolate. Blok (2016) pleads for interventions aiming to stop the spread of obesity instead of continuous research on the causal relations. The associations between the spread of the disease through social networks are however widely noticed. Interventions on fighting obesity should encounter the effect of the social environment on physical activity behaviour.

People, especially children at primary school age, adjust their norms and behaviour according to their social surroundings. These social norms can be addressed when the child is challenged by other aspects of the environment. The element of surprise helps to make people think differently about their normal behavioural patterns. Playing helps children to change norms as well. Through playing the child challenges norms in a imaginative worlds. Changing social norms through the stimulation of outdoor playing should be addressed in interventions when fighting the social contagiousness of obesity. This answers our research question B.

Playing has the ability to address and change social norms. Playing outdoors offers many stimuli that address the coping mechanism of a child for them to test their norms. Also, offering a various amount of play activities stimulates the child to go outside and be physically active. Different play types are: functional play, constructive play, exploration, dramatic play and games with rules.

Research has shown that the influence of the social surroundings on physical activity of a child can be either positive or negative. Behaviour is in a sense contagious to the children, they repeat what they learn and try to behave according to the values of their social surroundings. When these values include an unhealthy amount of physical activity, the children are likely to repeat that behaviour. Setting a healthy example is necessary for the child to learn the right behaviour.

Parents are likely to protect their children from lifestyles they disagree with, a socially safe environment is important to them. Contact with other types of behaviour is however important for children to test and create their own values. Creating an environment that is safe for the children to experience new norms helps to fight the social contagiousness of obesity.

The patterns found in this chapter will be implemented in the first ObeCity model. In the next paragraph we add the influence of the physical environment on physical activity behaviour to these patterns.
Figure 25. Overview of found patterns on fighting social contagiousness (author)
3.2. OBESOGENIC SPACES

Outdoor space plays a big role in child's social development (Shaftoe, 2008). Behaviour is both affected by the urban environment as well people's behaviour is facilitated by urban space.

To design a ‘good’ public space is to understand the child’s behaviour when they respond to available space. Throughout the 20th century, spaces for physical activity were offered to children in different shapes, changing almost every decade. The spaces related to the different social and health challenges that occurred. The learning points per decade are translated to requirements for child spaces for physical activity in the current time period.

1900 - 1940
The first spaces for children

At the beginning of the 20th century, during the Industrial Revolution, hygienic challenges in inner cities and related diseases to workers asked for thorough urban design solutions (Kruize et al., 2015). Inner cities were not a comfortable place to live for the common man, being in danger of catching a contagious disease like Cholera, Yellow Fever or Tuberculosis. The combined implementation of the Housing Law and the Health Law in 1901 were fundamental in improving the housing situation for lower income households and improving public health. Urban design developed as a profession starting with public health solutions fighting infectious diseases in inner cities.
The way that the urban environment offers child friendly environments has taken on many forms and shapes throughout history. In the beginning of the 20th century many children at time in Amsterdam lived in basements, in one-room apartments that were often damp (Van der Woud, 2011). There was little money and little room, nor parental supervision, so many children ended up playing in the streets. It was Klaren who first stated that these children needed a proper place to play. In 1899 Uilke Jans Klaren (aka Father Klaren), a shipwright from Amsterdam, stated that playing was very important for children to develop physically and mentally and the streets were too unsafe to do this.

‘Niet de jeugd is misdadig, maar de samenleving want zij ontneemt de jeugd alle gelegenheid tot spelen, tot goede lichamelijke ontwikkeling. Geef de jeugd gelegenheid zich lichamelijk te ontwikkelen en dit te doen samengaan met haar geestelijke ontwikkeling, en ‘t zal de jeugd verheffen.’ U.J. Klaren 1899 (Rubbens-Franken, 1950).

Father Klaren developed the first playground in a working class neighbourhood in Amsterdam (Rubbens-Franken, 1950). It became a neighbourhood centre for children to experience new things and a social gathering place for adults. First the play equipment was mainly built from wood, later iron prefab equipment was placed. Later playparks outside of the city were designed for children to go to on a family trip or school trip when there was time and money. This trip, escape from the city purely meant for playing, was used as a reward for the children with good behaviour. Over 1000 children visited these playgrounds daily.

In the 1920’s and 30’s we see a playground movement on the rise in Western cities. In 1931 the Dutch Playground Association (NUSO) was founded (Rubbens-Franken, 1950). This association was responsible for many square meters playgrounds in Rotterdam, Utrecht and Amsterdam. They provided play-leaders in these playgrounds who organized games and supervised the area. Guidance and education formed an essential part of these early playgrounds.

Figure 26. Amsterdams Uitbreidingsplan, (Van Eesteren, 1934)
The decennia that followed urban designers like Howard, Berlage, Van Eesteren and Wright experimented with the construction of healthy environments from a social idealistic perspective (Kruize et al., 2015). Garden Cities were built in Germany, Great Britain and the Netherlands, with affordable housing and healthy environments in mind. ‘The New Building’ focused on human health in urban structuring themes established by the CIAM in 1928. Light, air and space were there marking points. Urban green, sports and play facilities got a fundamental place within the designed urban landscape.

1940-1950 War Play

Junk-playgrounds became more popular during the war, they were invented in Scandinavian countries (Dattner, 1969). The junk-playgrounds were a construction site of all loose materials, ‘junk’, that for children formed the base for imagination and games. These playgrounds were supervised to a minimum amount, children dictated how they looked and what activities took place. They appealed to the phenomenon of children playing with the uncommon play equipment, creating a lively play environment rich of imagination but dangerous and chaotic in the eyes of adults. Children created an environment based on criteria they thought were important, different from the criteria imposed by adults. Water, dirt and junk often play an important role in the creation of these playgrounds. The material is adjusted to the age of the children playing there. Simple materials can be used by the very young while a wider range of materials is provided for the older kids.

1950 - 1970 Quantitative design

The Second World War caused the shifting of priorities that delayed the executions of some big pre-war planned urban designs. After the Second World War a more quantitative approach was needed to construct new homes and living environments for all those that were destructed. Instead of an idealistic urbanization, a scientific approach was introduced by Van Eesteren, Lohuizen and De Casseres. This resulted in the functional, modernistic and hierarchical structuring of the built environment. Car use started to rise, living areas were separated, areas were sun oriented and there were separate places for sports, places for waste, everything in its own function. A holistic approach of health and hygiene were priorities for this new constructed living environments.

Figure 27. Protest pamphlet against large scale urban design the around 1970s (unknown author)
We see in this period a shift in healthcare needs, from hygiene related diseases towards more chronic diseases that found their origin in lifestyle and human behaviour. It was the start of mass health education through new media such as television to inform the public on healthy lifestyle.

In this time period, the 1950s, many children played on the streets. It is easy to romanticize this image, but in many cases children played outside out of necessity (Karsten, 2005). In the 50s and 60s many families struggled with poverty and very small houses. Inside there were not many means for children to play so they were forced to play on the streets. Jane Jacobs ended the enthusiasm and free, modernistic thinking by pointing out the dangers of city life for young children. She plead for the improvement of conditions by offering a city on human scale. The city needed to provide comprehensible and safe areas for children in 1964 New York City (Lefaivre, 2007). In Amsterdam the same statements appeared, the municipality wanted to offer safe public playgrounds for children. The baby boom after the Second World War resulted in many kids in environments that could not yet facilitate places for this target group. Dutch ‘groekkernen’ appeared, outside urban region, car depended areas. Expanding city area and creating areas of a lower density is uninviting for pedestrians. These areas are therefore more likely to become obesogenic.

The neighbourhood offers different types of functions like shops, schools and playgrounds, which the children use on daily basis. Offering different types of functions within the neighbourhood scale, promotes walkability in the neighbourhood. The mixture should provide inside functions like shops and school, mixed with outside recreational areas like parks. Increased building density and a high number of inhabitants invites for a lively and social public space.
1947 - 1978

Aldo van Eyck

After WOII Amsterdam experimented with the design of collective playgrounds as a design tool to create a strategy for improving the quality of urban life (Lefaivre, 2007). Between 1947 and 1978 Aldo van Eyck was commissioned to build and realize 800 playgrounds in Amsterdam. These playgrounds were publicly accessible, no wall and no supervision. This was a new phenomenon in the urban design profession.

The playgrounds were placed on fallow urban grounds and wide curbs. Play elements in these play areas divided the space. Compositions changed depending on the site and local requirements. Most of the time there was no central elements but differently shaped elements were placed scattered in an area so a child could pick their own priority. This way the play space activated the child to invent their own play routine. In every playground the placement of benches was very important. Mums stayed there and met each other while their kids could play. The playground became collective property and a meeting space for the neighbourhood.

Children are able to judge a spot, often calling nice or stupid (Karsten & Kroese, 2004). In this matter aesthetics never play a big role, children mainly focus on the functionality of a play area. The opportunity to meet others and perform different activity contribute to a positive judgement of the spot. Filth or broken equipment are however judged negatively by children.

Van Eyck built characteristic playgrounds, first for the municipality of Amsterdam, later from his own office. The elements that appeared in almost every playground were the sandpit, the stepping stones, tumbling bars and the hemispherical jungle gym. They were minimalistic, static designs, open for a child’s interpretation and stimulation of imagination and movement. Besides the experimenting with the compositions of the playgrounds, with which Van Eyck tested his architectural ideas, he developed a model, the PIP

Figure 28. Aldo van Eyck playground Dijkstraat 1954 (Kollarova & Van Lingen, 2016)
model, that formed the base of the development of all his playgrounds. The strategy was to construct a **polycentric** network throughout the city serving the needs for children to play and express themselves. They were **interstitially** implemented in the urban fabric of Amsterdam, in-between the existing elements of urban fabric. The playgrounds were connected by a shared theme and recognizable design. They were physically connected through the infrastructure of the neighbourhood. But most of all they were **participatory**, requested by the inhabitants themselves and addressing the needs of the particular neighbourhood.

Building these playgrounds was a participatory process, the inhabitants of Amsterdam could simply call or write the municipality and ask for a playground in their neighbourhood. This was the beginning of bottom up city planning. Van Eyck criticized the earlier functionalist statements of CIAM, he said that functionalism had killed creativity and plead for the addition of social interaction and human aspects to the designs (Oudenampsen, 2016).

American psychologist Gibson introduced the concept ‘affordances’ (Gibson, 1979/1986). He approached the relation between an individual and their environment differently than psychologists before him. Where first the conception of a meaningless environment dominated psychology, the individual assigned meaning to a place and utilized a place, Gibson stated that the environment creates possibilities for action. This phenomenon he called affordances. Affordances mean that the environment is full of meaning, possible actions, which the individual can choose to utilize. Designing a space therefore means designing for certain actions. This action is unpredictable, Gibson states that designing for affordances means creating multiple action possibilities, for different target groups and individuals to choose their preferred use of space. Aldo van Eyck designed playgrounds based on that same ideology.
1970 - 1990
Child friendly neighbourhoods

From the 1970s to the 1990s the Dutch planning approach became more socially aware, more environmentally aware and more ‘maakbaar’ (Kruize et al., 2013). The human scale, social cohesion and liveability became central parts of planning led by architects like Van Eyck and Bakema. This led to the construction of ‘bloemkoolwijken’ with lots of space for kids and no car digestion. Walking and cycling became a central part of the design of residential areas, the ‘ideal’ living conditions for the modern family. Obesity rates have been rising in this period of time. Physical activity was introduced through ‘exercise guidelines’ in order to educate a broad public on the importance of exercise (Sallis & Glanz, 2006).

Active design of the urban environment helps to integrate physical activity in the daily urban system of citizens. Integrating active movement like walking and cycling in daily routines can help tackle the obesity problem without relying too much on personal motivation and other individual means. By facilitating a high quality walking and cycling infrastructure in the daily urban system of citizens, physical activity can be promoted through public space.

Pedestrians are the most important users of a street when designing for activity (Center for active design, 2013). When block sizes are small and curbs wide, there is room to walk to their destinations. Make sure pedestrians can walk in a fast, continuous way, not bothered by any cars or unwanted obstacles. When many people are using the sidewalk, adjust the size to fit the people. Make sure there are enough places to cross the street, also for people with disabilities. Benches aside the walking routes invite every age group to use the walkways or use them for a longer distance.

Placement of car parking on a distance forces people to walk to their car. Promoting active travel by decreasing the amount of car parking promotes the use of bikes or walking when possible. Give purpose to places that can be used for parking, but for other purposes as well. Roads for cars should be minimum width for car traffic, adding traffic calming street elements. Especially in neighbourhoods with children, traffic calming measures like signs indicating slow driving or planters should be implemented. Slow and fast traffic should meet as little as possible or in a safe and visible way. The city wasn’t very popular for families in the 70s and 80s so they moved to suburbs or the Dutch ‘groeikernen’. Cities wanted to attract more families to reduce traffic congestions and earn more taxes.

Especially in neighbourhoods with children, traffic calming measures like street additions indicating slow driving should be implemented. The contact between slow and fast traffic should be minimized or safe and visibly. Separate bikeways from all other traffic. Roads for cars should be minimum width for car traffic, adding traffic calming street elements. A continuous route for bicyclists in the area invites for cyclists.

Figure 29. Cauliflower neighbourhood design (De Boer, 1972)
26. Distant Parking

27. Minimize Curb-Cuts

28. Sidewalk Width

29. Street Additions

30. Minimize Contact

31. Separate bikeways
1990 - 2005
Responsibility

In the 1990s urban areas again grew rapidly. The new city inhabitant was critical on the housing provided and architects started to provide more personalized homes within urban regions. Cities began to ‘market’ themselves to potential new inhabitants: families. Cities were densified and extensive public transport systems were added. Big extension plans like VINEX neighbourhoods competed with these cities by offering space to park your car and play outside. The main topic of health was in this period transformed towards social-economic benefits and social safety. In this time period safety became more important in Dutch planning and urban design profession. The need for the reduction of accidents on playgrounds forced many municipalities to destruct the Van Eyck playgrounds. On average more than 20,000 accidents happened every year involving children (andere tijden)(echte bron toevoegen). The regulations on the safety requirements of playgrounds were sharpened.

Risk taking forms a central element in mainly physical play. Risk taking and competing with others are a game in itself. A playground can frame this risk-taking, visible for children and to an extend predictable. The balance between a safe and a challenging playground need to be considered at all times. Surfaces were not be slippery unless it is clear that it is a slide. Hand railing provide support when climbing or balancing is part of the intended game. Danger should be obvious, slippery slopes or heights should be identifiable by children. This plays a role in the design of safe but challenging playgrounds, but also in the design of detail in the urban fabric.

Safety issues prevent parents from letting their kids play outside (Weir, Etelson, & Brand, 2006). In general the freedom of movement, outdoor play and socializing has decreased among children over the past generations (Karsten, 2005). The role of the parents has become more important. In order to increase safety and therefore independence of children Karsten and Felder (2016) introduce streets with clear purposes.

Street differentiation provides a more transparent and therefore safe environment. Parents could make clear arrangements with their kids on where they could go, and where do could not go, by explaining the area. Distinctions can be made between streets for living, streets for playing and meeting, a place for familiar people and a place for more anonymity. Traffic distinctions can be made as well; streets for cyclists, pedestrians or a street for a park and a street for parking.

As cars entered the city, children left the streets (Karsten 2005). In 1950 in Amsterdam there was a number of 16.145 cars in Amsterdam in relation to 186.245 children. In 2000 this number of children increased to 102.742 in relation to a number of 227.540 cars. These cars are parked where children used to play. Outdoor space transformed from children’s space to mainly adult space. However we see a change in the home environment, this is now more children space and less adult space. Therefore playing outside plays a less dominant role in childhood experience.

Because public space belongs to everyone and no one at the same time, claiming territory seems problematic (Shaftoe, 2008). Natural human behaviour comes with the urge to claim or mark a territory. In some cases a space is dominated by a certain social group. In order to create liveliness the space should accommodate different social groups allowing the observation of one another without the necessity to directly involve. The distance between the spaces should therefore be appropriate to the social interaction anticipated. A choice should be provided for the kind of social interaction; when unacquainted and no intend for interaction normal human behaviour is to leave some space between the stranger. When a stranger takes a seat right next to an earlier occupant, when there are options to sit at more distance, this person is often treated with suspicion or discomfort.
Territoriality and interpersonal distance in the space people use play a big role in this behaviour (Gehl, 2016). Gehl (2016) studied the minimum distance for communication in public space. Distance used for communication in public space is based on the personal relationships of the citizens. The distance 0–45 cm is for intimate relations, 45–120 cm a personal distance, 120–370 cm social distance and above 370 cm is for a larger public. People will be able to follow events from a distance of 100 meters. Looking up or down is not very natural in public space; when people are walking they have their head tilted 10 degrees down to avoid obstacles. Spaces can be designed for the right distance depending on the type of relationships accommodated in public space. The possibility to observing others in public space plays a big role in the distribution of people in space. In general, places where people can observe others without being exposed from all sides are preferred.

In the observation of space, people extract a meaning from their observations. This is based from both the built form as well as the activities performed in it. Through these observations a determination is made on the safety of the place. Obstacles, amount of light, hiding places or possible entrapment are physical characteristics that influence the sense of safety and therefore the social behaviour in a space. Also the social behaviour and activities that are observed play a role in the safety determination. People in general feel more at ease when they can identify with the dominant group. In addition to feeling safe, the space should not bore the public. People should still be curious about what the place can offer them and what future discoveries could be made. Space should gradually reveal itself as one moves through it.

By orienting the space towards homes or public buildings the designer creates the ‘eyes on the street’ effect. Space is perceived as more safe because neighbouring inhabitants face the public space and therefore create a sense of control.
2005 - 2015
Individualization

From 2005 until now, we see a renewed attention towards the health of the individual human. Social empowering by internet access also contributed to an enhanced self-management. Demographic and economic uncertainties led to a more organic approach of the urban environment; without blueprints, fuelled by societal initiatives. Physical activity became a lifestyle choice incorporated in many aspects of the day, instead of a separate activity during the week.

Besides the possibility for different types of actions Gibson introduced, the embodiment of that action should be central in design (Rietveld & Rietveld, 2011). Critics have praised Van Eycks playground design, but disputed the fact that it did not include affordances for children of different age groups. Children’s bodies are developing as they grow. When designing affordances for children, physical challenge differs per age group. Distance of a jump, or level of difficulty is as important as the amount of possible actions in order to create a certain affordance. Playgrounds should therefore offer different distances, in their play equipment to appeal to different children. Van Eycks playgrounds offer the same type of affordances that doesn’t continue to challenge children once they are able to undertake the action. So where Sallis et al. (2006) state that the environment should ensure safe, attractive, and convenient places for physical activity, Withagen, De Poel, Araújo, and Pepping (2012) add affordances for different target groups and motoric skills to that list.

Primary school children are between the age of 6 and 12. Physical growth start to slow down at this age compared to years before, but the body continuous to develop. Muscles develop the body further and children lose their ‘baby fat’. Motor skills develop; ball handling, biking and swimming are within the physical ability of children. Fine motor skills develop as well; children learn for example how to write, tie shoelaces and balance their body.
As children grow up their experience of physical environment develops as well (De Jong, 2005). When toddlers start walking they gain the influence of changing their perspective of their environment. For a three year old this may not be bigger than 10 meter, for a 5 year old this space already grew to 30 meters. Once the child starts going to school, remember routes and assign meaning to places. For a 7 year old the neighbourhood is often available for little exploration. They understand where their friends live and know other functions in the neighbourhood. They know he area for a radius of around 100 meters. This grows towards a radius of 300 meters towards their ninth birthday, our target group. They could walk to school alone and cross several streets. Around the age of eleven the radius is about 1000 meters. Scale of the city becomes more apparent and the context of the environment becomes more clear. Once the age of high school is reached the radius of comprehensible scale is 3000+ meters. The experience of other cities, meeting children that live further away, gives more insight in the context of the environment.

Withagen et al. (2012) stated that besides the possibility for action, affordances could also invite for a certain action without the individual making a specific choice. Like reaching for a handshake or avoiding an obstacle. Evidence is still emerging on how, what and whether certain design interventions lead to certain automatic behaviour. Urban design tools to promote physical activity among children are developed globally. A better understanding of affordances could be the base for improvement of active urban design for this target group. For now the urban designer could relate to the physical affordances of children to connect to their capabilities. This create a natural, graduate challenge in the play environment as children grow.

Figure 30. A child’s physical and geographical development (Dattner, 1969)
In addition to a child’s affordances, addressing the sensorial dimensions of children adds to the amount of play activities that take place at a playground (Rojals del Alamo, 2004). Shapes or composites can form the base of imaginative games but addressing the senses of children creates a more exiting dimension in the playfield. Sounds, visual attraction, touch and texture provide information and stimulates perception and provides feedback for the coping mechanism.

The surrealistic art movement in the 1920’s stated that the city functions as a playground that facilitates people to create their own rules and express their inhibitions. The city became an area for experimenting; mystery and imagination were introduced to shift the focus from consumerism and conventionalism (Huizinga, 1938; Lefaivre, 2007; Strick, 2011). In that time period these elements were not adopted in the urban design profession. The natural environment can contribute to the play environment as well (Rojals del Alamo, 2004). Water, vegetation and the lay of land provide for game opportunities. Adding horizontal relief invites for play behaviour in an area. Small roofs, screens or sheds secure the areas from weather conditions. This way the areas can be used at all times.

Where in the 1920s mostly artists saw the positive influence of art in the city, now this view is more accepted in urban design as well (Willemin, 2016). Urban space is used as transition area and lost its sense of playfulness. Art or play elements in the urban fabric reinforce energy to ‘forgotten’ public spaces. Art has the tendency to open peoples mind and let them become aware of the space they are in. They tend to snap out of their daily routine and become more sensitive for a conversation or a different view on everyday behaviour. Temporary art therefore will have a big effect on socio-spatial interaction, the change of installation will trigger the visitors every time a change is made. An exclusive, unique element in public space can contribute to the sense of pride and territorial identification of the citizens. When conventional spaces for play are not available, look at places like flat roofs or courtyards to serve this purpose. Materials and location should be well chosen to serve the purpose of a public playground, fitting to the local context.
Well maintained plazas add to public life and activity in the city (Center for Active Design, 2013). By placing plazas close to pedestrian streets or transit stops, on a visible location, citizens can use the space in their daily walking routine. Adjustable elements on the plaza invites people to create personalized outdoor spaces using for instant movable and fixed seating. Parks near schools could be programmed by the schools for exercising or gym class. Horizontal relief stimulates exploration in the area and will create areas of privacy, but make sure the plaza stays accessible by levelling it with sidewalks in the area. Cyclists and people on foot should be able to access the plaza at all times. Community groups like schools and day-cares should be able to program the plaza on different time periods, room for bigger groups and seating stimulate these groups to use the plaza. Functions on the plaza should allow different uses by different groups or double use. The organization of pedestrian oriented programs increases the imaginability of places, help to distinct a place from others.

Schoolyards are plaza’s near schools that are intensively used by the school and most of the time property of the school. Children play at the schoolyards during (lunch) breaks, but also before school has started and after is has finished (Karsten, 2005). Specific design of these schoolyards helps children be active on that location. **Markings** on the ground indicate a type of play while leaving room for interpretation. Play elements in schoolyards facilitate physical activity among children. By making sure they are available outside school hours, these facilities can be used for a longer period of time. This can be done by opening or removing fences. If there are fences, painting them together with the children creates a sense of belonging. **Personalization** by child participation in the creation of outdoor areas, like paintings, helps children identify with the area and use it more frequently. Add planters to the schoolyard and other natural elements like a school garden to create some diversity on the square. Streets near the school should be child friendly, safe and allow play after school. Details in beautifying streets, views and street furniture, contributes to safe and uncomplicated spaces that can be used throughout the day. High quality street materialisation, wide curbs, planters, visible street crossings contribute to active transportation in an area.
Conclusion

In the beginning of the 20th century play became part of the design of the urban environment. In the 1970s Aldo van Eyck played an important role in the development of playground design by using the PIP model. Playgrounds must be constructed in a Participatory, Interstitual and Polycentric way. In the 1990s play environments have been restricted due to safety requirements. In order to improve play experiences in the neighbourhood a balance must be found between safety and challenging requirements.

Some requirements that we have seen in trends throughout the 20th century relate to social interaction between people while being physically active of related to an activity. Others related to specific play behaviour. The last category that is added in this chapter in the role of the urban environment when stimulating physical activity among children. In this section a distinction can be made between active transportation means and urban composition means, both related to neighbourhood design and both requirements for urban design contributing to the stimulation of physical activity among children. An overview of these elements can be found in Figure 31. This Figure answers research question C.

Besides play the children can be physically active in the urban environment by active transportation means. Adaption of physical activity in urban design should be made through the design of the traffic network, facilitating biking and walking behaviour. Streets could be adapted to this behaviour by adjusting sidewalk width, bike lanes and separation of fast and slow traffic. Parked cars could form an obstacle when children play outside, they take in the space where children could play. The street should be designed with different characteristics in color, materialization or overall experience. This results in a clear street pattern on which parents can make clear arrangements with their children.

The structure of the urban plan should facilitate all these places for physical activity. By adapting the density of the environment to human scale, creating walkable distances between places of activity, the urban structure adapts to the physical activity behaviour and stimulates this behaviour among citizens.

So requirements for the urban environment relate on the one hand to the behaviour we studied in the previous chapter; play behaviour and social interaction. On the other hand a different category of neighbourhood design adds to the physical activity of the child through active transportation means and composition of functionalities. In the next paragraph the requirements of both social epidemiology and urban design are combined in one model called the ObeCity model.
Figure 31. Overview patterns contributing to the stimulation of physical activity (author)
3.3 OBECITY MODEL #01

In this chapter research showed the patterns for urban design that contribute to the stimulation of physical activity among children and fight the contagiousness of obesity. All 40 patterns found in this chapter are combined to form the first Obecity model. This model is based on how abstract or concrete the patterns are and on what scale they should be implemented in the neighbourhood.

Figure 32 shows an overview of all patterns found in this chapter. A total of 40 patterns show solutions for urban design to stimulate physical activity among primary school children in a neighbourhood. In order to understand the relation between the neighbourhood and the pattern language, the patterns are placed in a matrix. By placing them in this matrix the patterns will be more easy to read from an urban design perspective, giving them a spatial dimension (Van Dorst, 2005). In this step of creating the Obecity model the placement of the patterns is purely indicated based on the vertical and horizontal axes of the matrix. These axis show the scale of the patterns and how concrete or abstract they are. In the evolution of the model throughout this research the composition of the patterns changes. The matrix is shown in Figure 33 on page 88. This matrix is called Obecity model #01.

The matrix shows on the vertical axis the characteristics of the pattern considering whether it’s a very concrete design solution or an abstract design solution. An example of a concrete solution would be for instance pattern 39, ground markings. This is a design solution that can be implemented instantly in a neighbourhood. Which colors or picture the markings should represent depends on other factors like the message of the markings and the location is will be used. An abstract pattern is for instance pattern 23, functionality. This gives no spatial indication or clear image of what the environment should look like. The only thing discussed here is the fact that the environment of the children should have a functional use to them.
Figure 32. Overview all patterns contributing to the stimulation of physical activity (author)
On the horizontal axis the patterns are categorized based on scale. The patterns range from large scale to small scale. An example of a large scale pattern is for instance pattern 24, polycentric. This pattern tells us something about the placement of playgrounds on neighbourhood scale, the playgrounds should be divided through the neighbourhood polycentrically. An example of a low scale pattern is for instance pattern 06, constructive play. The children should be able to adjust their environment. They therefore need to move objects that they can handle so the objects in this pattern need to be on small scale.

Figure 33 shows ObeCity model #01. All patterns are placed on the axes giving them a spatial dimension for urban designers to use. This answers research question D on how to turn the individual patterns into a usable model for designers to use as a starting point for urban design.

In this first version of the ObeCity model all patterns have the same priority. All patterns show solutions for stimulating physical activity among children. The model can now be used for designing in a neighbourhood with obesity problems. In the following chapters the model is adjusted to fit the local neighbourhood context and the needs of the children living there. The patterns will then show a different composition as well as different priorities. The priorities will be indicated by the size of the patterns. Patterns will grow when they need to be incorporated in design and slink when they are already present in the neighbourhood. The composition of the patterns is changed based on promising combinations that can be made among the patterns to design for this specific neighbourhood. Patterns that can form such a promising combination are placed closer to each other at the preferred point on the axes.
Figure 33. ObeCity model #01 (author)
4. LOCAL CONTEXT
In this paragraph we discuss the Obecity model in relation to the local context of Beverwaard. The three categories neighbourhood morphology, social interaction and play spaces are discussed independently in this chapter but all relate to Obecity model #01.

Adjustment to the Obecity model are based on the differences between theory and local context. The patterns are rearranged, prioritized and linked based on the differences between the required space and current space.

The result of this chapter is Obecity model #02, adjusted to the local spatial and sociocultural specifics of Beverwaard, making it more applicable to the design context.
RESULTS > chapter 3
METHODS > chapter 4
1. LITERATURE STUDY

2. CONTEXT ANALYSIS

3. PARTICIPATORY ACTION RESEARCH

4. DESIGN

THEORY

CONTEXT

CHILDREN

URBAN DESIGN

REFLECTION

discussion

ObeCity model #01

social contagiousness obesogenic spaces

ObeCity model #02

morphology social interaction play environment

ObeCity model #03

data collection and analysis

urban design intervention

references additional design requirements

inspiration personal style

urban design intervention

child participation

lesson program

play environment

reference additional design requirements
4.1. MORPHOLOGY

The differences between the preferred neighbourhood in the ObCity model and the neighbourhood current composition are discussed. Current neighbourhood composition is studied through a morphological and historic analysis of the urban space. Data is derived from vector maps at TU Delft maproom.

Beverwaard is a neighbourhood in currently part of Rotterdam Zuid. Before The Second World War it was part of the municipality of IJsselmonde. It functioned as farmland with only a few inhabitants. There was a constant struggle keeping the water from flooding the farmland. The farmers prevented this by building dikes and other reclamation measures. For centuries nothing else but farming happened on this land. In 1941 the Germans occupied the country and annexed the municipality of IJsselmonde to be part of Rotterdam. It has been part of Rotterdam ever since.

In 1978 this area was approved to become a residential area to attract families to Rotterdam “Beverwaard, de nieuwe woonwijk op Zuid”, see Figure 34. In this time period, cauliflower neighbourhoods were build in cities. Living, playing, learning, recreating and meeting were most important in the creation of the urban design (Wagenaar, 2011). The neighbourhood was supposed to attract families from VINEX locations to the city.
Beverwaard is a peculiar example of a cauliflower neighbourhood (Wagenaar, 2011). This cauliflower neighbourhood does not have the circulating street pattern like common in most cauliflower neighbourhoods. It also doesn’t have as many death ends or ‘woonerven’, but many enclosed courtyards instead. Beverwaard was conceived as a suburban version of the historical city center of Delft. With its’ long canals and linear structure. The street pattern did derive from more central ‘branches’ to more enclosed street areas.

The transportation system in the neighbourhood is divided between fast and slow traffic. The tramline follows the route of the main car access. Most longer street patterns related to a singel are for pedestrians specifically. Streets are wide and sidewalks often small resulting in pedestrians using sharing the streets with cars. This typology increasingly appears when entering the horizontal structure of the neighbourhood.

Density of the area was 50 houses/acre. Previous large scale urban housing projects like Bijlmer functioned as bad examples for this neighbourhood. Therefore buildings were assigned a maximum height of 4 stories. Most residential houses are in possession of a backyard that is often adjacent to an inner courtyard with car parking and playing areas.

This way the street pattern was laid out in North–South direction. East–West direction streets are smaller streets not meant for main access. They often function as pedestrian areas giving access to the enclosed courtyards. New areas were found in Rotterdam Zuid and bridges needed to be built to reach those areas. At the edge of Rotterdam, Beverwaard was visually cut-off from the rest of Rotterdam Zuid by the new highway A16. The Van Brienenoord bridge crossed the river Maas and made the neighbourhood Beverwaard shaped like a cone.


4.1.1 Morphology

Traffic
A tram connects the neighbourhood to the inner city of Rotterdam. Later wider roads were added North and South of the neighbourhood to create more accessibility by car, what was initially thought to be less important. This way the cars do not, or as little as possible, cross the residential areas and allow kids to play safely outside.

The only wide street that is placed in East-West direction is the ‘Oude Wetering’, that has the historic value as reclamation for the area keeping it from water. This horizontal street was kept in the new urban structure. This street functions as the core of the neighbourhoods and on it functions like shops, school, day care, health facilities and other neighbourhood functions are placed. This street is the only canal of the neighbourhood. This way the urban designers referred to the historic image of the Dutch city in the polder.
Figure 38. Beverwaard car traffic (author)
**Water**

The structure of the housing followed the old pattern of the ditches. Some ditches were filled up and made into relatively narrow streets. Others were widened and made into a ‘singel’. Rotterdam is famous for its ‘singels’ which in Beverwaard caused the division of the neighbourhood in 5 different areas with these green waterways in between.

The singels are made along the main pedestrian areas in the neighbourhood. Almost all singels are publicly accessible and turned into an area where no motorized traffic is allowed. The one canal in the neighbourhood is the ‘Oude Wetering’. This is the main shopping street and the only horizontal structured line in the area that function as a main passage. Along this canal shops and public buildings are placed. Pedestrians can approach the water on lower positioned walk adjacent to the water.
Figure 42. Beverwaard waterways (author)
Green
West of the neighbourhood lies the A16. Aside this highway a sound barrier was placed, on top of which a park is built to function as the main recreational facility of the neighbourhood. Besides this park, Beverwaard contains 5 additional parks are built throughout the neighbourhood. These parks are varying from fields of grass, high tree densities at the sound barrier or a combined function with play equipment.

Green is also used in the streets. Most homes in Beverwaard do not have a front yard. Green elements are placed on the street to prevent motorized traffic from driving through. In some occasions green is used to personalize the area. Also people place personal items in front of their homes. However there is little personal variety in the street patterns of Beverwaard. Because of the structure of the street patterns, low rise and the lack of variety it is easy to get lost when you are unfamiliar.
Figure 46. Beverwaard green structure (author)
4.1.2 Conclusion

We now compare the found characteristics of this neighbourhood to the ObeCity model. When an aspect is well represented in the area, the icon stays the same. When an aspect needs improvement, the icon becomes bigger, being an indication for improvement by design. When an aspect is already overly represented in the neighbourhood the icon becomes smaller. This aspect should therefore be addressed in design making it less prominent in the neighbourhood structure.

The cauliflower ideology of Beverwaard results in a highly walkable neighbourhood with a village-like feel. The area consists of several scale variations, by the parks and water elements on horizontal level. On vertical level we see an over-presentation of buildings of the same height. Higher structures would improve the density of the area by creating more variety in the building typologies. The walkability to the different functions is however well thought off. Because of the combination between low rise buildings and walkable distances the area complies with the human scale (18) aspect. On this matter the traffic situation in the neighbourhood is already quite ‘active’. Slow transport has priority in the area therefore patterns related to adding bicycle lanes, curbs, separated traffic can be made smaller for this is already covered in this area.

While we see some variation in horizontal scale, the variation in streets is missing in the area (33). All streets use the same typology varying from fast to slow traffic but not in physical appearance on another level. Colors, dimensions and materializations stay the same for the neighbourhood as a whole.

Functions like shops and community centers in the area are centralized toward the horizontal canal of the neighbourhood. Other parts of the neighbourhood are purely meant for living. The mixed use (19) aspect could therefore be considered in a new neighbourhood structure.

We can conclude that the elements recreation and nature (15) are well represented in the neighbourhood by several parks and courtyards. The water elements (17) are well represented as well. Singels and canals give the neighbourhood its’ characteristic shape. These icons therefore stay the same shape. These elements of nature, recreation and water are represented in every part of the area. Some areas have for instance bigger fields of grass than others, but they all present in all parts. Traffic is already based on active and slow transport as well. The street could however be more personalized and differentiated.

Figure 33. ObeCity model #01 (author)
Figure 47. ObeCity model #02.1 (author)
Beverwaard is built to function as a neighbourhood for families (Wagenaar, 2015). The neighbourhood was finished in the early 1990s. When it was finished 4817 houses were built that house now approximately 12,051 inhabitants. Fifty percent of the housing is family housing and 60 percent is social housing. These numbers are both higher than other areas of Rotterdam. Only a small amount of elderly people live in Beverwaard: 9% compared to the city average in Rotterdam of 15%.

Around 5,000 households live in Beverwaard. Because of the large amount of children in the neighbourhood, more than half of these households have children. A fairly large amount of single parent households live in the neighbourhood: 21% compared to an average of 11% in the city of Rotterdam.

Income of these households in lower than the Rotterdam average. More than half of all households is categorized as a low income household. Low income household means that the household receives just enough money to serve basic needs. This is often as much as the national social allowance of on average €1,100 a month for single households and €1,500 a month for single parents or couples. 64% of the inhabitants live of an income that is below €1,800 a month.

There is a high unemployment rate in Beverwaard. Compared to the average of 7,7% in Rotterdam, in Beverwaard 13,5% of the inhabitants is unemployed. A very small percentage of the inhabitants has a high education. Only 12% of the inhabitants has practised a Dutch HBO education or academic education. On average in Rotterdam this amount is 31%.
4.2.1 Lifestyle

The dominant lifestyle in Beverwaard is Green (SmartAgent, 2012). An amount of 34% of the inhabitants of Beverwaard relates to this lifestyle. Close to this dominant lifestyle is Yellow, 33% of the inhabitants relates to this lifestyle. Where 24% of the inhabitants of Rotterdam relates to the Red lifestyle, in Beverwaard only 13% of the inhabitants do. So we see in this area a very high amount of group oriented inhabitants, and barely people focused on the individual. Introverts and extroverts are equally represented in the area. On average however inhabitants in Beverwaard are less satisfied with the quality of their lives than the rest of the city.

Green lifestyle inhabitants are group-oriented and introvert. They like a quite space with a small group of familiar people like family, close friends or neighbours with whom they have a lot of contact. They like to undertake activities with people they know, comfortable living and certainty.

Yellow lifestyle inhabitants are group-oriented as well, but they are extrovert. They find many social contacts important and feel involved in a large community. They like to meet unfamiliar people and be out on the streets.

Inhabitants state that the relation between the different ethnic groups has improved over the last two years. On the other hand, Beverwaard scores low on the statement that neighbours feel comfortable with each other and share each other’s opinion. On average there is much contact between neighbours in Beverwaard. 60% of the inhabitants say they have weekly contacts with neighbours and other neighbourhood members. According to the inhabitants it is a neighbourhood where everyone knows their neighbours and inhabitants experience a high level of solidarity. Trust in government policies, municipality and area board is low in the neighbourhood. Inhabitants don’t expect a change for the better in coming years.

You see the difference between green and yellow inhabitants in these numbers. Some of the inhabitants feel comfortable with a mix, others don’t feel comfortable with each other and don’t share the opinion of their neighbours.
4.2.2 Safety

On safety Beverwaard scores lowest in IJsselmonde. This mainly has to do with the perceived safety in the neighbourhood. Inhabitants see vandalism and theft as a big neighbourhood problems while collected rates say the average of vandalism incidents in Beverwaard is less than Rotterdam average (Buurtmonitor, 2017).

There are not many reports of nuisance in the area, also people perceive the area as quiet. They do mention that Beverwaard gets a lot of negative press attention. The area is perceived as unsafe. When the municipality of Rotterdam introduced a refugee center in the neighbourhood there was a lot of protest from the inhabitants. Newspapers reported on a funeral procession organized by the inhabitants. There were however also many inhabitants that volunteered to help the refugees once they had taken up their residence.

Only 38% of the Beverwaard inhabitants say that they are proud of this neighbourhood. Inhabitants don't feel a connection with the place where they live as much as inhabitants of other parts of Rotterdam. Words they mostly associate with the area are: quiet, comfortable, green and unsafe. Positive and negative associations both exist in the neighbourhood; 46% of the inhabitants has a positive association with the area, 41% has a negative association.

Perceived image or neighbourhood reputation also needs to be considered when exploring area effects. The origins of a neighbourhood’s image are complex. However images influence the creation of networks and social capital (Cattell, 2001). When a neighbourhood is perceived as unsafe, unpleasant or negative in another shape, the inhabitants are less likely to engage in neighbourhood based social networks.

Figure 50 shows the associations non-inhabitants of Beverwaard have with their neighbourhood.

Figure 50. Words associated with Beverwaard by people that do not live in the area (SmartAgent, 2012)
4.2.3 Conclusion

We now compare the found characteristics of social interactions in Beverwaard to the ObeCity model. We analyze the different elements and see why and whether day are important to incorporate later in design or not.

Based on the lifestyle research in this neighbourhood we can conclude that group oriented people are dominantly represented in this area. This means that group bonding (12) as well as group bridging (13) icons become more dominant for design of public space. These group oriented people use public space differently than individual oriented people so public space should be adjusted to the (lifestyle) preferences of group oriented people. In order to facilitate an area for bigger groups of different ages and compositions the areas should be big enough to provide a comfortable interpersonal distance and accommodation (22) to perform the activities intended.

When safety is warranted the element of surprise (4) can be part of the social behaviour. Children can experience new contacts and get to know new kinds of norms and values while being outside. The element of surprise in the public space on a social level is quite well thought off. Space is programmed by schools and daycares to create different occasions for groups to meet. On a spontaneous level there are no specific elements in public space facilitating this behaviour. So this icon is important to incorporate in future design of the neighbourhood: spontaneous social contact should be facilitated more by for instance the use of art or other collective elements.

The importance of group related activities or this neighbourhood has consequences for design of urban space. Group bridging exists of three phases: observing, playing together and forming new relationships. So a child needs to observe others in order to assess the social status of these others using the space. Therefore the lighting (35) in the public space needs to be well sufficient for days and evenings.

In the second phase, playing together before starting a new relationship, enough interpersonal distance (34) in necessary to create a comfortable and socially safe space to facilitate these new encounters. The orientation of enclosing buildings towards public space increases the safety of the environment because the area is overlooked by people in these buildings.

Group bonding affects the public space in a different way. This type of groups are familiar with each other, like families or friends. For these groups the public space offers a sense of privacy and personalization (40). Some aspects of the public space signify the presence of these groups. Programming certain types of play invites for these specific groups of people to use a certain space for a specific amount of time.

Figure 47. ObeCity model #02.1 (author)
Figure 51. ObCity model #02.2 (author)
4.3. PLAY ENVIRONMENT

The differences between the preferred neighbourhood in the ObeCity model and the neighbourhood current composition are discussed. Current play behaviour facilitated in the neighbourhood is studied using data from Veldacademie, OBI and theory. Based on the found comparison the model is adjusted.

In the theory on social epidemiology we saw the importance of play for establishing new norms. Norms that affect the physical activity behaviour are established by the social network of a child. The child copies the behaviour of the environment and relates to these norms as his/her own. Through play the norms can be reevaluated. Imagination, the creation of small worlds and surprise contribute to this reevaluation and should be incorporated in the play activity. Dramatic play is a type of play that is purely based on the role of imagination in the play experience.

Different types of play can be combined with this level or imagination. Functional play is playing for the sake of motoric movement. This behaviour is a key element for stimulating physical activity among children. Running, balancing, jumping etc. all contribute to the child physical activity patterns. Construction play is play the creation of things through play, often with loose materials. Games with rules and exploration both guide physical activity behaviour in a more organized way than the other play activities. The urban space facilitating this behaviour should be more organized and regulated.

The play environment of the child facilitates these play activities. We saw challenge, surprise and functionality as important elements for the play environment. Now we compare these elements to the situation in Beverwaard to see which elements need to be addressed in design.
4.3.1 Composition

There are two main types of play compositions in the area. The open field provides accommodation (in most cases benches facing the playground) for others to watch the play activities. The play activities often consist of swings and a climbing frame.

The other type is the climbing frame within the courtyard. Most courtyards are adjacent to backyards. In order to create some privacy most backyards are enclosed by walls or fences. These courtyards playgrounds are therefore often less overlooked than the playgrounds outside of the courtyards. The playground on the fields are often targeted to a little older group of children.

Ground markings are used in the soft material underneath the play equipments. Sometimes this is green, relating to the grass the play equipment is in. In some cases this is a prime color, making the playground stand out in the environment.

4.3.2 Pokemon Go

A popular game last summer was Pokemon Go by Nintendo. The players could download the app on their phones and through augmented reality explore the neighbourhoods to ‘catch Pokemon’.

In the game visually interesting places in the neighbourhood were transformed into either pokéstops or pokegyms where you could train your pokemon and become better at the game. These spots were mapped by the Veldacademie, resulting in a map of selected places for pokemon. We see a higher density of pokéstops in the south of the neighbourhood.

These pokéstops and pokegyms are usually marked by visually interesting places. In the picture on the left we see these places in Beverwaard. We see a high amount painted elements, views, or markings. These elements normally had no specific function to the children but became interesting when they meant important places for their game.
4.3.3 Play locations

The play locations in Beverwaard are distributed among the neighbourhood. We see a high density of play spaces in the north east side of the neighbourhood. Here the combination of open areas and courtyards results in the placement of many play equipment tools.

Courtyards are typical for this neighbourhood, the cauliflower neighbourhood. The courtyards provide safe room for children to play, while their parents are close. We see this type of play mainly in the North side of the area.

In the rest of the neighbourhood the play equipment is restricted to open areas. Fields of grass or an official playground provide room for children to play. There is not much variety in the play spaces. Many spaces consist of a slide and a climbing frame. Soccer fields are scattered over the neighbourhood as well. In some areas the fields have a clear boundary, goals and lines on the ground. In other areas there is only one goal, or no goal at all. The field of grass implies the use of children for soccer by traces in the grass.

At the West side of the neighbourhood more official places for soccer are located. Here the playground Stormpolder is situated, the official playground for the neighbourhood. One could become a member here and join the activities. Also sport association for soccer and baseball are situated in the West area.

4.3.4 Programmed play

Inhabitants state that the neighbourhood organizes enough programs for children. Only 27% of the inhabitants is a member of a sports society or club. This is lower than the Rotterdam average of 36%. Many inhabitants don’t play sports and don’t visit in cultural facilities.

Children in Rotterdam struggle with their weight more than children in other parts of The Netherlands. In the past years we have seen a small decline of overweight kids in Rotterdam. The “Lekker Fit” program seemed to work on municipal scale. In Beverwaard however we see a rise of overweight kids in the past years. The group of children with obesity doubled in the last five years while in schools in Beverwaard implemented the “Lekker Fit” program.

Since 2013 there is an active Facebook community for Beverwaard inhabitants. This Facebook group gives insight in the activities that are taking place in the neighbourhood an IJsselmonde. Community centre ‘De Focus’ and playground society ‘Stormpolder’ are mentioned a lot on this Facebook page. ‘De Focus’ for instance organizes community dinner every week, where lower income households in the neighbourhood can get a cheap meal. The ‘Stormpolder’ has its own Facebook page as well. They target their festivities especially to young children and their families in the neighbourhood.

Inhabitants and people outside of Beverwaard are able to react on the content. According to the Facebook data an amount of 6000 likes are given to content on the page per week. 980 persons mention the page in a Facebook message and 6150 people follow the page in general.

Neighbourhood festivities like carnival, sport festivities and special holidays are celebrated in Beverwaard and later reflected on by an after movie or short report on Facebook. People share their personal stories on the Facebook as well. When there is a problem, someone lost an item or there has been a break–in, this information is shared on this Facebook as well.

Figure 54. Playgrounds in Beverwaard (van der Maas, 2016)
4.3.5 Conclusion

We now compare the found characteristics of social interactions in Beverwaard to the ObeCity model. We analyze the different elements and see why and whether day are important to incorporate later in design or not. In this paragraph we explored the play environment in Beverwaard. We saw that there are not many challenging playgrounds offered to primary school children in this area (37). Most play spaces contained mainly a slide and a climbing frame. These types of playground were placed either in courtyard adjacent to backyards, or in open fields further away form the home environment. When we can link the different types of play to spatial indications in the neighbourhood. We see that this neighbourhood misses the element of surprise, for the play spaces are all relatively similar (34). This element could facilitate play types like dramatic play and exploration in the neighbourhood. Horizontal relief (38) could contribute to the element of exploration when different in levels invites for further explorative play.

The interstitial (25) and polycentric (24) aspects are already quite well represented in the area. The playgrounds are distributed throughout the neighbourhood as a whole. They are interstitially integrated in the urban fabric, especially in the courtyards, becoming part of the daily routes the children pass. Ground markings (39) are more restricted to the play area, but are in most cases present on the playground territory. They refer more to lower scale solutions while they could also play a role in bigger scale.

More than enough room was provided for games with rules (09), safety (14, 32) and functionality of the playgrounds. The playgrounds were all quite regulated leaving little room for interpretation. Also no loose materials (16) were provided to engage in construction play (06) or compose elements of the playground.

More individually oriented social situations like solitary (10) or parallel (11) are underrepresented but not, as research has shown, unimportant for a child’s play behaviour. Therefore these icons are made bigger, underrepresented in this area, and should be stimulated more in the design of public space. However the main public spaces should be able to facilitate groups of people, for we saw in the analysis of the social situation mainly group oriented people live in this neighbourhood. Spaces for individual or parallel play should be safe. Accommodation of others that can observe is important for this form of play.

So what this play environment needs to focus on is the challenges that the environment offers to the children. The children gain in abilities when throughout childhood and the environment of Beverwaard does not offer enough affordances for the children to excell in these abilities. Therefore the current play situation in Beverwaard doesn’t contribute to the reduction of the obesity epidemic.
Figure 54. ObeCity model #02.3 (author)
4.4. OBE CITY MODEL #2

The ObeCity model has changed in priorities throughout this chapter. We saw that traffic and water solutions were already well integrated in the urban design. Patterns that gained priority were related to social interaction, imaginative play and personalization of space.

We now know the priorities for design in this neighbourhood. When we rearrange the patterns looking at the ones that gained priority we see that a combination of surprise and dramatic play can be made. Children can experience surprise as a part of their play activity. The variation in street patterns can be linked to the patterns related to the slow traffic structures in the neighbourhood. Social Bridging can be part of the element of surprise when combined with a safe amount of personal distance.

This way possible solutions for Beverwaard are prepared. Next chapter we relate this to the perception of the children.
Figure 54. ObeCity model #02.3 (author)

Figure 55. ObeCity model #02 (author)
5. CHILDREN
The ObeCity model is now adjusted to the local context of Beverwaard. During the Participatory Action Research, children in Beverwaard participated in a design process to promote outdoor physical activity behaviour in their neighbourhood.

The PAR led to data on the current physical activity behaviour of the children, their social environment and how they perceive the urban environment. Besides the data resulted the PAR process in design ideas that the children developed design ideas to improve their urban environment.

The combined data of the current situation and dreams of the children is compared to the ObeCity model for the aspects urban design, social interaction and play behaviour. In paragraph 5.3 the ObeCity model is adjusted for the last time.
RESULTS → chapter 3

METHODS → THEORY

1. LITERATURE STUDY
   - social contagiousness
   - obesogenic spaces
   - ObeCity model #01

2. CONTEXT ANALYSIS
   - morphology
   - social interaction
   - play environment
   - ObeCity model #02

3. PARTICIPATORY ACTION RESEARCH
   - data collection and analysis
   - ObeCity model #03

4. DESIGN
   - references
   - additional design requirements

URBAN DESIGN

CHILDREN

CONTEXT

THEORY

CONTEXT URBAN DESIGN

REFLECTION

CHILDREN

play environment

social interaction

morphology

inspiration

personal style

child participation

lesson program

urban design intervention

discussion

ObeCity model #02

ObeCity model #03

ObeCity model #01
5.1 CURRENT USE

During the Participatory Action Research process the children were involved in the design of their urban environment. The current use of the neighbourhood compared to different patterns in the ObeCity model is discussed in this paragraph. According to the findings the model is adjusted.

During the first lesson with the children the course of the design process was explained. A total of four lessons was scheduled to complete the full design process. The lessons consisted of analysis of the environment, creating a concept, placing the concept into the context and making a prototype.

In this chapter the current use of the neighbourhood is discussed. During the analysis phase the children analyzed the current situation in the neighbourhood and their own behaviour. They used a word cloud to get notion on what is healthy. Drawings to understand their perception of the neighbourhood and their direct urban environment. In a diary they kept track of their daily activities, company and spatial behaviour for one week. Finally in the picture assignment they took pictures of their neighbourhood and assigned positive or negative value to it.

The children gained a better understanding of their environment through these lessons. This resulted in the creation of concepts resulting from the analysis phase. However the analysis phase provided data for this research to test the ObeCity model to the current use and perception of the neighbourhood by the children as well. In this chapter an overview of the data provides insight in the perception of the children.
5.1.1 Awareness

During the first lesson the researchers explained to the children that this project was about health promotion. In order to understand the perception of the children on health they formed groups to make a word cloud. They answered the question: what is healthy? Healthy eating and aspects of healthy eating were mentioned a lot, however in this analysis we focus on physical activity and environment.

First we discuss the words on physical activity mentioned by the children. One of the most expressed words was sport. The children expressed the relation between sports and health clearly, every group wrote down sports at least once. They described the types of sports they perform at school on a weekly basis: gymnastics and swimming. Also basketball, water polo, soccer, baseball, tennis and volleyball. Some of the children performed these types of sports outside of school or knew people who did. Soccer is the sport that the children also play at the schoolyard before school or during breaks, on the schoolyard a soccer field is made for this purpose. Other examples of types of physical activity, less common sports, were shown as well. We see skateboarding and skating as more informal types of sport, possible to play in the streets. Also street dance is mentioned. This type of dancing is particularly popular in Beverwaard. On the Facebook page of the neighbourhood several short movies appear of young girls performing street dance on the streets or in the parks of Beverwaard. They take their own music and record their performances. Reactions of other neighbourhood inhabitants on this medium are positive. The type of sport that is less common but still mentioned by the children as healthy is pool dancing. Whether the children performed this sport or knew someone who did, did not become clear from this short word cloud exercise.

Besides the official sports, general physical activity was mentioned by the children as well. Playing outside was mentioned 8 times, running and cycling both 7 times and walking 4 times. Playing in general, without the mentioning of inside or outside, was mentioned 2 times. Walking the dog was also mentioned once. It was clear that the children knew physical activity was important to stay healthy, and playing is part of that.
The newest game that was mentioned two times was Pokémon Go. The children play this augmented reality game in their neighbourhood, where they are able to catch and train digital Pokémon. The game was very popular with the children, once one group shared it with the class as a healthy game, the others happily confirmed. The reason for the game not mentioned more than two times is probably because children did not associate this game with health or the popularity had already decreased since the summer. The availability of WiFi was also mentioned once as healthy. The children thought that it was important to be able to look up things you did not know and be connected to people that could help you when you were lost.

Besides food and sports, the children expressed a wide view on what they thought was healthy in the word cloud assignment. Sleeping was mentioned 5 times. They understood that getting rest and sleeping enough was important to stay healthy. Reading was also mentioned 5 times and brushing your teeth was mentioned 4 times. Taking care of yourself, getting rest, developing skills and personal hygiene was important to them to stay healthy besides activity and food. Thinking, making music and singing were mentioned in this line of thinking as well. What is interesting to see is that besides these individually focused healthy habits, positivity was also important for the children. ‘Being happy’ was mentioned one time and ‘smiling’ three times. Physical appearance was only mentioned once as ‘thin’, referring to looks.

The children expressed very little aspects of health that related to sociocultural or cognitive elements. Playing and playing outside was however mentioned a lot. The children related this aspect of being healthy to physical activity but not necessarily to the social benefits it would have. Social activities were not linked to health in this exercise. Some children however mentioned cognitive aspects of the individual as healthy, for example laughing, living, learning, thinking, being happy, singing and making music. These phenomena show that the children know that being healthy is more than just eating and exercising. So the children did not link social activities to health, but they did mention the playing context.
In the word cloud the children described several elements that related to the physical environment in the neighbourhood. 'When the sun shines' was related to a positive health, children mentioned that they were happier when it was sunny and that they could go outside more easily. Fresh air, plants, trees and nature were mentioned as well. The children thought that it was important to be surrounded by a clean and green environment in order to stay healthy. These elements appeared only later in the word cloud exercise, and were not mentioned as many times as food and sports. However almost every group related to at least one aspect of the urban environment.

So with this word cloud the children expressed a broad view on health. Interesting is that the elements of their physical environment they mentioned relate to elements we found important not necessarily in active design, but in more traditional urban design for health: light, air and space. The broad range of physical activities they mentioned expresses the importance of this for the children to be healthy. When the urban environment would offer spaces to exercise these types of activities this would relate to the children's perception of health. The individual aspect of health, personal development and positivity, are in line with the current trend we recognize in health, the individual complex approach. These 9 and 10 year old children are aware of the fact that taking care of yourself is important. This could be a first step toward taking responsibility for once own health.
5.1.2 Home environment

In the second exercise the children drew their neighbourhood. Through this exercise the researchers gained more insight in the perception of the children to their home environment. The children drew the analysis form memory. The researchers gave some direction on what they could draw. The children were asked to draw their homes, where they come often, where they play and where they walk. The elements that they drew most are placed in the word cloud in figure *. The elements that the children drew were placed into categories. We recognized four different categories: buildings, roads, play equipment and natural environment.

The first category is buildings. The children drew buildings in the neighbourhood that they find important. Most children started by drawing their home. Some drew their home very detailed, with curtains, interior pieces or detailed facades. Other children drew a simple home, consisting of a square with a triangle roof. The detailed homes often contained curtains or flowers behind windows. One of the children drew his home as an apartment block, placing himself and his family on the second floor. Another home we saw a lot was the Dutch ‘rijtjeshuis’, where the home was placed in a street with other homes attached. Besides their home other buildings that the children drew were the school. Many children walk or cycle to school every day, making this a vivid part of their living environment. Some children wrote on top of the building simply the word ‘school’, others the name of the school ‘Regenboog’. The other location of the school was indicated with ‘hoofdgebouw’.

The children drew the building Hoogvliet several times in the analysis drawing. Hoogvliet is the local supermarket where most of the Beverwaard inhabitants to groceries on daily basis. Some children even drew the interior of the supermarket. Other stores that were drawn were supermarket Lidl and snackbar Verhage. In one occasion the GP had a prominent place on the drawing (see figure *). Other buildings the children drew related to the homes of friends, family or acquaintances. These elements will be further explained in the paragraph family ties.

Figure 59. Child analysis of neighbourhood PAR
The second category of drawing elements is roads. Many children drew roads to link the different elements on the drawing to each other. Roads were drawn in many different ways: some children drew thin lines, others open lines and some dotted (see figure). On the dotted lines the roads functioned as just the connection between different destinations. On these lines often a car or human figure was drawn to indicate the movement. On the open lines an indication was given on the environmental aspects of the route. For instance which other homes were passed, how wide the road was or the parks and trees that were placed near the road.

The sidewalk was often drawn separate from roads for cars. This shows the separated pedestrian roads in the neighbourhood. The roads that are used by the children are often different from the roads that are used by cars. However in their appearance in the drawings they did not differ. Figure x shows the sidewalk indicated as tiles with the mentioning of ‘steen’ (rock).

In some occasions the children drew parking spaces very prominently on the map. These parking spaces were placed near buildings or homes and sometimes with cars. In theory we saw that parking spaces often take up potential play spaces. In Beverwaard the cauliflower structure creates small parking plazas that are placed near pedestrian roads. Also near every home is enough place to park your car close enough to walk. The generation of ‘achterbank’ children is used to walk from the front door of their home to the parking space of the car and go their destination from there.

The third category of elements the children named was play equipment. The children sometimes just drew the outlines of a playground, calling it ‘playground’. This often indicated a playground that they did not use much. In some cases the playground related to another age category or the children were simply not interested in the type of play activities that could be performed there.

![Figure 60. Child analysis of neighbourhood PAR](image-url)
However most of the children gave a more detailed description of the elements of a playgrounds. We saw many swings, slides, seesaws and climbing frames. These play elements were not necessarily placed in the playground environment. Most of the children placed one element of the playground, for instance the swings, close to their home on a field of grass. Also the soccer field was often placed close to home. The children did not show much variety in the play equipment that they drew in the neighbourhood, accept for the schoolyard.

The schoolyard was often drawn relating to play equipment or play activities. The play equipment drawn in the schoolyard was very different from the play equipment in the rest of the neighbourhood. Accept for the soccer field the climbing frames here were drawn more extensively and with other colors. Many children use the schoolyards outside of school hours to play. It is an enclosed area where they can play without being bothered by strangers.

The last category of elements drawn by the children was the natural environment. Many children drew elements relating to a field of grass, trees or even a forest. Of course soccer fields and basketball fields related more to the activity taking place than to the actual field. A notable example of natural elements is the drawing below (Figure 61).

This participant drew her own home small on the map, leaving much space for spacial places in her environment. Most children drew their home as the biggest element on the map, which makes this drawing stand out. Instead of the build environment she filled the space surrounding her home with grass. In the grass roads are drawn as dotted lines leading to several different destinations. On the road at one point a bridge is drawn. As destinations she drew forest, water, bridge, playground and fields of grass, higher or lower grass. The most special element none other kid drew was the place that provided good WiFi. She drew two playgrounds, and a place called 'secret spot'. By this she gave the map

![Diagram](Figure 61. Child analysis of neighbourhood PAR)
a certain mystery and treasure elements to it. The natural environment was significant on this map, providing not only direction but a destination in itself.

Only one other child had drawn water in the environment. Water plays a significant role in the urban design of this neighbourhood, where the structure is based on the old polder structure. However almost non of the kids drew these elements. Another element on some drawings relating to the natural environment was the field of ‘artificial grass’. This was a relatively new soccer field. There was only one soccer field with artificial grass in the neighbourhood so when the children talked about this field others knew what they referred to. The field was clean and fenced which made it a popular soccer destination.

So from all the elements that were drawn by the children we recognized four clear categories: buildings, roads, play equipment and the natural environment. In all categories we distinguished the differences between elements that were drawn as a destination and as just a marking point. We noticed that mainly buildings and play equipment functioned as the destination for children. Natural environment only functioned as a destination on rare occasions. There was little to no difference between roads meant for pedestrians and roads that could be used by cars as well.

Figure 62. Overview of all elements and amount of elements drawn by the children (author)
5.1.3 Transportation

The transportation the children used to move through the neighbourhood was measured through two different means. On their drawings they wrote how they go to school. In their diaries they wrote how they went to all other types of activities as well. In this chapter we combine the data from the children of the drawings and from the diaries.

During the first lesson the children wrote on top of their drawings how they go to school. Most of the children wrote down more than one type of transport. This indicates that it depends on other factors, changing per day, what type of transport they use. Most of the children walk to school, 51% of the children wrote this down. When school ends notable throughout the neighbourhood are the groups of children walking home together. The lessons were given not in the main school building, but in the ‘dependance’, just around the corner of the main building. Here groups 6 to 8 take class. In this building most children walk home by themselves. Almost no parents come to pick them up or drop them off unless there is a special occasion.

When they walk home in groups the children that came by bike often ride their bike along the group, slowly. Pedestrian streets with wide curbs accommodate these groups with different transportation means. At the rear of the schools the bikes can be parked. There are some shields to protect the bikes from rain and there is room to lock the bikes to a fixed point.

10% of the children wrote down that they come to school by car. This was often coupled with biking or walking. In some occasions these children are taken to school by car. Near the school there is lots of room to park the cars or ‘kiss and ride’. From the diaries we saw that during the week the children stay mostly in the neighbourhood. Their main transportation mean is by foot or bike. During the weekend they perform other type of activities. Activities like sports or a trip to the zoo are performed outside the neighbourhood. Therefore during the weekend the car is used as a transportation mean more often than during the week.

Twelve percent of the children used motorized means to come to school. In the diaries we also saw ‘scooter’ as a mean to travel. One child wrote down to come to school by public transport (metro, tram and bus). When we look at the geodata we see that two children in this group live outside the boarders of Beverwaard. Public transport connections with these other areas of Rotterdam are quite extensive. A tramline crosses the neighbourhood from north to south and leaves around every 15 minutes in a direct connection to the center of Rotterdam. At the Southside of Beverwaard a ‘P+R’ is situated. This is a free parking spot for visitors of the city center so that they can avoid the traffic in the center while getting there comfortably by bus or tram. One tram and many different buses leave from this location.

So during the week the children move through the neighbourhood mainly by themselves or with groups of friends. They use walking and biking to move through the neighbourhood. In the weekend they go to locations outside the neighbourhood where adults take them by car. Active transportation is already quite common in this neighbourhood. Interesting was that the commute, like ‘to school’ or ‘going home’, was often mentioned as a location or activity instead of transportation in the diaries.
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Figure 64. Filled out diaries (author)
5.1.4 Activities

For one week all children kept a diary. In this diary they listed the activities they engaged in per day. The activities were, in analysis phase, divided in 9 different categories: play, food and drinks, screentime, physical activity, personal care, homework, trip or excursion, chilling and sleep and other.

The most named categories were on the one hand play and on the other hand food and drinks. They both were assigned to 20% of the total activities. Screentime, like watching tv or computer, was mentioned for 14% of the activities. Physical activity, like soccer or cycling, was mentioned for 13% of the activities. The categories personal care and sleep were assigned to activities the children mentioned like ‘waking up’ or ‘shower’. They were both assigned to 8% of the activities. Study, like homework and reading was mentioned for 4% and a trip like going to a party was mentioned for only 3% of the time.

The category ‘other’ includes the activities that were mentioned by the children less frequent like chatting, cleaning or making music. Interesting to see was the activity called ‘outside’. The children mentioned the location where they were as an activity instead of just a location.

The children mentioned play for 20% of the activities. A variety of activities different types of activities were shown in this category. Of all play activities, 66% was assigned to an outside location, while only 27% of the play activities were inside.

In the inside play category, many of the activities were described by just stating ‘playing’ or ‘playing inside’. Occasionally they mentioned playing types like with lego, drawing or playing games. The location was often mentioned in terms of ‘at grandma’s’, or ‘in my room’. The location that was mostly mentioned for playing inside was home. A distinction was made between living room and bedroom. Other locations that playing inside was assigned to were homes of friends, family or at school during lunch break. The company was often small, the children mentioned being alone, with ‘a friend’ or ‘my sister’, a maximum of three people engaged in playing inside.

More the half of the playing activities were outside play activities. The type of activities varied a little, but most of the time children mentioned ‘going to the playground’, just ‘paying’ or ‘playing with friends’. Some children specified their activities by mentioning ‘hide and seek’, ‘playing tag’ or ‘water fight’. When the playground was involved the children also mentioned challenge games like ‘who can swing the highest’ and dramatic games like ‘vadertje en moedertje’. We see a higher variety of locations mentioned for playing outside. When home, a friend’s house or the house of a family member is mentioned the children played outside in front of the house, in the garden or at the back of the house. The inside location was stated as the area they moved around from when they played outdoors.

Most of the time they assigned friends as a company to play activities. Companies were often bigger than when the children played indoors. Groups of friends consisted of three people on average. Many children described playing outdoors as an activity they performed alone, the children did not further elaborate on their specific play behaviour when they were alone. They did go to more familiar places when they were alone compared to when they were in a group. Locations like schoolyard, just the garden or a specific square. Classmates were mentioned as a company as well,
often related to activities performed in the schoolyard during lunchbreak. Also siblings or family members were mentioned as play company. Interesting to notice was that friends and family did not mix during play activities. Only one time they were mentioned mixed during the same play activity. These groups remained divided during the rest of the play activities. Adult family members like parents, uncles and aunts or grandma often were mentioned when the children went to a special place to play outside like the beach or ‘stormpolder’. When friends were involved the play activity happened in a more generically described area like ‘outside’ or ‘at the playground’.

Activities that the children mentioned that involved **screentime**, were mostly performed indoors and alone. When watching tv was mentioned, family members sometimes joined. Most of the screentime was performed at home. Friends often joined when a computer game was played. There were some interesting combinations of screentime and being performed outside. These outside screentime activities were performed on smaller screens like telephone or PS4. The game Pokémon Go was mentioned as outside screentime once in the company of friends. During the lessons the children mentioned Pokémon Go as one of their favorite games to be playing in the past summer. During the picture lesson the children took some pictures of places that functioned as ‘pokéstops’, places where they could catch Pokémon during the game. Most children explained during the lessons that they had their own Youtube-channel or other online sources on which they shared stories with their followers.

In the category **physical activity** we see, like in the play category, most activities being performed outdoors. In this category we see a mix of official sports, performed in a club with a trainer, and unofficial sports performed without professional supervision. The activity the children mostly named as indoor physical activity was swimming. They swim once a week, organized by the school during school hours. Other official sports we saw indoors were dancing (Spanish dancing and street dance), kick-boxing, horse riding and gymnastics.
Walking, cycling and running were mentioned in the physical activity category outdoors. These activities were often combined with commute from home to school or other locations in the neighbourhood. In some cases cycling or running were not assigned to a specific location or with a specific purpose. Dog walking and jogging with the company of family and friends were named as specific physical activities. Another outdoor physical activities that was mentioned a lot was soccer. This activity was mostly performed by boys and at a soccer association, but also in the schoolyard before school started. Children refer to ‘that field’ or ‘the schoolyard’ as locations were soccer was mostly performed. Another official sport that was performed outdoors besides soccer, was baseball and street dance.

During the week we didn’t see as many trips or excursions as during the weekend. During the week ‘stormpolder’ together with a family member was the most named trip or excursion. In some occasions there was a birthday party and some children visited family during the week. Grandma was the most visited family member. In the weekend we saw families engaging in trips or excursions on a bigger scale, visiting other cities or doing day trips to for instance a theme park.

The type of company the children described was in analysis phase divided in 5 different categories. These categories are friends, family, friends & family, classmates and alone. These categories were assigned to the activities by the children. Interesting to see was they did not mention the company of unfamiliar people during certain aspects of activities. ‘Alone’ was assigned to most of the activities the children engaged in.
5.1.5 Family ties

Most of the children in Beverwaard live in broken families, divorced parents. Some parents found a new partner and started a new family which made the composition of some families mixed. What was interesting to notice during the picture-walk, was that some children explained that their parents were separated but lived closely together in the same neighbourhood. Also other family members like grandma’s and aunts and uncles were lived close. They could walk to their homes and see them during the week or are taken to their homes by car. Some children drew their family ties during the analysis lesson (see Figure *). They related to family homes or neighbors in their drawings as marked points on the map. In this drawing and after short elaboration of the participant we notice that the environment is quite unfamiliar to this child. She drew the left side of the drawing. The destinations are drawn but places in between are just dotted lines. She and other children mentioned that their parents did not let them play outside a lot. Mainly girls mentioned that their parents would not let them go outside alone.

The children in this neighbourhood often deal with social problems in the home environment. Some children live in families that are supported by government funds or child care institutions. Sometimes this has to do with financial problems, but most of problems relate to social difficulties at home like violence or neglect. Foster care is not an uncommon institution in this neighbourhood (source*). Children that have experienced escalating problems in the home environment are placed in this trajectory. In some cases they are placed in homes separated from their brothers and sisters. Teachers at ‘de Regenboog’ deal with these situations on a daily basis. School functions as a stable place for children that don’t have much stability at home.
5.1.6 Visited locations

During the week the children visited different locations in the neighbourhood and outside the neighbourhood. In their diaries they recorded the locations of these activities. After data analysis the locations that they visited most were visualized in the Figure 69. The size of the circle indicates the amount of visits during the week. The color differs per location. Some locations contain smaller circles in the bigger circle, this indicates the different words used by the children to explain that location.

Most of the activities they described were assigned to the home location. Of course the children were at school during the week as well, but the diaries were designed for locations outside school hours. The schoolyard was a popular location to play outside of school hours. Related to the home environment were the activities taking place in the garden or on the balcony. These private areas provided outside space for play activities within the privacy of the own home. Other locations related to the home area were on the street in front of behind a familiar home. Friends and family were popular destinations for the children as well. The most visited family member is grandma.

The children described that they played outside a lot. They however did not assign a clear location to the outside location. Just ‘outside’ was mentioned mostly, but somewhere, or just the neighbourhood in general was the only description of these locations. In the natural environment and in playgrounds a more detailed description was once given in ‘the blue square’ or the specific location the ‘stormpolder’. When a specific activity was taking place, like shopping or sports, the children were more likely to describe a clear location like a specific store or sportsclub.

So only clear activities gave the children indications for a clear description of locations. Adding clear characteristics to the environment could help the children play with an assigned purpose. Also they could give a more clear description on their whereabouts to parents or other kids.
Figure 69. Analysis visited locations by the children during one week.
5.1.7 Neighbourhood aesthetics

During the third lesson the children made photographs of their neighbourhood with disposable cameras. Still in the classroom the researchers explained to the children how the cameras worked and what they were supposed to take photographs of. The children did not immediately recognize the devices as cameras for most of them have their own mobile phone with camera function. The classroom was divided in six groups and per group one researcher guided a tour through the neighbourhood. The sizes of the groups varied from three to six children per group. Every group got a map of the neighbourhood with a predetermined route they were supposed to walk. The researchers predetermined the routers to make sure the children would be back at school within half an hour, before their next class. If the children wanted to walk a different route to show special elements in the neighbourhood this was possible, but the time restrictions stayed the same.

The children decided on how they divided the tasks during the walk. Most of the groups took turns in taking photographs, dividing the limited amount of photo's on the camera among the group members. Other group members read the map, not every child was able to do this, and filled out the stencil of which we talk more in the next chapter. During the walk the researchers asked the children questions about their neighbourhood, about where they go often, what they liked and with whom they went somewhere.

Not all pictures were taken correctly, the children experimented with the functioning of the camera. However after analysis of the photographs, it became more clear which elements of their urban environment were important to them and which elements they did not take pictures of. We distinguished 11 categories of pictures. The categories are roads, other children, grassfields, singels, play equipment, dirt, buildings, bushes, schoolyard, researchers, parking and others.

**Roads**
Most pictures were taken from roads. These pictures we could divide into pedestrian paths, 21 pictures, tiles, 10 pictures, streets, sidewalks and paths at the rear of homes. There are many pedestrian paths in Beverwaard. The pictures of these paths the children took were often near a singel, waterway, that is typical for this neighbourhood. Children walk these routes mainly by themselves or in groups. When they walk in a group, the children that came by bike cycle slow to keep up with the walking group. Most pedestrian paths were indicated with signs or small poles were placed at the beginning of the path to stop bigger vehicles from entering the path. Some of these roads were at the rear of the homes, often enclosed by wooden garden fences. These roads are often plain and offer little to do for kids other than walking or running. Some of these paths lead to playgrounds, others are just crossings or shortcuts to get through the neighbourhood fast. The children stated that they liked the 'good nature' in the neighbourhood, the 'pretty flowers' especially. They also liked the streets with good hiding spots for playing hide and seek.

Other pedestrian paths that were photographed were in 'the forest' as the children called it. This is the park near the A16 for pedestrians and cyclists (and often their dogs) only. Some of these paths are unpaved, which gave the children the adventurers are forest like feeling. Not every child was allowed to walk in these parks by themselves, some parents restricted the area when they were alone or at night, others the area all together. The children described the 'forest' as a good place to walk, but sometimes there were homeless people which they described as 'scary' and 'dirty'. 'And at some point a bag of cannabis was found, and fire was set to the hut we built'.

The pictures that were taken of tiles give some insight in the types of surface the children deal with when they walk through the neighbourhood. Two pictures were taking of tiles and a manhole or well. Whether the children took these pictures on purpose or accidentally, did not become clear from analysis. We therefore don’t know for sure what they think about the surfaces in their neighbourhood. What we did see in these pictures is that when the children look down, most of the time the surface is the same. The only surface on the pictures were bigger or smaller gray tiles. In some occasions they walk on grass or rubber tiles, but most of the surface in Beverwaard is covered in gray tiles. ‘Colourful’ was described as an asset by the children: ‘I like this street because there is a lot of colour.'
Figure 70. Overview of all picture taken by the children during the fieldwork lesson categorized in themes (author)
Other kids
Second most photographed thing by the children was other kids. One assignment of the walk is to take a picture of the group all indicating the number of the group so that the researchers could trace back the pictures to the route that number walked. However besides the picture of the group the children enjoyed taking funny pictures of each other and themselves, turning the camera to make a selfie.

Grass fields
Third most photographed element were grass fields. In most areas the pedestrian routes are placed directly besides grass fields. In some grass fields a little horizontal relief creates some visual attraction. In other places the grass fields are just on the side of a waterway or the entrance of a park. Most pictures of grass fields were however soccer fields. There are some official soccer fields in Beverwaard. Some of them are fenced, others are just on open grass fields. The fenced once are placed in official play gardens like Stormpolder or they are a central element in the neighbourhood. When they are placed in the neighbourhood the soccer fields do not necessarily have a grass surface, but tiled. Fencing of the field varies from vary high in the Stormpolder to lower fencing in the neighbourhood and no fencing in the parks. The children were appreciative of soccer fields close to their homes. They specifically liked the soccer field near the Stormpolder and the artificial grass soccer field. Some children stated that just a field of grass, without play equipment, was boring. They preferred the fenced soccer fields because the ball always stays on the field.

Singels
The children took 19 pictures of singels. They play a dominant role in the initial neighbourhood design and still form the grid of the structure. They function as the indicators of pedestrian routes in the neighbourhood. We were able to walk along most of the waterways. Along the waterways a number of trees were placed. In some areas these blocked the view to the other side of the water. The children found these waterways not very appealing to the environment. They stated that the ball ends up in there when they play soccer. They described the water as dirty, ugly and full of death fish but in some cases they liked the view and pretty nature.
Play equipment

The children took 17 pictures of playgrounds or play equipment in the area. Almost all of these pictures contained a slide. They were too big to use the play equipment as this was meant for and often used it in other ways. If the equipment was a little bigger the children used it to climb on and to sit and talk to each other. The surface of the play environment is different than in the streets. Tiles on playgrounds are more colourful and often softer material. When the children described what they liked and disliked in the neighbourhood they stated functional play equipment as their most liked items. They preferred playgrounds with many different types of equipment where they could ‘do a lot’ and spaces that were spacious and close to home.

Filth

What was interesting to see is that the children took almost as many pictures of filth as they did of play equipment. As opposed to play equipment filth was described as the most disliked element in the neighbourhood. The number one filth that was photographed was dog poo. Children stated that dog poo often interfered with their play behaviour because people walked their dogs on grass fields where soccer fields were placed as well. One participant marked the dog poo as ‘not nice, but funny’. Parks, grass fields and areas near trees were therefore often avoided by kids who wanted to stay clean. Three pictures were taken of dogs that children bumped into during their walks. The dogs were described as a nice element in the neighbourhood because ‘they are cute’.

They also took pictures of small litter on the ground: plastic bags, empty bottles and pieces of paper. Filth in the water was for the children particularly filthy and ‘not good for the water animals’. Water lost its attraction by beer cans and other litter ending up in it. Besides the small litter in the water and on the ground, what is notable when you first walk through Beverwaard is the many piles of bulky waste spread through the neighbourhood. On many corners waste is collected but will stay there for some time. This was also photographed by the children and marked as dirty and unattractive.
Buildings
As they walked through the neighbourhood the children also took pictures of buildings. Their school, some homes but also buildings where they meet outside of school. This is mainly the Hoogvliet, the local supermarket. The kids buy food after or prior to school and some go there for domestic groceries as well. The children liked the Hoogvliet because ‘you can buy stuffed animals here’.

The children took pictures of community building the Focus as well. This building serves as meeting place for the community. Activities like yoga, line dancing, painting and choir singing are organized here. Schools in the neighbourhood use parts of the building for special events and church organizes events on Sundays. The children liked the Focus mainly because of the ‘wijkmuziek’ that is often organized there. The Focus organizes cheap meals for community members with little means twice a week, which is according to the school director full every week.

Bushes
Some pictures were made from bushes in the neighbourhood. Most bushes are placed in parks in or surrounding the neighbourhood. The bushes in the streets mainly function as indicators for boarders. Bushes surrounding the schoolyard for, together with the fence, the boarder between schoolyard and sidewalk. In some places the bushes are places between the sidewalk and the street. Interesting is that that are not many homes with big front yards in this neighbourhood. Most of the housing has just a small place in front of the house as a semi-private zone between private and public space. Bushes in that area indicate that transition space.

Schoolyard
The walk started at the school. The first place the children crossed was the schoolyard, of which they made 10 pictures. There are a number of different play areas in this schoolyard. The soccer field and basketball field (two in one) take up most of the room. A ping pong table is the other ‘official’ sports area, placed right next to the field. Play equipment for climbing, balancing and small games are placed throughout the square. A climbing wall is placed on the wall of the school. Ground colouring indicate walking routes and at the
rear of the school building bicycles are placed. Benches and tables make room for lunch and chatting. Two pictures were taken from schoolyards nearby. The children did not express what they particularly liked at the schoolyard, they did however mention that they play here often before and after school.

**Other**
The children took 9 pictures of the researchers that guided them through the neighbourhood. During the walk the children shared information about their neighbourhood experience with the researchers which were evaluated among the researchers at the end of the session.

Children took two pictures of private bins, the Dutch ‘Kliko’, and one picture of a central garbage point. These central points are placed in the streets, often near parking spots. They both disliked and liked the bins in the neighbourhood because on the one hand they ‘smell’, but on the other hand they ‘keep the streets clean’.

Parking takes up a lot of space in the neighbourhood. Where in the initial design parking took a less dominant role than public transport, later parking spots were added to the design. It is in most cases possible to park your car close to your home or in front of your home. The children took 6 pictures of mainly parking areas. In most cases they are next to a single or other pedestrian street. Barriers stop the cars from entering this area. P–signs on the ground indicate the parking spots and trees in between the parking spots break the long lines of parked cars and add natural element to the street. The children disliked cars because ‘they are poluting’, they stated that they liked the streets without cars because ‘there is more room for walking and playing’.

Only two pictures were taken of signs indicating the certain rules. There are many signs in the neighbourhood that indicate neighbourhood rules. The two pictures that the children took of signs were not taken of neighbourhood rules, about respecting each other and listening to each other. The children only took pictures of signs indicating the restrictions for dogs.
5.1.8 Conclusion

In this paragraph we described the current use of the neighbourhood for physical activity by children in Beverwaard. We saw what elements of the neighbourhood they found important, which locations they visit, their relation to their social environment and judgment of the aesthetics.

Now we relate this information to the ObeCity #2 model. We saw that group bonding appeared more in their daily behaviour than group bridging. They performed many activities with friends and family. These activities related to familiar environments like home, school or at a friends house. When family joined on play activity this often was regulated play in the Stormpolder or sports. Social bridging (13) was not mentioned by the children a lot, from the diaries became clear that social groups did not mix on many occasions.

The children went to school independently. Parents only came to school for special occasions. Bike or walking were the main means of transport for most of the children lived close to the school. These elements of the obesity model, related to the traffic situation, are therefore not changed in this model.

When the children related to their direct environment they mainly drew their homes and roads. Natural environment (15) like trees and grass fields were drawn as well. Most outside areas were filled with functional content like play equipment, car parking or buildings. The children judged these natural environments positively, as long as it was combined with an activity.

During the picture walk the children referred to the environment as likable or dislikable. In these walks they did mention that a street was pretty or not. This they related to the colors and views to experience there. However more places were assigned with a positive comment when for instance a soccer field was present, there was a good place for playing or a specific type of play like hide and seek or building sandcastles. The children valued the functionality (23) of a place higher than what is looked liked. As long as the place was clean, not broken and enclosed this was preferred for playing activities.

The locations visited by the children mainly referred to home and the home environment. When they played outdoors the locations related to a familiar home, in someone’s street or ‘behind his house’. The orientation (36) of the play environment is therefore important for the children in the choice of their play area. Areas in the neighbourhood further away from home were often only vaguely described. A more clearly distinguishable location could lead to a higher use of the spaces by the children (33).

Figure 55. ObeCity model #02 (author)
Figure 71. ObeCity model #03.1 (author)
5.2. DREAMS

During the Participatory Action Research process the children were involved in the design of their urban environment. After analysis of the neighbourhood they brainstormed on improvements for outdoor playing. From that brainstorm 12 concepts were developed that in the final lesson were made into a model. The values the children expressed through their ideas are incorporated in the final adjustment to the ObeCity model.

The children expressed their ideas for the neighbourhood using three different means: drawings, writing and models. During the second lesson total of 12 concepts were formed as neighbourhood ideas for the future. The children presented their concepts to the classroom, explained why their ideas increased children’s play activities outdoors and came up with a catchy slogan.

From the concepts in lesson two, a model was made in lesson four. Most groups stayed with their initial idea and translated their drawing to a physical model. A small amount of groups changed their initial idea, inspired by the materials handed to them or because they came up with new ideas themselves. In additional stencils the children wrote down why the design would make playing outdoors more fun. The model and the paper with the reasons was presented to the class. After every group of children presented their ideas the children received their diploma; they finished the class for urban design.

After analysis of the reasons mentioned by the children we identified two main categories the children mentioned. The reasons for improvement of the urban environment for outdoor play consisted of social interaction and challenging play. All concepts contained the possibility for social interaction and functional play. Interesting was the added aspect of the children that became clear when they presented their work. Many children assigned a level of imagination to their design. Their design gained a story, an adventure one could undertake in the design. In this paragraph we elaborate on the ideas that the children came up with.
5.2.1 De Heilige Meeuw

The concept ‘Helige Meeuw’ (holy seagull) stood out from the other concepts by the children. The children in this group made a giant bird in their neighbourhood while other kids came up with more obvious designs like for instance soccer fields or play equipment.

The idea of the Heilige Meeuw already developed from the first lesson, the analysis of the neighbourhood. One boy drew his home with on top of that home a seagull. In his drawing the seagull said: ‘Ka, ik ben een meeuw!’ (Ka, I am a seagull). In the second lesson we saw the seagull appear in the brainstorm drawings. The first idea on this brainstorm sheet was for fewer soccer fields. The second was for more climbing frames, after that was the idea of a spaceship in the water and the last idea was the seagull. In the brainstorm the seagull was meant for children to fly on. Both the spaceship and the seagull got votes from the group. After discussion among the group a choice was made for the group to work out the seagull as their main concept to present to the rest of the class.

In the concepting phase the children promoted the seagull to being saint, they called it the ‘Heilige Meeuw’ (Holy Seagull). In their drawings of the Meeuw they explained that the Meeuw was very big and many people could go on it. It still said ‘Khaa!’ and ‘I am a seagull’, but it also said, ‘I am saint’. They drew many people on their drawing in line to go on the seagull.

In their description of their concept they wrote down that the Heilige Meeuw could fit 1000 people. They could fly over the neighbourhood on this seagull. Their slogan was: ‘De Heilige Meeuw voor iedereen vliegen met ons mee!’

But during the presentation they all shouted: ‘Khaa! Ik ben een meeuw!’

In this group one group member came up with a clear concept for design and he was able to convince the three group members on his team to adapt this concept and work out the details together with him. In the fourth class they still remembered this idea and made a model out of it.
During the modeling lesson the group with the Heilige Meeuw concept was able to find the materials they needed to create a model of the seagull. It did not have the shape of a realistic seagull but the colours the features were recognizable. The materials handed to them inspired them to come up with the story that the seagull was crashed on top of the houses. Their was smoke coming out of him like he was on fire. On their stencil with reasons why this design improved outdoor play for children they wrote down these four reasons:

1. Omdat je op de heilige meeuw kan vliegen  
   (Because you can fly on the holy seagull)
2. De omgeving is kleurrijk  
   (Because the environment is colourful)
3. In de vijver kun je zelf zwemmen  
   (You are able to swim in the pond)
4. Je kan met de vogels spelen (en ook in de avond)  
   (You can play with the birds (and in the evening as well))

The seagull was clearly the main focus of this design and an attraction for outdoor activity. The flying part was explained by the children as fun and exciting. The fact that you could play with the bird in the evening as well was a plus for the children too. The materials provided in the modeling class inspired the children to build a pond and garden with trees. The fact that the environment was colourfull was a positive aspect for their environment. Swimming in the pond was something this group, and other groups as well, found particularly exciting. Every week they had swimming lessons together but swimming was marked by many groups as a good feature to their design.

In the end the Heilige Meeuw was a statement piece. This was a surprising element in the urban environment and the children were able to develop an imaginative scenario from the single idea. The children were fascinated by the design and came up with stories as they presented the idea to each other.
5.2.2 Family and disco park

The group that developed the family and disco park was primarily a bit confused on what the main idea of their design was exactly. They started off with one idea, the family park, but had a discussion with another group mate that really wanted rabbits in the park. So they decided to combine their ideas and make the rabbit and family park. Their main reasons for fun were playing with animals and enjoying family together in one park.

In the modeling lesson the rabbit idea however disappeared again the park became a family and disco park. This idea had these four reasons for making outdoor play more fun:

1. Door de vijver (because of the pond)
2. Door het voetbalveld (because of the soccer field)
3. En door de oxbord (because of the oxbord)
4. Door een spongebob bord (because of the spongebob sign)

They assigned different play elements to different parts of the model. These elements could be used by many types of people. The soccer field was more for the boys, but the girls could play near the pond. The Spongebob sign was a recognizable landmark to the children. Next to the Spongebob sign the only boy in the group had made an airplane on the roof. The girls were not happy with his input and decided the airplane was not to be incorporated in the stencil with good reasons for playing outside. Like the airplane the soccer field was placed on the rooftops.

An oxboard is a balance board on which children could maneuver through the neighbourhood. These boards were recently found illegal for they go quite fast which makes them dangerous for children in traffic.
5.2.3 IJs Hamburger Paradijs

One group developed the ‘Ice hamburger paradise’. They designed the hamburger as a giant trampoline, with a slide that would start on top and end in a swimming pool. Their slogan was that this would be a great family trip because it was fun for parents and their children too. They could eat, play and relax together. The group of girls that developed this concept eventually made a model of it. They were not very happy with the results, the girls didn’t think the hamburger was very pretty. But in the end that didn’t really matter and therefore they wrote down the following reasons:

1. Het is leuk en lekker en niet mooi!
   (It is fun and tasty and not pretty!)
2. Het is leuk voor kinderen want ze kunnen spelen en eten
   (It is nice because children can play and eat)
3. Het is leuk want het is creatief en kleurrijk en een
   zwembad en een springkussen
   (It’s nice because it is creative and colourful and there is a swimmingpool and bouncy castle)
4. Het is wel niet leuk en mooi
   (It is not fun and pretty)

5.2.4 De leuke wijk

The children in this group designed the fun neighbourhood. Their initial design concept was a computer soccer game to ‘inspire children for a better and more creative future’. But during the modeling lesson they came up with other ideas for their neighbourhood:

1. Omdat je een voetbalveld hebt met een dak
   (Because there is a soccer field with a roof)
2. Omdat er een racebaan is
   (Because there is a racing track)
3. Er worden veel en grote stadion
   (There is much and big stadium)
4. En een trein
   (And a train)

They placed a roof over their soccer field and a train track over the running track. They found it particularly important to be able to play outside even when it rained.
5.2.5 Gratis groenten en fruit

The children in this group developed a free fruit and vegetables machine. They placed the machine in the middle of the square for everyone to use. They mentioned that if parents have no money, children would still be able to eat because it is free! Their slogan for this concept was:

‘Wil je fruit en je ouders hebben geen geld dan heb je een fruit automaat lekker gezond bezig!’
(If you want fruit, and your parents have no money, than there is a fruit machine, tasty and healthy!)

On the rooftops of the neighbouring buildings they placed green gardens to grow vegetables, play soccer and hike. They build a ladder so people could climb on the rooftops.

5.2.6 Voetbalveld met tribune

There are not enough soccer fields in the neighbourhood according to this group. They built a soccer field in the middle of the triangle plaza. In this group clear they combined the functional games with rules, soccer, which they know, with elements of play that complimented that.

Next to the soccer field they build a tribune of straws. This way parents could watch the game and everyone could enjoy the soccer field. The cars were placed on the racing track adjacent to the soccer field. The cars were very fast and exciting to the children. They beautified their model with flowers and trees.
5.6.7 Griezelbos vs. zwembad

This group built a scary forest next to a swimming pool. In their concept the swimming pool was placed at the end of the scary forest. This way the children could, after a good scare, enjoy the swimming pool. It wasn’t a normal swimming pool, but a disco-swimming pool, where children could swim and dance at the same time. In the scary forest a big spider was placed as well as a number of different trees.

The children made sure to mention that the swimming pool was for children of nine years and older only. For smaller children it was still a bit too scary. This group was the only group that related to a website for more information on their idea.

‘Eng 9+ griezelbos en op het einde is het disco-zwem feestje meer info kijk op missy.nl, zie je daar!’
(Scary 9+ forest with a swimming and disco party at the and, for more information go to missy.nl, see you there!)

They refered to their idea as explorative adventure for children of nine years and older. The idea of the disco-swimming party was ‘just cool’ to them. A benefit for playing outside was the ‘ability to move and play at once’. They named for reasons why their idea would make playing outdoors more fun:

1. Omdat je er kan spelen
   (Because you can play there)
2. Omdat kinderen schrikken en dat vinden ze leuk
   (Because the children are scared and they like that)
3. Het is voor volwassenen en kinderen
   (It is for both adults and children)
4. Je kan er vrienden maken en dat is gezellig
   (You can make friends and that is fun)

In their reasoning both the scary content of the forest as well as the possibility to engage in social interaction and ‘make friends’. When they built the disco-pool in the model they added a dike, that in the end played a role in the scary forest as well. The dike collapsed and the streets were filled with water. This idea was added to the story in modeling class.
5.2.8 Superspeeltuin

The Super Playground started as a concept of an, as the children called it, ‘elastiekknop’. This was a button in which the children could push and they would turn into elastics. They would have elastics in their arms and legs.

When they started building a model the button turned out to be quite difficult to build. So they added loose elastics to one of their areas. This was loose rope with which the children could play. They called this rope the ‘jungle’ robe.

Besides the rope they also added a soccer stadium, a bus, trees and Spongebob. The Spongebob in their model was very special because this Spongebob had eyes and a nose like diamonds and he was walking on a rooftop.

5.2.9 Het zwembadparadijs

The swimming paradise started a concept from the idea that everyone likes swimming. They built a dolphin swimming pool with diving board on their plaza. Children could swim with dolphins here. They added solar panels to keep the swimming pool warm. Their main reasons for this idea to stimulate outdoor play were based on the functionality, price and social interaction at the pool:

1. Omdat kinderen meer kunnen zwemmen en spelen
   (Because children can swim and play more)
2. Omdat als kinderen zin in zwemmen hebben ze gewoon buiten kunnen zwemmen
   (Because children can just go outdoors to swim)
3. Als het warm wordt en je ouders hebben geen geld en je wilt gaan zwemmen kan je gewoon buiten want het is gratis
   (If it’s warm, and your parents have no money, and you want to swim, you can just go outdoors because it’s free)
4. Met heel veel mensen
   (With very much people)
5.2.10 Villa Glijbaan

The concept of this group was very concrete. The children wanted a slide from their home, so they wouldn’t have to walk the stairs. They gave three reasons why this slide was making outdoor play more fun:

1. je heb een villa en een glijbaan in een je hebt boven een deur en dan en dan zie je een glijbaan en als je geen zin heb om naar beneden te lopen kan je glijden (you have a villa and a slide in one, upstairs is a door, and than you see the slide, and if you don’t feel like walking down you slide down)
2. Een super snelle glijbaan (it’s a super fast slide)
3. Het een villa en een glijbaan in één (it’s a villa and a slide in one)

This group found it difficult to make a model for the rest of the neighbourhood. They built the slide and the staircase to the slide. Later they added a swimming pool and rocks to the middle of the square and antennas on top of the roofs.

5.2.11 Het kinderparadijs

The Kids-Paradise added many different elements to their model. They didn’t work with a clear concept because they developed a concept with other children than the children in their group at the modeling class. The elements they added we already saw at other models as well. They placed green on the roofs, o soccer field on the open field and on the other roof a swimming pool as well. The swing on the main square had a special element: is warmed your bum. The reasons they named why this would make outdoor play more fun:

1. Omdat er een zwembad is (Becasue there is a swimming pool)
2. Omdat er een schommel is (Becasue there is a swing)
3. Hij verwarmt je billen (It warms your bum)
4. Er is een voetbalveld (There is a soccer field)
5.2.12 Conclusion

We now compare the found characteristics of the designs by the children to the ObeCity model. When an aspect is well represented in the designs, the icon becomes bigger. When an aspect is not mentioned by the children in the designs the icon becomes stays the same.

The element that was mentioned most by the children that would make playing outdoors was a swimming pool. The swimming pool should be free of charge and preferably on a roof or with dolphins. While we taught from the analysis of the drawings that the children didn’t like the water in the neighbourhood, we now know that water is important to them, as long as it had a function that is ‘just cool’ (17).

The imaginative aspect of the ideas was mostly expressed in the modeling lesson. Some children kept to their original concept and created a 3D model of their ideas. The children came up with many creative ideas for the neighbourhood that they related to a storyline. Spooky elements or adventure were aspects in the ideas that helped the children explain their ideas to others. They relate to a combination of elements of dramatic (7) and exploration play (8).

The stories gave the ideas symbolic value that helped the children’s creative expression. Examples of story-ideas were areas with the possibility to flood, a big, holy bird on which children could fly over the neighbourhood and a scary forest. Challenge was important for the children. Most children expressed the possibly to discover new things and taking risks, doing something dangerous, in the context of imagination and competition. Stories were interesting to other children because of this specific element, motivating them to explore the idea further. This related to the element of graduate challenge (37) and surprise (04). The children would be

Financial elements were in some concepts taken into account. Play activities were often free or very cheap because ‘some parents have no money’. When designing public space this is automatically meant for a broad public. Accessibility and equal opportunity is however important to take into account when designing in this neighbourhood.
Figure 74. ObeCity model #03.2 (author)
5.3. OBECITY MODEL #3

The ObCity model is adjusted one last time. From the current use the main adjusted elements were functionality, social bridging and personalization. From the dreams of the children we learned that surprise, exploration and dramatic play were important to incorporate in design.

In the last ObCity model the configuration of patterns indicates possible combinations. Because of the design proposals of the children exploration, dramatic play and surprise are combined with graduate challenge. The design relates to the affordances of the children keeping them intrigued as they grow and discover the neighbourhood. Water became important only when related to a specific function like swimming. Social bonding and bridging can be combined in relation to the personalization of space. Creating unique places in the neighbourhood will help the children communicate their whereabouts to other social groups.
Figure 75. ObeCity model #03 (author)
6. URBAN DESIGN
The final ObeCity #03 shows the priorities for design of the urban environment in Beverwaard. The patterns in the model are applied in the urban design of the neighbourhood in this section.

The patterns cannot be directly implemented in the urban environment. The interpretation of the patterns is based on the inspiration from the PAR process and personal experience of the designer. Studied references and additional design requirements play a role in the implementation of the patterns in the environment as well.

A combination of these factors will eventually determine the design choices made in this chapter. First we show how the patterns are implemented on neighbourhood scale. After that a the four different areas are further elaborated on. A distinction can be made between the given patterns and the interpretation of the patterns on which we reflect in the next chapter.
1. LITERATURE STUDY
- social contagiousness
- obesogenic spaces

ObeCity model #01

2. CONTEXT ANALYSIS
- morphology
- social interaction
- play environment

ObeCity model #02

3. PARTICIPATORY ACTION RESEARCH
- lesson program

ObeCity model #03

4. DESIGN
- data collection and analysis
- child participation

Urban design intervention

references
additional design requirements
6.1. CONCEPT

The concept of this neighbourhood design to stimulate physical activity among primary school children in Beverwaard is based on three fundamental patterns from the ObeCity model: street differentiation (33), exploration (08), accommodation (22) and functionality (23). The structure of the singels is adapted as a the main slow traffic infrastructure for the children.

During the morphological analysis of Beverwaard, we noticed the street patterns that related to the historic polder structure of the area. Singels followed this structure and divided the area in five different blocks. Along most of these singels the roads were designed for pedestrians only. Motorized traffic was assigned different routes. This way pedestrians and children have quite a lot of room in the neighbourhood. Children are able to walk to school by themselves along the different singels.

One important cause of obesity is the lack of physical activity. The integrated pedestrian walkways in the neighbourhood is an urban design intervention that stimulates inhabitants to walk instead of taking the car. The density of the area invites people to walk to their locations as well.

In the diaries that the children kept during the week we noticed that during weekdays they stay mostly in the neighbourhood, and just in the weekends they go to other areas as well. We also noticed that the children wrote down that they play outside quite a lot. They played at the schoolyard before school or places near their homes or near their friends homes. When they moved further in the neighbourhood they often described their whereabouts as: ‘outside’, ‘somewhere’ or ‘Beverwaard’. As we walked through the neighbourhood we noticed that there is little variety among the streets. Therefore we added street differentiation (22) as a main pattern to structure the neighbourhood and direct the design concept.
The current street pattern of Beverwaard already appoints many streets as streets for pedestrians only, which is positive for stimulating physical activity. In order to create a street differentiation we assign a different theme to these pedestrian walkways. These themes follow the structure of the singel from the North of the neighbourhood to the South. By creating these themes long lines of thematic walkways in a polycentric (24) composition of the neighbourhood the design stimulates further exploration (07) by the children to discover the line as a whole.

Even though the lines are meant for the children to be physically active, designing places for accommodation (22) will help them occupy the area for a longer period of time. The placement of the designs within the daily walkways of the children provide a more frequent use (25). Also other parties could join an watch and physical activity can be combined with regular chilltime. The functionality (23) of the play equipment differs per theme. This gives the children a specific purpose to discover all themes and actively engage in different types of play.

Figure 76. ObeCity design concept (author)
Along every theme the walkway should provide room for several standard elements. The first and most important element is room for play. From theory we know that play can be performed solitary (10), parallel (11) and in a group (12,13). Along the routes we should therefore design these three configurations for play. The group play can consist of familiar groups, group bonding (12) and unfamiliar groups (13). In order to facilitate unfamiliar groups, room for observation is essential. Due to these different configurations of play, along the routes play equipment for high intensity play and play equipment for low intensity play are placed.

Accommodation for observers, parents, elderly or tired children is placed along the route as well. The accommodation design is adjusted to the theme of the walkway as well as the play equipment.

For the play areas are designed in public space it’s very important to be aware of other users of the area that do not necessarily want to involve in the play activities. These users of the space are for instance dog walkers, commuters or other pedestrians. The walkways as well as the bigger play areas should enable other people to just pass the scene without it blocking their way. However the design should stimulate the use of children and be an interstitial part of the daily routine. Therefore the design should address and invite possible users as much as possible.

The themes that are chosen for Beverwaard are based on the ideas of the children during the PAR process. The first theme is the idea of ‘De Heilige Meeuw’. This theme is placed at the singel placed most centred in the neighbourhood. This central placement of this theme is chosen because of the element of surprise that is very important to stop the contagiousness of obesity. People pass this area every day to go to the supermarket and on their way they will be confronted with an unfamiliar element: a giant seagull crashed in the park.

The second theme is based on the many swimming pools that the children designed. This theme is called the Wild Water Way. It is situated West of the Heilige Meeuw theme. This theme incorporates water in the play equipment. This way water gets a functional translation for the children. It is already very present in the area but the children did not see the benefit of the water yet...

The third theme is based on the scary forest designed by the children. The exciting and scary elements of this design idea were translated to the design of a maze. The theme is called A Maze. The children should be amazed by the graduate reveal of this landscape and the users.

The fourth theme is called the Swing. This theme is placed at the entrance of the area and stimulates the children to explore all the other themes. Swings indicate the movement through the area. The last theme is Let Loose and meant to join both dog walkers and children in the enjoyment of outdoor area and nature.
Figure 78. Spatial integration of concept (author)
Figure 79. Masterplan 1:10,000 (author)
Figure 79. Masterplan linked to ObeCity patterns (author)
6.2 HEILIGE MEEUW

The most central theme of the obeCity design is the Heilige Meeuw. This theme stimulates the braking of ruling social norms and think differently about the environment. The Meeuw is a landmark in the area and invites for playing and social gathering.

The design of the Heilige Meeuw is based on the design idea of the children. The Meeuw is designed as a sculpture to stimulate people to think differently on ruling social norms. The idea was adapted from the children and existing references and inspiration from the work of the famous artist Florentijn Hofman.

The Meeuw is the most important element of this line. The rest of the line is designed within the theme by using bird-related elements like feathers and nests.

Figure 80. Concept line Heilige Meeuw (author)
Florentijn Hofman,
**Aardfeestvarken**, Holland, 2013

In the city center of Arnhem the Aardfeestvarken was placed to celebrate the birthday of the local zoo. The Aardfeestvarken is 30 meters long and 9 meters high. It is made out of concrete and can be climbed or to a different home when necessary.

The Aardfeestvarken was placed here because the area was experiencing more vandalism. This ornament was meant to give the area a positive boost. It's the biggest public artwork in The Netherlands.

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Florentijn Hofman,
**Slow Slugs**, France, 2012

40,000 plastic disposable bags were used to design two slugs on the church way in Angers. The sculptures are 18 x 7,5 x 5 meters high and were placed as if they move towards the church.

The sculpture is meant to slow people down from their daily rush and take the time to enjoy the environment. Hofman stated:

“**they remind us of religion, mortality, natural decay and the slow suffocation of commercialized societies.”** (Hofman, 2012)

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Florentijn Hofman,
**Big Yellow Bunny**, Sweden, 2011

This bunny is placed on a central square in the Swedish town Örebro for the openART biennale. The rabbit is placed upside down with his backside against a statue that is a standard element of this square. The bunny is made from wood and not accessible. People cannot climb on this element is was purely meant for observation.

The rabbit is 13 meters high and made from local materials. It was meant to question the purpose of public space and monuments.

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Figure 81. Heilige Meeuw plan 1:1000 (author)
The children first designed the Heilige Meeuw in drawings. They captures the more organic shape of the bird and indicated the size of the animal by explaining that over a 1000 people could fly on it. During the modeling class the idea was transformed and the Heilige Meeuw was placed crashed on the homes in the neighbourhood, resulting in smoke and the big bird on top of the houses.

This design idea was adapted for the neighbourhood because it fit several elements of the ObeCity model. First the idea was surprising. Like the artwork of Hofman it is meant to make people think differently about their environment. This is precisely what an ornament like this big Meeuw could accomplish.

The Meeuw was placed on the central park of Beverwaard. Many people pass this area and therefor many people will be surprised by this element in their daily routine. In this park a stage is situated. This stage is used for public performances and faces a big, empty, round field of grass. The Meeuw was designed to ‘crash’ in this field of grass, facing the stage. The size of the Meeuw can be compared to the scale of the Aardfeestvarken; 40 meters wide and a maximum of 4.5 meters high. Like the Aardfeestvarken the Meeuw is made out of concrete. Therefore children, and other interested parties, are able to climb it. The shape of the Meeuw however is bumpy. High parts like the tail and the head are a little harder to climb than the wings. The feet are placed behind the Meeuw, for it has crashed unexpectedly, and are the most difficult part to climb. The feet point in the are and the legs are very thin. Children should be around the hight of 1.40 meters to be able to climb the feet.

The crash landing of the Meeuw has resulted in the grass to wrinkle in front of the beak. The area in front of the stage is wrinkles. These wrinkles form a horizontal relief that create a challenging landscape for functional play like tumbling, running, hiding or jumping. The wrinkles function as a tribune for the stage as well. In order to stimulate role models, leaders of the community, to show their talents on the stage the tribune that is created. People can watch the stage from the wrinkles of from the beak, head or wings of the Meeuw.

The park where the Meeuw has crashed is accessible through five different entrances. Depending on the entrance the visitor enters at the the tail and feet, wings or head of the Meeuw. From any point visitors of the Meeuw should however walk over the grass first before they can reach it. The grass near the backside of the Meeuw is not wrinkles so visitors could use this way to easily step on the wings.

The last design intervention for the Meeuw is to stimulate exploration play by creating a view on the Meeuw from the walkway theme it belongs to. By making an intersection in the elderly home adjacent to the park a continous line is create from which the Meeuw can be viewed. This intersection of the building is necessary to create this view and attract more children to the Meeuw, making it a landmark in the neighbourhood.
Figure 83. Spatial integration of Heilige Meew, front view (author). The Meeuw faces the stage causing the grass field to wrinkle. Depending on their age children are able to climb on several parts of the Meeuw
Figure 84. Spatial integration of Heilige Meew, birds eye view (author). The wings of the Meeuw are its main entrance, every occupant of the Meeuw needs to walk through the grass first to get to the Meeuw.
Figure: section shows the intersection of the elderly home adjacent to the park. By creating this passage the children and elderly are able to meet each other in a semi-enclosed environment. The water from the park is extended to this area to indicate the route. The semi-private space of the elderly is indicated with an elevation of a porch of approximately 1 meter. This way the elderly can oversee the situation and choose for either a more private or more public outside space.

Along the route that is assigned the Meeuw theme several different elements invite for play. First are the nests. The nests are placed along the waterway on the grass or partly on the grass. The horizontal nests can be used for relaxing, hide and seek or balancing games. The vertical nests function as small tunnels of natural material. These nests are all made from natural elements. Children can help make the nests with the branches of trees from the neighbourhood.
Other elements that are placed on the track are feathers. The ‘Springveer’ is designed as a feather of the Meeuw that he lost on his crash landing. The feather is placed on a spring so that it can move once a child steps on the platform. The Sprinveren can be used by one or multiple children and adults with a maximum of four. They are placed along the singel are meant for a short use when passing by. The type of play that is stimulated using this Springveer is functional: balancing, jumping and twirling. However the symbolism of the feather invites for dramatic and exploration play as well.

The other type of feather than can be found on this theme are the feather benches. These are adjustable benches in the shape of a feather placed along the route. This feather combines the accomodation of people with the elements of the theme. The adjustable character of these elements relates to construction play, where the adjustability of things is an important play activity. The users of these benches gain more control over their environment for they are in charge of the composition.

Figure 88. Springveren as play equipment to balance, jump and twirl, relating to the Meeuw as his feathers fallen off on his crash. (author)

Figure 89. Feather benches as play equipment to relax and move yourself, relating to the Meeuw as his feathers fallen off on his crash.
Figure 90. Bridge relating to nest theme providing both accommodation as well as a passage (author)
Figure 91. Nests placed on a grass field as well as along the singels (author). The natural elements allow the children to build huts and play hide and seek.
In this theme water is made more accessible and functional for the children to use in play activities. The multi-functional use of the water square and the inviting water playscape make this theme inviting for different age groups throughout the year.

During the PAR process the current use of the neighbourhood by the children indicated a limited notice or even dislike of the water elements in the neighbourhood by the children. However water plays a big role in the urban plan of the neighbourhood and forms the main structure of the buildings. During the design process many groups incorporates swimming pools in their design so the element of water was reintroduced in the ObeCity model relating to functionality. Next three water related playgrounds formed the references for this design.

Figure 92. Concept line Wild Water Way (author)
Carve
Potgieterstraat, Holland, 2010

In this typical Amsterdam street a playscape has been realized ordered by the municipality of Amsterdam. The street was assigned to become a playstreet, making it unaccessible for motorized traffic. The street incorporates play elements like tunnels, trampolines, whisperpools and water fountains. The materialization of the square is a soft black material on which the children can sit, fall and draw.

AZC Architecture
Trampoline Bridge, France, 2014

This inflatable bridge crosses the Seine in Paris. It is a concept design which is never been built. The idea was that people could jump and slide over this bridge in order to introduce a new way of crossing the water. This engages in the same activity only more fun and playful.

Urbanisten
Waterplein, Holland, 2013

This multi-functional square in Rotterdam is designed as eco friendly plaza to both moderate the overflow of water in the area and be a social gathering place. On this square multiple activities can take place like soccer, basketball, skating and meeting. The square is partly surrounded by a big tribune.

When it rains the square is able to capture the water until it can be released to the sewage.
Figure 93. Plan Water Square #01 1:1000 (author)
The water square was based on the several water related designs of the children. Children designed swimming pools with dolphins, swimming pools on rooftops and disco swimming pools. Most of the swimming pools designed by the children were explicitly free of charge, this way also children of which the parent could not afford a trip to the swimming pool could enjoy the water.

The idea was adapted to make the children more aware of the fun and functionality of water in their neighbourhood. Water is part of the history of Beverwaard from it’s old polder structure. However the children judged the water because it is often filthy and when the ball from soccer games go in they can’t play soccer anymore. Therefore we want to introduce water as fun element in the neighbourhood inviting for new types of games in a challenging way.

While the children enjoy swimming, a public swimming pool would ask for constant control and maintenance. Enjoying water in public space should be without risks for drowning and low maintainable. The watersquare and potgieterstraat function as examples on how to adapt the public space to accommodate children and water in one place.

The interesting aspect of a watersquare in general is the fact that the functionality changes with the weather. When it rains the square fills with water. It gradually reveals the water to the sewage in order to stop overflow. The square can now only be used on bare feet. When monitored well in winter the water on the square can be frozen and used as an ice skating area.

The combination of the activities skating and basketball is made on this round watersquare. By placing stairs as well as a ramp skaters can easily access the watersquare. Also the square is now accessible for people with a disability. On the South side of the square another play area is situated with play equipment for young children like a climbing frame and a slide. Also a soccer field is placed here. This soccer field is mentioned a lot by the children for it is the only soccer field with artificial grass in the neighbourhood.

By adding this water square this play area become more attractive for children of an older age. Skating, basketball or just chilling on the sunny side of the arena invites for young people to meet. By elevating the sides of the water square and the sides of the triangle planters places are created for people to sit and observe the play area.
The section of the square and neighbouring buildings shows the integration of the square and relation to the surroundings. The square is sunken in the ground with a maximum depth of 1.65 meters. The stairs that create the access to the lower part of the square function as an arena as well. On the sunny side of the square people can use the stairs to sit and watch the activities or have a conversation. At the ‘cold’ side of the square the ramp is situated. The stairs gradually forms into a ramp following the circle clockwise. At the West side of the square car traffic can pass the location. On the East side the main pedestrian road is situated which is the main entrance for skaters and spontaneous visitors.

The rest of the theme along this line is addressed by bridges and benches with the water theme. The bridges reveal the water through nets that are placed in the wholes in the bridge. This creates an element of surprise as well as the possibility to stay longer on the bridge when jumping or relaxing in this part.

The other element are small wooden benches placed near the water. By placement of these benches and vegetation in the water the water becomes more accessible and enjoyable for visitors. These elements create a visual variation between the singels in the neighbourhood as well which helps the children orientate on their whereabouts.
Figure 98. Section and materialization of the water square 1:50 (author)
Figure 99. Plan Water Square #02 1:1000 (author)
The rounds water square is one way interpreted the water ideas of the children. On the same walkway in this theme, the second waterway is situated at the South of the singel. Here a triangle shaped plaza is situated. It is comparable to an island, for it’s surrounded by water at the three sides of the area. On the East side backyards of neighbouring homes are situated, on the West side the ‘forest’ (as the children called it) starts, the sound barrier next to the highway, and on the North side a road leads to front yards of neighbouring homes.

Waterways give this area a triangle shape. On the triangle at the moment is an empty field of grass surrounded by a line of trees. The forest is very much present at this area so we want to incorporate the ideas of the children of the ‘scary forest’ and see how we could adjust the idea of Spongebob in the materialization of the area combined with the water theme. By adding a horizontal relief in the are the empty place is more enclosed. Bumps in the surface create different areas. In order to increase the variety and invite the children to choose their own play priorities the functionality of the bumps differs. Some bumps function as tunnels, others as trampolines. On the area whisper polls and ‘springveren’ are incorporated as well to relate to other play equipment in the area and increase variety.

At the South side of the area another playground is situated. Because of the enclosed character of the area the path leading to this other playground functions as a way to both control the play activities when necessary, but also the opportunity for independent play by the children. Because their are no homes directly facing this area their is no dominant group to occupy the place. This area is therefore designed for unfamiliar groups to meet. The bumps in the surface provide privacy when necessary and allow the participant to observe the situation before engaging.
Figure 101. Current situation location water square #02 (author)
Figure 102. Water square #02 eye level (author)
Figure 103. Adaption of pedestrian streets to theme of water square #02, eye level (author)
Figure 104. Adaption of bridges in the theme to water square #02 eye level (author)
6.4 A MAZE

The Maze is situated at the Eastern singel of the neighbourhood. This theme is based on the scary forest idea of the children. The space gradually reveals itself to the users and evokes for further exploring to amaze the users.

Two plaza’s along this area are designed as mazes. The children are triggered to discover the right ways in the maze. By adding punctured walls with different sizes of holes it depends on the accordances of a child, their physical appearance and their sense for direction whether they are able to find their way through the maze.

Examples from mazes that are explained next. Some of these mazes were part of art projects and not publicly accessible, not all these mazes were targeted at kids but they interpret the idea of the maze all differently.

Figure 105. Concept line Wild Water Way (author)
BIG Maze, USA, 2014

Within the National Building Museum in Washington DC BIG installed a big wooden maze. Visitors of the maze get lost in the 18 m² maze. The horizontal variation allows the visitors to look over the edges of the maze to see the quickest way to the heart of the maze. The maze is built of plywood. As people reach the middle they can see the way out.

Unknown

This maze is not based on the option to walk different routes but on the possibility of the participant to walk through the high 'grass'. A maze doesn’t necessarily need to consist of different routes, but could also be the opportunity for the routes to be created in a chaos of vertical elements.

Jacob Dahlgren
Primary Structure, Sweden, 2011

This maze is situated in a forest in the south of Sweden, near Wanas. The maze is made of steal beams that are painted in 18 different bright colours. The size of the maze is 10 × 10 × 2,7 meter. The contrast between the forest where the maze is situated and the material is very big, making it an eye catching artwork, inviting children to climb. The basic grid of the composition of the beams is repeated making the possibilities of the composition of elements endless.
Figure 106. A Maze #01 plan 1:1000 (author)
The first maze is situated in the North of the Amaze walkway. On this field of grass three different types of playgrounds were situated. These three playgrounds related to three different age groups. The upper playground was targeted to children from 2 to around 6. On the middle playground PingPong tables were placed allowing people of all ages willing to play this game to engage in it. The PingPong table could also be used for sitting and social gathering. The playground at the South of this area was targeted to people that just wanted to enjoy the environment. No play equipment was placed here but roses and vegetation of other sorts creating a serene atmosphere.

The surrounding surface of the maze is a field of grass with a graduate horizontal relief. In the design of the maze the existing playgrounds in the middle of the area formed the central hearts of the maze. From these centers the maze is accessible and the area can be explored.

North of the area a park is situated containing play activities like basketball and play equipment like a climbing frame and seesaws. By adding the maze at this point in the area a different type of play is introduced. This type of play has no predetermined rules and allows the children to explore their own capabilities. West of the area a school is located and the South forms the access to the main shopping center of the area. The combination of many different play types in this area allows spontaneous visitors to occupy the area for a longer period of time.

The walls at the maze are placed on the horizontal relief that already exists in the area. The long lines in between the walls allow the children to run on this surface and experience different speeds by the bumps in the terrain. They holes in the wall allow sneak peaks to other areas and even shortcut when a child fits through them.

The walls are a maximum height of 1.60 meters. This allows adults to overlook the area but creates enough height for children to not be able to see what is on the other side of the wall. However the holes in the walls could be used for the children as a way to climb the walls and walk on the edges on top. The material of the walls can be compared to the material at the watersquare, the spongy material invites the children to touch the walls, sit on them and climb them.

The walls both create a play experience as well as the boarders of the area. By adding the walls around the existing playgrounds they are not visible on first sight allowing the children to explore the area that gradually reveals to them.
Figure 108. A Maze #02 plan 1:1000 (author)
At the location along the amazing walkway that is located more to the South of Beverwaard another maze was placed. This maze is based on the same principles as the maze in the North. The materialization and the colours are not different. This way the mazes relate to each other visually allowing the visitors to link the two locations to each other.

The difference on this location is the waterway placed in the middle of the maze. There is no bridge at this point of the singel so when the children want to experience the maze as a whole they need to walk around the water. Also different groups of children could use the maze at the same time without interfering with each others game. This allows the different social groups that live near this area, in the trailer park and refugee center, to play near each other and observe each other.

On the route in between the different mazes several elements are placed relating to the amazing theme. These elements are related to the sensory means of the children. They can feel different surfaces, hear each other through whisperpools and climb on the maze elements with different textures.
6.5 SWING

The Swing route is located at the main entrance of the Beverwaard by public transport. Swings along the route invite visitors to come in and explore this route and other routes in the neighbourhood.

This route is the only route where traffic and pedestrians share the same space. The tram follows the same route as the children and at some point cars drive on this route as well. This makes this route different from other routes in the neighbourhood. Design interventions here are smaller and placed on the side of the roads. There are however pedestrian roads as well.

The main idea of this Swing theme is based on the diaries of the children where swinging very high was stated as a fun play activity.
Because of the traffic parents need to be insured that their children are safe when they use this route. First design interventions are therefore based on the contact between cars and children. Three design interventions make the cars and children aware of each other. Safety, personalization and ground markings play a role in these interventions.

The first is the adding children’s drawings on the floor. This personalizes the space and makes car users aware of the presence of children. Second is the adding of the elements we first saw at the maze theme. The rubber vegetation forms a barrier for pedestrians, keeping them from running on the streets observantly of traffic. The rubber vegetation should first be moved before the children are able to run on the street. Other users of the streets should however still be able to cross the street without experiencing a big physical barrier. The vegetation should be placed in such a way that they raise awareness of the fact that traffic is coming, but still enable people to walk through.

The last intervention is based on reversed thinking. The pedestrian lane in this intervention is not meant for the children, but for the cars. The children are the main users that occupy this area, the cars are just allowed as guests. Making a crossing for cars instead of children strengthen this thought and makes car drivers aware of their position in this area.
Figure 116. Swing concept line, section and materialization 1:50 (author)
Along the Swing route several different elements indicate a play activities. First are the swings. They form the main play element on the route. Swings are placed on three different manners in this route. First is in trees. Along this route several big trees allow for the branches to be used to hang swings. Second is along the side of the singel. The swings are placed on both side of the singel. When one swings high enough on both sides of the singel, children could imagine they are able to touch each others feet.

The last ways the swings are used in this area is on existing urban furniture. Land posts and bus stops along this route create the perfect elements to hang swings and combine a normal activity like waiting for the bus with the playful element of swinging.

The second element that is used in this area is the running track. Markings on the ground indicate a racing track on which the children can run towards the finish sign. This is purely an marking on the ground but stimulates children to run instead of walk. The placement of these tracks here is meant to motivate children to run to other themes in the area as well once they have entered the neighbourhood.

The last element on this track is the accommodation placed at the end of the singels. This accommodation allows people to watch the people on this track. The materialization of these accommodation spaces is based on the materials of the bridges. These bridges are introduced in the Wild Water Way, but are placed in different shapes throughout the neighbourhood.
Figure 120. Bridge, section and materialization 1:50 (author)
Figure 121. Bridge, eye level (author)
6.6 LET LOOSE

The final theme in Beverwaard is Let Loose. In this area dog walkers and children share the space near the forest to play, be physically active and stay outdoors for a longer period of time.

Dog walkers and children both use the same areas of public space. While the dogs need to be on a leash throughout the neighbourhood children complain about dog poo on soccer fields. The dogs are important users of public space and walking the dog is a healthy activity. However children and dogs do not go well together so dogs need their own separate spaces to play unleashed.

Several examples of dog parks functioned as an example for this design intervention.
Indications for the best elements of a dog park

Different play equipment in the dog area allows the dogs and their owner to train new tricks and enjoy the area through the different activities that can take place there.


Gated elements in the park allow dogs to run freely. Adding water points, a dog playground and enough bins to collect the dog poo creates a park where a dog and their owner enjoy the outdoors.

Dogs in this park are ranged by size, so that every dog can feel comfortable and not intimidated by other dogs.

http://landarch.uclaextension.edu/
Figure 123. Let Loose plan 1:1000 (author)
The dog themed route is placed at the Western edge of the neighbourhood, near the forest. The forest is already a popular destination for dog owners and one of the few areas where dogs are allowed to walk unleashed. However the play equipment for the dogs is not added to this location yet. By adding enclosed dog parks the dogs can enjoy play equipment together with their owner without bothering other users of the area.

Some children in the class mentioned they owned a dog. Dogs were marked as an aspect in the environment that the children liked because they are 'cute'. However dog poo was marked as dirty ('but funny though'). In order to allow children to enjoy the area the dog area was designed as an enclosed area. Within this area several different elements are placed for the dogs to play with and train.

The elements in the area that are targeted to children relate to the indications of the forest by the children. Rubber vegetation introduced in the Amaze and Swing theme function in this area as a reference to the forest adding the maze-like play activities.

Some children mentioned that they were not allowed to go near the forest alone because homeless people live their and small crimes take place according to the children. By adding bicycles to activate lighting and WiFi hotspot (the WiFiets) the area becomes more attractive to stay for longer period of time with a group of people.
7. REFLECTION
7.1 CONCLUSION

In this conclusion we look back on the design and design process and answer the main research question. The spatial patterns one should incorporate in design contain significant elements of social epidemiology. Stimulating physical activity in Beverwaard is about more than just active transportation. In order to stop obesity from spreading children need to reinvent the norms on physical activity. Challenging, surprising and imaginative play invites for both more extensive physical activity as well as change of the social norm.

A current trend in cities is that health differences become bigger. Citizens with a lower Social Economic Status (SES) have more health related problems than citizens with a higher SES. Therefore the segregation in cities leads to certain neighbourhoods more vulnerable for obesity than others. Beverwaard is a neighbourhood with mostly inhabitants of a lower SES. The neighbourhood Beverwaard is designed as a ‘cauliflower neighbourhood’. In these types of neighbourhood the car plays a less dominant role and active transport like walking and cycling is given much room in the street design. Despite the incorporation of active transportation in the urban design of Beverwaard, obesity is a big problem among primary school children in this neighbourhood.

Research on social epidemiology has shown us that obesity could be approached as a social contagious disease. In the beginning of the twentieth century urban design has played a big role in the fight of contagious diseases in cities. In this research we found elements of urban design that could fight the social contagiousness of obesity. We based the design requirements for urban design on examples we saw applied throughout history. Physical activity and health became more central elements of urban design throughout the last three decades. In that same time period we saw however obesity rates still rising. The social contagiousness should not be forgotten in design.

It is clear that just active transportation elements in the neighbourhood Beverwaard is not enough to stimulate outdoor physical activity among children. We looked for ways to design the urban environment in order to stimulate physical activity among primary school children in
Beverwaard taking into account the social contagiousness of the condition. In this conclusion the main research question of this thesis is answered:

**How to design the urban environment to stimulate outdoor physical activity among primary school children in Beverwaard?**

In order to understand the elements of urban design that play a role in stimulating physical activity the ObeCity model developed. This model was based on a theoretic frame of recent social epidemiological research on fighting obesity and examples from urban design now and throughout history.

The model in this thesis can be applied to every neighbourhood with high obesity rates. By following the steps in this thesis the model can be adjusted to local circumstances and, with the involvement of the community, applied in urban design. The first step was the application of the ObeCity model to the situation in Beverwaard through context analysis. Based on this analysis the priorities in the model shifted. After that the ObeCity model was adjusted based on the findings from Participatory Action Research together with primary school children in Beverwaard. In the final ObeCity model a selection of spatial patterns became the priority for designing to stimulate physical activity among primary school children in Beverwaard. These patterns contained elements of play, social interaction, active transportation, incorporated child ideas and Participatory Action Research.

### 7.1.1 Play

Social epidemiological research taught us that social norms play a big role in the physical activity behaviour of a child. The element of surprise in public space helps the individual child to change the current social norms and think differently. For children a playful environment helps to develop cognitive skills and make their own choices on the way they deal with their environment. Five different types of play (functional, exploration, dramatic, construction and games with rules) should be incorporated in the urban design to change the norms of children on physical activity behaviour and stimulate outdoor play.

The play elements from the ObeCity model that were used in the design of this case were functional play, dramatic play and exploration play. These elements were combined with other elements in the model to create the urban space. Horizontal relief and graduate challenge were incorporated in every design in combination with the different play elements. The horizontal relief of the landscape invites for the children to run, tumble and climb more than a flat landscape. Graduate challenge is added to the different play landscapes to continue to challenge the children. Children grow physically as well as cognitively, by providing playgrounds of different sizes, the affordances of different age groups are triggered.

In the design for Beverwaard these types of play were embedded in the urban structure by assigning different themes to the pedestrian pathways in the neighbourhood. These pathways were adjacent to the singels that dominate the spatial structure of the urban design of Beverwaard. Along every singel a different theme meant different elements of play, recognizable by materialization and functionality. Along the route different elements of play are placed, this causes a decentralization composition of play elements that invites the children to explore full track.

**Heilige Meeuw**

Three themes were designed more extensively in this research. The 'Heilige Meeuw' plays the most dominant role in the new urban design for Beverwaard. Placing this element in the center of the neighbourhood helps children and other users of the public area to break with standardized habits and think differently about the ruling social norms. The seagull is ‘crashed’ in the central park of the neighbourhood, causing the normally smooth open field of grass to bump and the bird to be stuck there. These elements form the play equipment that stimulates imagination of the users. Dramatic play is therefore the main type of play used in this theme. The construction of the seagull invites for climbing, running on the small hills (functional play) and explore the area further while being physically active.
A Maze
The second theme that was designed was the ‘A Maze’. As the name would suggest this area was developed to amaze the users. Mazes on this route invite for further exploration of the area. They challenge the user to find out what is behind the wall. This creates a sense of excitement for the unknown and challenges the user to be brave, extend their horizon. By using light elements the movement of the children can be noticed during the night. The height of the maze makes sure that adults are able to monitor the mazes without interfering with the play activity of the children.

Wild Water Way
In this area water elements are incorporated in the play activities. By combining the water elements in the different play activities the play activities in this theme differ per season. Where in summer the water square can be used as a water fun area where children can play with water and cool down, in winter is can be used as ice skating area. Also the square is designed as skate or basketball park when there is no water. The multi purpose use of this area invites for a continuance of physical activity throughout the year.

7.1.2 Social interaction
Besides influence of play activities on the spread of obesity among a social group, social interaction plays a big role as well. By introducing different groups in public space the children are exposed to a variety of social norms. The routes are designed in such a way that they invite for physical activity but also accommodate stay for a longer period of time. Along the route siting elements provide a place to rest and adults to watch their children. Children function as a catalyst for interaction public space. When children play outdoors adults join them. Firstly parents who watch their children, but other social groups like elderly, dog walkers and adolescents as well. The groups are able to watch each other and make new social contacts. This process is called group bridging and an important element when changing social norms.

Social safety
By the placement of the singels from north to south of the neighbourhood different parts of the neighbourhood are crossed which enables meeting different types of people. However parents need reassurance that their children are safe when playing and they don’t meet people that could hurt them. By providing different types of spaces along the route a certain extend of privacy is provided. Children and other users can choose their amount of exposure to others when choosing a bigger or smaller play area.

Other users of the public space that do not necessarily want to be part of the social interaction or play activities should be taken into account when designing with the ObeCity model. By placing the elements for physical activity along highly used routes these people are confronted with physical activity but never forces to join or limited in their travel options. Therefor the play equipment never blocks a passage.

Physical safety
The geographical childhood has been restricted by many safety measures in the last three decades. These safety measures restrict the imaginative play environment that is so important for a child to create their own values. A place for children in the city to test their values is extremely important for this process. But active design in cities has mainly be focusing on adults, while spaces for children have been restricted due to safety measures. Through the ObeCity model the urban environment can fulfill the needs of the children integrated in the urban design.

Besides the safety assurance parents need according to the social interaction on the route, they need to know the children are safe from injury as well. The central routes are placed on pathways for pedestrians only to avoid getting hit by a car while playing as much as possible. Fencing, marking and placement of the play equipment provides children form running on to the streets or falling in the water. Possible danger is this way made obvious. Clear markings on the route enable parents and children to clearly communicate their whereabouts. Parents could now for instance restrict their children only to stay on the ‘Heilige Meeuw’ track or not to go further than the orange Maze. This way they know where the children are and know the risk that they take in this specific area. The children can go play by themselves without their parents interfering to much with the playing process.
7.1.3 Participatory Action Research

By involving the target group in the design process they gain a sense of control over their environment. This sense of control has a positive influence on health perception and the use of outdoor areas for physical activity. This was the primary reason to involve the children in design of the urban environment. Besides the direct influence of the use of the spaces by the children, the data collected during the process provided indirect input for the design as well. The children played a role in the priorities of the ObeCity model that lead to the priorities in design and they provided design that formed the main inspiration for final design.

Child participation

In the PAR process it is very important to adjust the communication means to the capabilities of the participants. The specifics of the target group according to their age has been specifically important in this research. The PAR process was designed on the one hand based on existing models and literature and on the other hand help of primary school teachers. The process was designed for the children to complete the full design cycle. They analyzed the neighbourhood and developed concepts for improvement. Along the way the researchers collected data on the current use of the neighbourhood as well as future dreams for the neighbourhood by the children. Not every child had the same capabilities so a combination of methods helps to involve every child in the process. Using drawings, writing and model making every child was involved in the improvement of the neighbourhood.

Incorporating child ideas in design

The ideas of the children formed a direct inspiration for design of the themes. The seagull, maze and waterway were ideas developed firstly by the children. The information the children gave on their experience of their environment, social interaction and physical activity behaviour was input for the ObeCity model. Based on this model further design decisions were made. The children gave more insight in their interpretation of health improvement in a word cloud. From this we noticed that the urban environment doesn’t play a direct role in their perception. By adjusting the environment to their preferences we hope to contradict that perception and make urban design play a more active role.

From the analysis drawing we saw which design elements in their environment did play a role in their perception. Homes, roads, parking and play equipment were drawn the most. From this we concluded that the functionality of an area was more important to the children than the aesthetics. Filth or dirt was not appreciated by the children, as well as stinging bushes. The area should be fit for the functionality of play.

In their diaries they kept track of their activities, locations and ways of transport. This gave us more insight in their daily patterns. We noticed that they often undertake activities with family or friends, but not often with both of them together. We designed the play areas on locations where different groups of people could easily meet. From the models we concluded that when the children dream about improving their environment, social interaction, challenge and imagination are most important to incorporate in the design.

The elements of the ObeCity model are open to interpretation in every urban situation. This way the ideas of the children can easily be incorporated in the final solution. By using the desired design elements of the children an environment was created that attracted this target group to play outside.

This design includes the adjustment physical, social and individual factors that stimulate physical activity behaviour among children. By developing not only a design but also a model that can be applied to other urban design projects as well this research serves the societal need to fight obesity and contributes to the reduction of one of the most pressing public health threats of the 21st century.
7.2 DISCUSSION

This thesis attempted to combine social research with urban design. The integration of the two fields of science communication and urbanism let to on the one hand data that answered the research questions. On the other hand this data did not provide all required input for design. In this discussion the role personal interpretation, approach and creativity are explained.

Research approaches on the fight against obesity have shifted from an individual approach, towards a better understanding of the influence of the environment on this condition. First this related mostly to the physical environment (proximity of cycle paths etc.) later the social environment was incorporated as well. In this research we try to adapt to this environmental approach and see how the urban environment should be adjusted to both stimulate physical activity and reduce the social contagiousness. The complexity and size of this approach led to a complex iterative process.

7.2.1 Research and design

The most complicated aspect of this thesis appeared in the very end. At the end of a social research process the research questions are answered and a conclusion can be drawn. A design process is not as clear as that. The designer is simply done drawing when time is up. In design are so many variables that data can never cover all related questions. In this research the ObeCity model provided the main elements of design. However when design decisions are made three other elements start to play a role: additional design requirements, inspiration and personal style. These are not elements that are directly incorporated in the ObeCity model but play a big role in the final spatial appearance of the design. See Figure 126 for a visual overview.

First are the additional design requirements. The urban design of Beverwaard was in this case targeted to reduce obesity among children, but other target groups use the public space as well. Elderly, dog walkers and other pedestrians should be able to use the space as much as others. Also traffic and safety requirements play a
big role. All spaces should be accessible for emergency services, slopes should not be too steep or slippery and easy to maintain. Further more aspects like ecology, water management, sustainability and practical use influence the spatial aspects of design.

The second element is inspiration. Besides the direct inspiration of the research process that plays a role in design, inspiration that the designer has gained from passed experiences plays a role as well. Projects that the designer visited or knows about, experience the designer has had as a child, the weight of the designer could all play a role in the design one would make related to reducing obesity.

The last element is personal style. Related to the design experience of the designer one would have developed a personal design preference, a style or vocabulary. The designer has developed a recognizable set of design aspects relating to this vocabulary. All these elements together could never have one finished answer, only time restriction will in the end lead to the final answer; possibilities are endless.

Science Communication
The relation between research and design can be frustrating. It is frustrating for a researcher to see how little of the data can be directly applied in the design. On the other hand it is also frustrating for a designer to see that the questions that relate to the research are very different than the questions related the design. In research is studied what is there, that should be changed. In design is noticed what should be there but is not yet. The the designer and researcher therefore speak two different languages. A designer doesn’t need a clear question in order to give a spatial answer. A researcher doesn’t necessarily need a spatial answer in order to answer the question and add to the body of knowledge.

By creating the ObeCity model with spatial patterns an attempt was made to create a language between the researcher and designer. In this research the patterns are still open for optimization. Theory, context and PAR research could be optimized and patterns extended and specified. This job is one for a Science Communication expert that understand the complexity of both fields.
This doesn’t mean that the language should in the end be made in such a way that personal interpretation and inspiration do not have to play a role anymore. The creativity of a design process earns its’ value from these aspects. Also the element of surprise, that is so important in obesity design, is partly gained from these undefinable elements. The creativity of the designer creates a neighbourhood that is different from others, and varying internally. Researchers must strive towards making a question very small and comprehensible, while a designer is constantly looking for combinations that would spatially make sense. A designer doesn’t unravel the process to small parts, they look for the best possible combinations of elements.

In a way the approach used in this research is comparable to the Design-Based Research method (Amiel and Reeves, 2008). A number of methods was combined to find a practical application to solve a problem. The patterns in the ObeCity model formed the communication mean between the theory and data and applicable urban design.

### 7.2.2 Obesity approach

While the design process is very complex, obesity as a condition is complex as well. The environmental approach of obesity considers environmental aspects that influence the energy balance of the individual. ‘Obesity is linked to broad social developments and shifts in values, such as changes in food production, motorized transport and work/home lifestyle patterns. Therefore the environmental perspective on obesity seeks the explanation in the changing complex environment of human beings as the cause for weight to rise’ (Egger & Swinburn, 1997). The choice for the environmental approach of obesity was based on the environmental aspects of urban design. This is however not the only approach for obesity. Other approaches consider the change of behaviour from different angles.

In 2009 the UK Government Office for Science, Foresight, researched the complex environmental aspects that relate to obesity (see Figure 127). In this research we mainly looked at individual activity and activity environment. Also we considered social influences by incorporating social

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**Figure 127. Foresight obesity map (Government Office of Science, 2007)**
interaction in the design of the urban environment and individual psychology through the effects of play on a child. We did not however take into account the importance of food production, consumption and biology. The practical application of this research with all parties involved did not allow for the whole system to be considered.

From the environmental approach, urban geographer Steven Cummins (2015) recognizes a new paradigm, a new approach to health in the urban environment: the complex system health approach. This approach he pleads for urban design interventions to relate to the complexity and dynamics of obesity when stimulating physical activity. It should consider the time and place dependency, the amount of interaction of an individual with their environment and the individual lifestyle choices. Because obesogenic spaces do however not necessarily lead to overweight problems among every inhabitant a more in depth analysis of the psychology of the individual lifestyle choices of children would give more insight in the choices for physical activity and stimulation of these choices by the urban environment.

Due to time and management restrictions not all elements of the obesity environmental approach could be considered. This had consequences on the one hand for the design outcomes and on the other hand on the usability of this data to the body of knowledge of obesity research. Preferably we would have considered this case of obesity among children on system level, taking into account the system as a whole. Instead we just considered parts of the system. However the focus on physical activity behaviour of children provided more in depth knowledge on these aspects of obesity.

We now discussed the restrictions of this research based the research starting point. The role of science communication and urban design in this project differed; the collected data could not directly be applied in the urban design solutions because urban design requires a higher scale and more complex approach of the problem. The approach of obesity as a complex condition required several different methods to be applied for data collection. The chosen target group was not able to reflect on the complex issues in urban design and obesity so the role and interpretation of the designer were big in this research.

7.2.3 Research methods
In this research four different methods were used: literature study, context analysis, PAR and urban design. These methods were chosen based on the methods used in literature and recommendations by experts.

**Literature study**
The choice for literature was based on the availability of literature by the researchers. Recommendations by mentors and experts lead to the selection of literature considered in this thesis. While the literature was based on a wide variety of sources, the snowball affect limited the search for literature. A more extensive literature review would have resulted in a better understanding of the separate elements of research while now often a more general view was used.

**Context analysis**
The neighbourhood of Beverwaard was firstly analyzed through morphological and data base analysis. This analysis considered the general urban structure of the neighbourhood and the collected data by GGD Rotterdam. By performing this analysis after literature research the ObeCity model was restricted and more specified to the location. However the indications of the children and the more extensive design process later in the project asked for a more in depth analysis of the neighbourhood. A more extensive analysis of the neighbourhood was executed throughout the process but the questions raised in the final design were not yet answered by the context analysis.

A more in depth and extensive picture of possibilities in this neighbourhood could have been achieved when the loop between the literature, context, data and design was made more often. The iterative aspect of the project would have enhanced the information ultimately gained form this context analysis.

**Participatory Action Research**
The PAR process was the most extensive data collection method used in this research. For this method the researcher developed a lesson program based on literature and expert guidance. The choice for the sample was based on the availability of the school and the data of Rotterdam showing high obesity rates in this part of the city. However
the classroom that was available for this research did not contain as many obese children as the data implied for the general neighbourhood. These children contributed to the research but might have had a different angle on health and obesity from a group of children with more weight problems. Also every lesson was conducted two times in the two different classrooms. The lessons were given under mostly the same circumstances but differences like day, time, available materials were unavoidable. One class struggled with high temperatures because of the flat roof. The other class was smaller so the children had less space to maneuver during the brainstorm exercises.

After collaboration with the local school the method was adjusted to fit the school’s schedule. During the PAR process the role of the researcher was dominant. The researcher developed the lesson program as well as performed the lessons in the classroom and analyzed the data. Through this process qualitative data is collected which is vulnerable for interpretation in the research process and ‘cherry picking’ by the designer. The analysis of data in this research has some vulnerabilities on that point.

The Veldacademie guided the design of the process and assisted during the lessons. The researcher should be aware of the influence on the target group during the process. Because the lessons were all performed by the same researchers this had an influence on the performance of the children. The group of researchers that were conducting the lessons were all new to this target group and no primary school experts. The lack of experience in didactics and education the researchers on this group was of influence on the performance and data output.

Because the literature study, context analysis and PAR-design was performed by the same researcher the elements of importance were already very familiar to the researcher. Especially when analyzing the data this could have lead to a biased interpretation. In several lessons the data could need further analysis.

Lesson one
The data collected on health awareness during lesson one contained mainly food. All types of food that were healthy but also nutrients. The children clearly interpreted food as an important element of health, these aspects were not taken into account in this research. The input of the children was however clearly based on a lesson of the ‘schijf van vijf’ they just had a week ago where nutrients played a big role.

Lesson two
The brainstorm lesson was a very extensive lesson. Most children were tired at some point or found it difficult to come up with new ideas. The children got frustrated when they could not come up with new ideas. The didactical talents of the researchers were tested when they were both stimulating the children to come up with new ideas, think out of the box while at the same time comforting them and maintaining a productive atmosphere in the classroom.

Lesson three
During lesson three the pictures were gathered together with the children. According to the diaries of the children they already played outside quite a lot. Whether playing outside is really a problem in this neighbourhood could only be identified after more in depth interviews with the children and their parents. Combining the picture lesson in the neighbourhood with walking interviews, or discussing the pictures the children made with them and their parents could have given more insight in their interpretation of the environment.

Lesson four
During the fourth lesson the concepts from lesson two were developed into models. Not every group consisted of the same children as lesson two which lead to discussion among the newcomers. Not every group was therefore able to stick to the concept they made earlier. Besides this the materials handed to the children in lesson four influenced output in the models. Also the children came up with new ideas by themselves or had drawn a concept that was difficult to model so they switched to another idea.

After every lesson the researchers reflected on the process during the lessons and the outcomes but analysis of the detailed data was done just one researcher. Analyzing the data in a group would have lead to a better and more understanding of the data and a more extensive analysis.
Urban design
The main ideas for the concepts of urban design were derived from the ideas of the children during the PAR process. The data functioned as inspiration as well as input for the model with design patterns. The patterns were prioritized based on the findings in the data. There was however some information missing from the data that was interpreted by the designer. The detail in the urban design could have been better founded if the data contained more information of the user of the space and their preferences.

However the children added a lot of information that was not incorporated in the design as well. For instance the dolphins, Spongebob, big slide or rooftop soccer fields could have been used in the design in order to stay close to the ideas of the children and give the design a more in depth meaning of their participation. Examples of architects that work in this field and incorporate children’s ideas more literally in their design are Baupiloten from Germany.

The differences between boys and girls were not specifically studied in the research while theory indicates that they use public space differently. In the data we saw girls as well as boys interested in soccer fields. We did not further elaborate on the use and therefore did not make that distinction in design.

The choice for the design location was based on the morphological structure of the neighbourhood. A more in-depth location analysis of the use of the neighbourhood by the children could have lead to different locations for design. Based on theory and preferences of the children finally a choice for playscape design was made. The design of this playscapes was partly based on the design preferences of the designer. Other playscapes that are used as references are not necessarily build to fight obesity among children. The playscapes in this area however are designed with this purpose but not that different from the other playscapes. Research on other models for the design of playscapes could be studied in order to see what their effect on obesity rates is.

The theory on playground as a tool for changing social norms was based on the theory of Freud. This is not underpinned by many other theories and Freud has been highly criticized for being sexist, not falsifiable and lacks the possibility of free choice by the children. The option for self-selection is very important in behavioural change to fight obesity. The majority of these studies that promote urban design as a tool to fight obesity do not include the possibility for citizens to self-select their obesogenic environment as a preferred living environment. Also the effects of the design could differ per social group. Therefore several sources suggest to incorporate the subjective experience of the environment (for example safety and target group specific experience) into obesity research whenever possible (Black & Macinko, 2008; Poortinga, 2006; Smith & Cummins, 2009). Because of the high amount of collected data further and more in depth review could lead to conclusions on these other topics as well. This was however not possible in the time and capacity restrictions of this research.

One of the starting points for design besides based on the element of surprise to stop the obesity spread, is the integration of different social groups. Through social bridging the children are exposed to different social norms that helps them reflect on their own. This is however difficult in a ‘village’ like Beverwaard, where everybody already knows each other. The two ‘different’ groups in the area are the people on the trailer park and the people in the refugee center. These locations were however not explicitly incorporated in the design. Further study to involve these locations in the neighbourhood could lead to more social bridging in the neighbourhood.

Another important source on the design of the neighbourhood for children was Karsten (2005). Her studies however often take place among higher educated parents and children with a higher SES. The characteristics and preferences of these parents and children could differ in this areas where mainly people of a lower SES live. A more in depth analysis of the lifestyle preferences of all different groups living in this neighbourhood will give more insight in their preferred behaviour in public space.
7.2.4 ObeCity as a pattern language

In this design research a language was created to understand the implication of the design on a social and physical level.

There are several patterns that are applied in almost every theme of the design. Safety for instance is an aspect that should be more incorporated in some areas with for instance traffic or a lack of social control. However this element is an additional design requirement as well for every design aspect needs to be safe, socially and physically.

From the ObeCity model found that personalization of the urban environment was important to stimulate the use of outside space for physical activity. Also the participation in design of the urban environment stimulates the use of this space. However personalization is a pattern that can be implemented in certain locations in the design. Design participation is a mean to address several other aspects of the ObeCity as well. Finding a way to combine these patterns would allow for a more clear pattern in the ObeCity model.

There are several design indications that were used in the design, but were not officially in the pattern language. These were for instant the variation in sense of privacy by creating horizontal relief, graduate reveal of space to the user, speed changes to create a sense of excitement and sun orientation. These could be added as additional design requirements but they could also become individual patterns. More design research is necessary to understand the relevance of these elements to the stimulation of physical activity.

7.2.5 Expected effects

In order to maintain the element of surprise that is significant in this research a fast approach of the urban design interventions is plead for. Even a graduate implementation of different design elements in the neighbourhood could trigger the children’s attention and stimulate them to go outside. Whether the element of surprise and social bridging could lead to making healthier choices concerning physical activity should well be monitored. In order to maintain the element of surprise it is important to rotate the design elements in public space once in a while in order to keep triggering the users. Cooperation with other areas in the city could allow this type of rotation. By announcing big changes in the environment and involving the community the inhabitants are made aware of the change and curiosity is raised on their environment.

Social interventions like the involvement of different social groups in programming the space could also lead to a higher amount of children using the area. After care might be necessary to keeping involving the target group and activate them to use the urban environment for physical activity. Further communication could take place with schools and other partners. The sensitivity of the topic should in this case always be encountered. The stigma on obesity is very much alive among the target group and stigmatizing the overweight children could lead to further psychological damage.

The results of the ‘Gezond in IJsselmonde’ project of the Veldacademie are measured in two years when the program ended. These results will give more insight in the effect of the intervention in the classroom on the health and health perception of the children.
Recommendations for further research

Besides building this project and monitoring the results, further research could on the one hand be done on the content of the ObeCity model and on the other hand on the collection of data. The ObeCity model can be optimized by expanding the elements based on further theoretic research. Also applying to different locations could ask for patterns that are not yet incorporated in the model in current shape. Working with other groups of kids, perhaps of other weight, background or SES could also lead to a different prioritization of the model and the need for expansion. Ultimately the model covers all urban design elements related to obesity among children in the city. It is already quite complete based on this research but a complete model could be the starting point for every urban designer in obesogenic areas. This way the model contributes to the improvement of health in various different environments.

The data collection in the PAR research could be further analyzed and optimized. The lesson program could be designed to incorporate many different stakeholders like parents, municipality and designers. Together they could find a fitting interpretation of the ObeCity model per area, leading to a democratic and healthy optimization of space.

For further research I personally want to work in a field on both sides of the scale. On the one hand relating to the users, listening to their needs and design with them together. On the other hand I want to be able to take a step back, look at the bigger picture of urban design and develop the ability to design an urban environment that serves everyones needs. The creation of this design language is the first step towards addressing this in between position.
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