Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences

Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

Personal information	
Name	Susanne E. M. van Rijn
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Studio		
Name / Theme	Design of the Urban Fabrics / The influence of the design of green public spaces on adolescent physical activity behaviour	
Main mentor	dr. A. Romein (Arie)	Spatial planning and Strategy
Second mentor	ir. L.P.J. van den Burg (Leo)	Urban design
Argumentation of choice of the studio	The complexity of the relationship between the "social processes" and the composition of the physical environment is at the core of the studio Design of the Urban Fabrics, with the objective to develop "a sustainable and liveable urban environment" (Department of Urbanism, 2019, p.57). This matches my main interest in this graduation thesis, which is to explore the relationship between adolescent physical activity behaviour and the design of public space. Physical activity behaviour is a complex behaviour, influenced by a lot of factors, among which the physical environment. In this thesis it is explored how the design of urban form can steer this behaviour in a positive way. Being sufficiently active can furthermore be seen as a vital component for healthy citizens also relating to the topic of health, which was one of the studio topics when I started my thesis. Note: I started with Leo vd Burg as my first mentor and Arie Romein as my second, but changed this in the process. I have contacted Kristel Aalbers about this, and she advised me that I could stay within this studio when I did not want to change my subject.	

Graduation project	
Title of the graduation project	Urban design for physical activity – An exploration of the role of the design of green public spaces in stimulating adolescents in Westland, the Netherlands, to be more physically active
Goal	
Location:	Westland, the Netherlands

The posed problem,	
research questions and	
design assignment in which these result.	

Physical inactivity is a large threat to public health, both on a global and on a local scale. It is related to one third of the deaths in high-income countries (as it contributes to high blood pressure and overweight), increasing risks at diseases such as diabetes, depression and several types of cancer (World Health Organization, 2010). Being sufficiently active has multiple benefits, both on physical and mental health. Within the European region of the WHO, as well as in the Netherlands, adolescents are the age group at risk, with respectively 86% and 76% being inactive (Centraal Bureau voor de Statistiek, 2019; World Health Organization, 2015). Where other groups in the Netherlands mainly show rising trendlines, adolescents show a fluctuating and partially descending trendline since 2001 as can be seen in Figure 1 below (CBS & RIVM, 2018). In Westland only 14% of the adolescents meet the national directive of minutes spent on physical activity in 2015, showing more alarming numbers than the Dutch average (Keetman, Veltman, Dekkers, Rooseboom de Vries, & Berns, 2016).

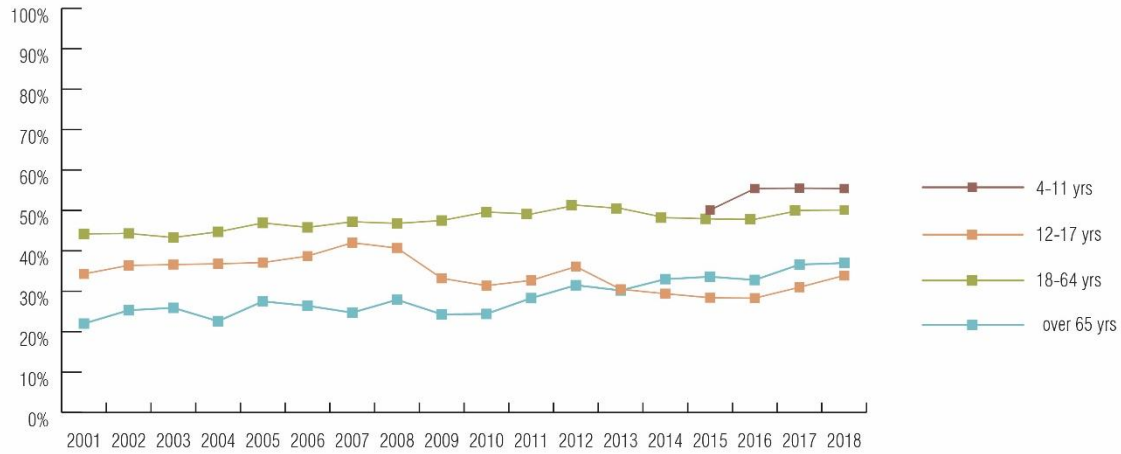

Figure 1 Trends in percentage of Dutch population meeting new physical activity guidelines (based on data from CBS & RIVM, 2018).

Adolescent physical activity behaviour is influenced by a high variety of variables, ranging from personal variables such as age, to sociocultural variables such as support from important people (Sallis, Prochaska, & Taylor, 2000). Research has also shown factors of the physical environment to be related to physical activity behaviour in adolescents, such as the availability of parks (Ding, Sallis, Kerr, Lee, & Rosenberg, 2011), opportunities to exercise (Sallis et al., 2000), and presence of and access to destinations (Davison & Lawson, 2006). Physical activity is furthermore seen as intermediary variable connecting green spaces to health (World Health Organization, 2016). Green public spaces can facilitate people with opportunities to engage in outdoor physical activity as they offer places to be active, and can attract people to go outside (Hartig, Mitchell, de Vries, & Frumkin, 2014). However, previous research has shown inconsistencies in what specific spatial aspects are contributing to adolescent physical activity behaviour, and the influence of similar variables is inconsistent in some studies (see e.g. Bauman et al., 2012; Ding et al., 2011). Because of these

inconsistencies, every spatial context requires adequate analysis and research of (variables influencing) adolescent pyhsical activity behaviour before being able to design effective spatial interventions.

Westland, the Netherlands, is selected as location to transform the results of empirical research in tailor made spatial interventions. First because of the urge for adolescents there to become more active. Second, because of its extraordinary spatial structure of villages embedded in an industrial landscape of greenhouses. It is shown to be the least green municipality in the country (Booister, 2017) and the most densely built one (Dollen, 2019), leaving the question how much space is left and fit for adolescents to engage in physical activity.

This problem statement has lead to the following main research question:

What spatial interventions in the system of green public space could stimulate adolescents in Westland, the Netherlands, to be more physically active?

The research and design objective is to explore how the redesign of green public spaces in Westland could contribute to stimulating adolescents to be more physically active in outdoor spaces. More specifically what spatial aspects are required for adolescent physical activity behaviour. Inconsistencies in prior research findings suggest that local context is important to understand and take into account when using knowledge on the spatial aspects of physical activity behaviour in practice. Therefore an important aspect of the graduation thesis is the design of a survey to be distributed among Dutch adolescents. The design assignment of the thesis is two-fold: (1) To translate the knowledge from prior empirical studies into a survey to distribute adolescents. Design is used as a research tool here to develop a set of questions on preferred spatial quality for green public spaces to engage more in physical activity. (2) The results of the survey are used to redesign an existing public space in Westland as an illustrative example of a green public space that could stimulate adolescents to be more physically active.

Process

Method description

Four phases can be distinguished in this graduation thesis:

(1) Theory

To underpin the selected approach and operationalisation of the theory and available knowledge, a **review of literature** is done on the following topics: (1) green space use in relation to physical activity behaviour, and (2) (environmental) variables influencing adolescent physical activity behaviour. From this review of prior empirical studies (spatial) attributes are extracted to use in the Context phase.

In this phase the following sub questions are answered (1) How is the green public space related to adolescents' physical activity behaviour? and (2) What spatial aspects of green public space can stimulate adolescents to be more physically active?

(2) Context

The selected attributes are used to develop a **sample survey** to distribute among Dutch adolescents. Questions cover several topics: general information, physical activity behaviour, barriers and motivation for physical activity, the use of green public spaces, and preferred spatial quality for physical activity in green public spaces. **Design** is used as a research tool to compose and visualise the questions on preferred spatial quality, using a method called 'conjunct measuring'. From this survey the relative importance of specific spatial attributes can be defined with a **multinomial logit analysis** using SPSS. The outcome of this analysis is used as input for the spatial intervention and to evaluate the prior research findings for their fitness in this context.
Both the survey results and the spatial aspects found in literature will scope the **spatial analysis of public space** in Westland. Attributes are inventoried and analysed using mapping, photographs and tracing of said attributes. The survey results enable the scope of public spaces to include in the spatial analysis. The relative importance of specific spatial attributes will be used to assess the existing public space in Westland to select a test case for the spatial interventions.
To observe and document current conditions of the spatial structure of (public spaces in) Westland **site visits** take place during this phase too.

In this phase the following sub questions are answered: (3) How can the physical activity behaviour of Dutch adolescents be described? (4) How could adolescents in Westland be motivated by the redesign of (green) public space to be more physically active? and, (5) How does the public space in Westland encourage or discourage adolescent physical activity behaviour?

(3) Intervention

Research by design is used in this phase to redesign the selected public space. The results from the survey inform this design phase to create an illustrative example of a green public space that could motivate adolescents to be more physically active.

Used to answer the sub question (6) What spatial design interventions can be developed to stimulate adolescents in Westland to be more physically active?

(4) Evaluation

As a final step both the spatial intervention in Westland, and the findings from the survey are evaluated against the light of the literature review. In this phase the main question will be answered and conclusions are drawn for future steps and the applicability of the findings of this thesis.

Literature and general practical preference

(Adolescent) physical activity behaviour

Davison, K. K., & Lawson, C. T. (2006). Do attributes in the physical environment influence children's physical activity? A review of the literature. *International Journal of Behavioral Nutrition and*

Physical Acitvity, *3*(19). https://doi.org/10.1186/1479-Received

Ding, D., Sallis, J. F., Kerr, J., Lee, S., & Rosenberg, D. E. (2011). Neighborhood Environment and Physical Activity Among Youth - A Review. *American Journal of Preventive Medicine*, *41*(4), 442–455. https://doi.org/10.1016/j.amepre.2011.06.036

Kaczynski, A. T., & Henderson, K. A. (2007). Environmental Correlates of Physical Activity: A review of Evidence about Parks and Recreation. *Leisure Sciences*, *29*, 315–354. Retrieved from https://www-tandfonline-com.tudelft.idm.oclc.org/doi/full/10.1080/01490400701394865

Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical acivity of children and adolescents. *Medicine and Science in Sports and Exercise*, *32*(5), 963–975.

Use of green space in relation to physical activity behaviour

Bedimo-Rung, A. L., Mowen, A. J., & Cohen, D. A. (2005). The Significance of Parks to Physical Activity and Public Health - A Conceptual Model. *American Journal of Preventive Medicine*, *28*(2S2), 159–168. https://doi.org/doi:10.1016/j.ampre.2004.10.024

Hartig, T., Mitchell, R., de Vries, S., & Frumkin, H. (2014). Nature and Health. *Annual Review of Public Health*, *35*(1), 207–228. https://doi.org/10.1146/annurev-publhealth-032013-182443

McCormack, G. R., Rock, M., Toohey, A. M., & Hignell, D. (2010). Characteristics of urban parks associated with park use and physical activity: A review of qualitative research. *Health and Place*, *16*(4), 712–726. https://doi.org/10.1016/j.healthplace.2010.03.003

General practice experience

Center for Active Design. (2010). *Active design guidelines - Promoting physical activity and health in design*. New York: City of New York.

Physical activity data

CBS i.s.m. RIVM. (2018). Voldoen aan beweegrichtlijnen naar leeftijd 2001-2018 [table]. Retrieved August 8, 2019, from https://www.sportenbewegenincijfers.nl/kernindicatoren/beweegrichtlijnen

World Health Organization. (2010). *Global recommendations on physical activity for health*. *Geneva: World Health Organization*. https://doi.org/10.1080/11026480410034349

Reflection

Societal Relevance

As inactivity is a threat to public health, it is important to take action upon it. It is suggested by several authors that "our response to the public health challenge of inactivity has not been as strong as is needed" (Kohl et al. (2012); Hallal et al. (2012) as cited in Reis et al., 2016, p.1345). This suggests that every step we take towards coping with inactivity and contributing to get people to become more active is important. It shows that it is important to adress physical activity in every discipline possible, not only within the health sector (Reis et al., 2016, p.1346).

Former head coach of the Dutch women's hockey team Marc Lammers has a motto to improve a team prestation by strengthening *every* aspect of it. Improving every aspect with two percent will also lead to an improvement of 100% when you improve several different elements (Lammers & Hendrickx, 2010, p.51-52). Following this chain of thought, not only behavioural change and education are important to get people active, concentrating on the physical environment is necessary too.

With the high pressure on the space in Westland, and a large share of inactive adolescents, the relevance of the location is clear too. The GGD Haaglanden (2015) acknowledge the importance of the physical environment in health issues, respected their key messages for Westland. In one of them they focus on the development of a 'healthy living environment' (GGD Haaglanden, 2015, p.22). Another focusses on the development of youth in a positive way, focusing among other aspects on physical activity behaviour and the development of a safe physical environment (GGD Haaglanden, 2015).

Scientific Relevance

Physical activity behaviour is shown to be complex to understand and intervene in, due to the high variety of variables influencing it. One type of variables is related to the physical environment. However, empirical research has shown many inconsistencies in what spatial aspects are contributing to adolescent physical activity behaviour (see e.g. Bauman et al., 2012; Ding et al., 2011). As an example some studies show a positive association between accessibility to, and density and proximity of parks, and physical activity as reported by adolescents while other studies show no association at all (Ding et al., 2011, p.448). Where Maas et al. (2008) additionally argue that the amount of green space has no influence on the percentage of people meeting the Dutch physical activity guidelines, they neither take the opportunities of this green space nor the reasons why people are physically active or not into account.

These inconcistencies show the difficulty to develop interventions that are beneficial at multiple scales and in multiple places. Because of its complexity and the influence of social and cultural variables, which may vary by location, it is important to research the (environmental) variables in a specific local context, before designing for this context. This graduation thesis will respond to the uncertainty between the theory and practice as it attempts to first test the prior findings in a specific context, and second to translate the research findings from this context into spatial interventions.

Relation topic and larger educational framework

I strongly believe that it is our job as designers of the physical environment, either architects or urban designers, to try to develop environments that preferably let people thrive. In Urbanism the composition and construction of different elements in the physical environment is the key theme to concentrate on, as related to the users of a space. Physical activity always needs space in which people can be active, and the composition of e.g. public spaces, or routing networks can contribute to facilitate people with physical activity spaces.
With the start of my graduation thesis, health was one of the topics of the studio Design of the Urban Fabrics. Being sufficiently active can be seen as an integral part of healthy citizens as it is beneficial for both mental and physical state. The objective of exploring how to steer physical activity behaviour through the composition of urban form, relates my graduation topic even more to the studio.

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380(9838), 258–271. https://doi.org/10.1016/S0140-6736(12)60735-1

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Centraal Bureau voor de Statistiek. (2019). Leefstijl en (preventief) gezondheidsonderzoek; persoonskenmerken [table]. Retrieved October 30, 2019, from https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83021NED/table?fromstatweb

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