SPACE FOR SPORT

THE INTERPLAY BETWEEN THE PHYSICAL ENVIRONMENT, INTRAPERSONAL FACTORS AND SPORTS PARTICIPATION

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- CHAPTER 1 -

INTRODUCTION

1.1 The importance of sports participation and the physical environment for health and society

Sports participation has many benefits for physical, mental and social health and wellbeing. Regular sports participation may contribute not only to a healthy lifestyle and feeling fit and healthy, and to a decrease in non-communicable diseases such as obesity, type 2 diabetes mellitus, cardiovascular disease and types of cancer and mental illness [1–6], but also to an increase in social capital, social cohesion, and positive development and life prospects [1,7–11], particularly in disadvantaged communities and among socially vulnerable people, including youths [12–15]. Therefore, local and national governments in Western countries, including the Netherlands, increasingly consider sport as a way to achieve societal objectives such as decreasing obesity and other health problems, reducing socioeconomic differences in health and decreasing social polarisation [16–21]. In order to achieve these goals, policies have promoted physical activity in general, and sports participation in particular [22,23].

Sports participation and its social and health benefits may differ between individuals, and depend on personal characteristics and the physical environment in which an individual participates in sport. Not all environments encourage or facilitate sports participation to the same extent. Environmental factors such as the geographical location (e.g. a sports facility such as a swimming pool, a basketball court or a city park), the organizational setting in which sport takes place (e.g. a traditional sports club, or unorganized with friends or individually) and even the surface (e.g. asphalt or forest trails), as well as the socio-spatial characteristics of an individual's neighbourhood, may have impact on how the sports environment is experienced and used, and on how frequently people participate in sport and thus the extent to which social and health benefits are gained [24–28]. In addition, sports participation in a sports club is seen as one of the most important organizational settings to enhance active lifestyles in young people, and is even associated with greater psychological and social benefits compared to participating in sport individually [28,36]. However, the organizational settings and geographical locations where sport takes place, or the 'spatial context of sport', have recently undergone changes. This issue is discussed further in section 1.2.

The aforementioned examples emphasize the importance of the objective physical environment, and how it is perceived by individuals, for health and health behaviours and the promotion thereof. This is also central in socioecological models [37,38]. Studies have confirmed that the physical environment plays an important role in explaining sports participation. However, intrapersonal factors – such as motivation, perceived constraints on participating in sport, and time use – may even be more important determinants of sports participation [39–42]. The role of the physical environment in sports participation should therefore be studied in relation to the personal and psychological characteristics of actual and potential sports participants. However, more empirical research is needed on the relative importance of the physical environment and the interplay with intrapersonal factors in order to explain whether people participate in sport, how frequently they participate and whether they drop out or continue to participate [38,43].

The aim of this thesis therefore is to provide insight into the importance of objective and perceived characteristics of the physical environment relative to intrapersonal characteristics, in explaining sports participation in different organizational settings, at different geographical locations and for different population segments, and how intrapersonal characteristics moderate the relations between physical environmental factors and sports participation.

This introductory chapter provides the general context of and rationale for this research. The following section gives an overview of trends and developments related to sports participation, its settings and locations, and the current societal debate on sport policy. Section 1.3 presents the theoretical framework of this thesis, focusing on socioecological models and determinants of sports participation and their interrelations at different levels, based on existing empirical evidence and its limitations. Section 1.4 discusses the gaps in the literature that this thesis fills and explains the conceptual framework of this research. Section 1.5 introduces the overall aim of this thesis and the research questions, 1.6 presents the research design and 1.7 outlines the subsequent chapters.

1.2 Trends and developments in sports participation and policy

Physical activity and sports participation

Sports participation is operationalized in this thesis as *'purposeful active participation in sport-related physical activities performed during leisure time, which entails both participatory sports and performance sports'* [44,45]. Although for decades now policies have been aimed at increasing sports participation and physical activity levels, about one third of the global adult population currently does not comply with public health guidelines concerning sufficient, health-enhancing physical activity [46]. These figures are worse for adults living in high-income countries: 26% of men and 35% of women are insufficiently physically active, compared to 12% of men and 24% of women in low-income countries [5]. Sedentary levels have increased enormously in the recent decades. Too much time is spent sitting at work, school, home and during transport [46]. The sedentary levels in the Netherlands are among the highest in Europe: Dutch people aged 15 or older sit on average for 6.8 hours per day, compared to 5.2 hours for Europe as a whole [47,48]. In contrast, Dutch adults are among the most active Europeans regarding their weekly recreational physical activity and sports participation rates. On average, 80% of Dutch adults aged 15 or older are physically active during their leisure time each week, compared to 44% in the European Union; and the weekly sports participation rate is 56% in the Netherlands, compared to 40% in the EU as a whole (2017) [49]. Generally, the sedentary levels of sports participants are slightly lower and their time spent on physical activity is slightly higher, compared to those who do not participate in sport but may be physically active in a different way, for instance by cycling to the shops, walking to work or working in the garden [47]. In addition, sports frequency and time spent on sport is higher among members of sports clubs than among non-organized sports participants [50].

The situation is worse among younger people. Globally, at least 81% of adolescents aged 11–17 were insufficiently physically active in 2010 [5]. The sedentary rates of Dutch people aged 12–20 are among the highest in Europe: they sit for about 10.4 hours per day [51]. Fortunately, many youths are still involved in sport. About 75% of Dutch adolescents aged 12–20 participate at

least once a week in sport, and 56% of adolescents aged 12–19 do so as members of sports clubs [52]. However, club membership rates decline sharply after the age of 14 and continue to decline with age [52–56]. Each year, almost one third of youths drop out of organized sports, and dropout rates are higher for girls than for boys [40,57,58].

The aforementioned figures show that levels of health behaviours differ significantly by sociodemographic characteristics such as age and sex. It is therefore necessary to investigate various target groups to gain more insight into the specific behaviour of sports participation, including the preferences of these target groups for specific organizational settings and geographical locations.

Settings and locations used for sports

Whereas in the Netherlands sports club membership among youths declines with age, membership rates among adults have stabilized over the past decade [47]. However, due to the individualization of sports participation, informal and flexible types of sports such as running or cycling in the public space, or working out at the gym (in so-called 'light' sports settings), have become increasingly popular and participation rates have increased more rapidly than sports participation in traditional organized sports clubs (or 'heavy' sports settings) [20,59–64]. Sports participants increasingly participate on their own or in informal groups and events. Many have embraced these light settings as flexible and cheap alternatives to traditional sports clubs with their fixed training schedules and locations, the required presence of other people and obligations (or the sense thereof), such as voluntary work [63,65]. At the same time, sport has become an important part of the lifestyle of many people. Sports participants increasingly focus on improving their health and wellbeing, and it is no longer the case that only those who are interested in performance and competition in the context of organized sports clubs are attracted to sport [66]. In addition, participation in multiple types of sports and the use of multiple and less formal settings (such as gyms or other commercial sports providers), have been encouraged through flexible memberships [67].

According to sport sociologists, the aforementioned changes in sports participation and the settings used for sports participation are related to wider cultural and societal processes of change, such as modernization and individualization [61]. These processes have resulted in a change in the values, habits and attitudes of sports participants, changing perceptions about sports participation and the creation of new opportunities to practice sport [45]. For instance, sports participants have been developing different preferences for a greater variety of organizational settings and geographical locations for sports activities, including public spaces (such as public roads and parks), natural environments (such as forests and beaches), and commercial health centres and gyms [59,68,69]. According to the 2014 Eurobarometer survey, the largest share (40%) of European citizens aged 15 years or older engage in sport or physical activity in light, informal settings such as parks and outdoor spaces, 23% do so at health centres, gyms or other sports centres, and only 13% participate in sport or physical activity as members of sports clubs. In the Netherlands, however, sports club membership is still relatively high: 27% of the Dutch population aged 15 years or older are members of sports clubs [49]. In 2012, at least 41% of Dutch sports participants used the public space as their principal sports location, whereas 23% used commercial sports facilities, 18% used public indoor sports facilities, 17% used public outdoor sports facilities and 17% used swimming pools [47]. Interestingly, sports participants in urban areas more frequently used public roads, parks and commercial sports centres as their sports locations compared to the inhabitants of more rural areas.

This thesis focuses on sports participation in different formal and informal organizational settings, and distinguishes between formal club organized sports (i.e. based on club membership), semi-formal alternative organizations (e.g. health and fitness centres/gyms, programmes organized by municipal sports services, mass sports events or work-related sports activities) and informal self-organized participation (e.g. with friends, family or colleagues, or individually). When reference is made to the geographical location of sport, a distinction is made between official municipal sports facilities (e.g. swimming pools and indoor and outdoor sports facilities), commercial sports facilities (e.g. gyms and health centres) and the public space.

Trends and developments in policies to enhance sports participation

In recent decades, local sport policies have focused on encouraging sports participation by supplying, facilitating and subsidizing sports clubs and sport and physical activity programmes for all [21,23,70]. Vulnerable groups – such as people with a lower income or a lower socioeconomic status (SES) or position, a migration background or disabilities – are specifically targeted because of their lower physical activity and sports participation rates [71–73].

Both policymakers and scholars have recently become increasingly aware that public spaces, including parks, squares, playgrounds and natural areas, have the potential to stimulate active lifestyles and sports participation. Municipalities try to make the built environment more attractive for active use by designing cities that encourage people to be more physically active [74–77]. For instance, attractive urban running and cycling trails and routes as well as gym facilities have been developed in the public space. These spaces facilitate all kinds of unorganized and informal sports such as running and cycling, as well as commercial semi-organized gyms, urban sports, boot camps and yoga activities. Besides focusing on increasing sports participation rates, which are already relatively high in the Netherlands [49], national and local ambitions and documents on sport policy increasingly pay attention to the contribution of sport to other health and social policy goals and promote collaborations with other policy sectors [16,78,79]. For example, this is expressed in the increasing 'instrumentalization' of sports clubs. This means that sports clubs, which are usually managed by voluntary boards and coaches, are increasingly expected to contribute to all kinds of societal goals at the social and health levels, in addition to organizing sport [70]. Societal goals that sport is believed to be able to contribute to include challenges regarding, for instance, obesity, reduction of healthcare costs, youth care, aging and loneliness.

Interestingly, although there is increased policy attention to more informal and flexible types of sports settings and locations, a relatively large share (85%) of the sports budget of local Dutch municipalities is still spent on the construction and operation of public sports facilities, which often facilitate traditional sports clubs [80]. This provision of a sufficient, varied and accessible sports

infrastructure has long been prioritized [81]. However, little is known about investments in less formal sports settings and locations, such as public spaces, and how they contribute to sport, health and social policy goals [79]. In addition, little is known about the extent to which public spaces that enhance active lifestyles are the mutual responsibility of multiple policy actors representing these different policy domains.

Furthermore, it is well known that the Dutch sports infrastructure is well organized. The density of the sports facilities provided is high and they are of high quality [49,82]. However, recent studies have shown that differences in this 'official' sports infrastructure makes only a small contribution to the differences in sports participation rates in certain neighbourhoods and among certain groups of the population in the Netherlands [80,83]. This indicates that besides the traditional sports infrastructure, other factors – including informal settings and locations, such as the public space and commercial sports facilities or initiatives, as well as intrapersonal factors and neighbourhood characteristics – also play a role in explaining sports participation. However, the presence and quality of 'active' and sport-friendly public spaces for sports participation, as well as the interaction with intrapersonal factors, has often been neglected in studies on physical environmental determinants of sports participation [79].

By investigating the relative importance for sports participation of different aspects of the physical environment and the interplay between the physical environment and intrapersonal characteristics, this thesis provides insight into the use of different types of sports settings and locations, and their contribution to promoting sports participation among different population segments. It may thus inform policymakers about the provision and facilitation of specific sports facilities and sports settings, in order to encourage sports participation among specific target groups. For example, it may help them to decide whether environmental interventions should focus on specific organizational settings or geographical locations for sport, how to design attractive public spaces that will invite people to participate in sport, and which types of actual and potential sports participants should be targeted. In addition, this thesis contributes to drawing broader attention to the importance of a healthy urban living environment.

1.3 Theoretical background

Whether a person starts doing a sport or decides to participate in a sport in a certain organizational setting and at a certain geographical location and point in time, could be viewed as an individual behavioural choice. However, such choices are not solely individual matters. Research has shown that many determinants impact on whether people participate in sport, how frequently they participate and whether they remain involved in sport or drop out. This section introduces several important theories that have been applied to understand health behaviour, including sports participation, and for the development of interventions that promote these behaviours. Socioecological models are among the theories that have been most frequently applied to understand the determinants of health behaviours. These models emphasize the role of the environmental contexts of health behaviour. Other socio-psychological theories, such as dual-process models, consider both conscious and non-conscious influences, whereas motivational theories focus particularly on psychosocial influences on and mechanisms of behaviour.

Socioecological models: the importance of intrapersonal and environmental levels and the interactions between these levels

This thesis applies a socioecological framework that is frequently used in studies on the relationship between the physical environment and physical activity [38]. Socioecological models have been applied to a far lesser extent in research on sports participation, with the exception of a few studies [8,84,85]. The central idea behind socioecological models is that it usually takes a combination of interventions at the intrapersonal and environmental levels to achieve substantial changes in health behaviours [86]. Ecological models hypothesize that health behaviours are affected by multiple levels of influence, including influences on the intrapersonal (i.e. biological and psychological), interpersonal (i.e. social and cultural), organizational, community, physical environmental and policy levels [86–88]. All influences on health behaviours potentially interact across these different levels. There are various ecological models and theories, and each describe categories and hierarchies of behavioural influences differently [37,89,90]. However, ecological models should be behaviour specific in order to be more effective in explaining the specific influences on a certain

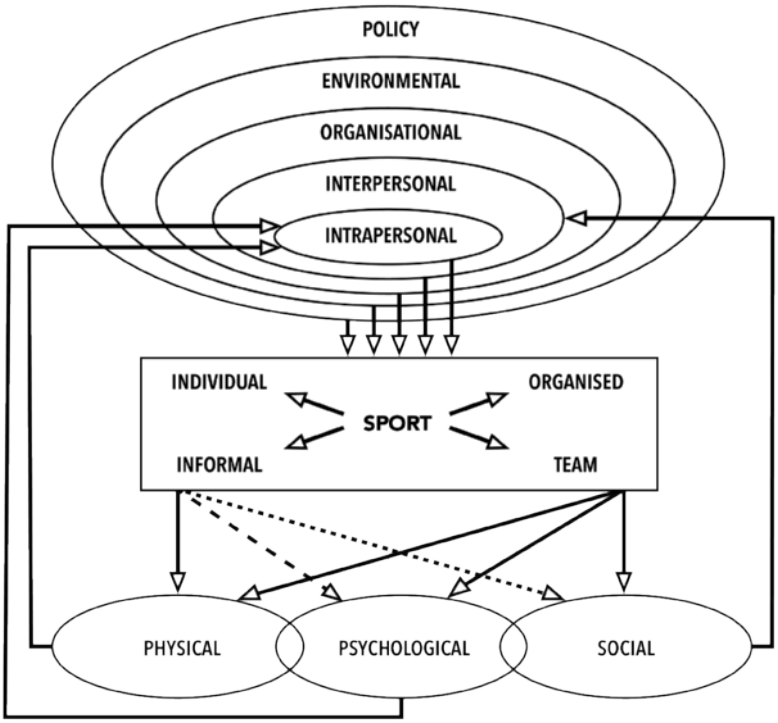

Figure 1.1 Health through Sport model [8]

behaviour [86]. For instance, environmental determinants associated with walking may not be relevant to promote running and are even less likely to promote club football.

One of the first variants of ecological models that have been specifically applied to sports participation is the 'Health through Sport' model (figure 1.1) of Eime et al. [8]. Besides the 'regular' determinants of sports participation based on established socioecological models, this model includes specific elements that are characteristic of the sport context. Furthermore, the model includes health outcomes of sports participation at the physical, psychological and social levels, and these levels may interact and strengthen each other. The sport-specific elements include specific formal and informal locations and organizational settings where sports activities can take place, and team versus individual sports [8]. Participants can engage in different and multiple types of sports and organizational settings. Furthermore, the Health through Sport model assumes that the relative importance of specific determinants at the different ecological

levels differ for children, youths and adults. For instance, some environmental settings, such as schools, mainly play a role for children and youths [8,91].

From socioecological models to dual-process models

Most socioecological models acknowledge the interplay between intrapersonal and environmental factors. While the majority of these models are very comprehensive in order to give a complete overview of aspects that may influence the assumed relationships between environments and behaviour, they do not provide clear hypotheses on how these factors at different levels interact [38,43]. Another limitation of socioecological models is that they do not explicitly define the causal mechanisms that underlie health behaviours [8,92]. For instance, whereas evidence is growing about the existence of an 'obesogenic environment', much is still unknown about the causality of environmental influences on health behaviours [93,94]. For these reasons, Kremers et al. [94] introduced the EnRG framework (Environmental Research framework for weight Gain prevention, figure 1.2), which focuses on determinants at various socioecological levels and makes explicit causal mechanisms of energy-balanced behaviours, such as physical activity and sports participation. The framework is an example of a 'dual-process model', in which behaviour is hypothesized to be the result of a simultaneous influence of conscious and unconscious cognitive processes. Conscious or reflective processes refer to rational influences, and unconscious or impulsive processes refer to spontaneous factors and processes that occur beyond an individual's awareness [95]. In line with this, it is suggested that physical environmental characteristics can influence behaviour both indirectly and directly. The indirect causal mechanism refers to the mediating role of conscious, behaviour-specific, individual cognitions (i.e. attitudes, subjective norms, perceived behavioural control, and intentions) in the influence of the environment on behaviour. Direct influences reflect the automatic, or unconscious, influence of the environment on behaviour, for example, taking the stairs because no other option is available [96]. Specific personal and behavioural factors – such as sociodemographic factors, personality, awareness, habit strength, and involvement – may moderate the causal pathways [94]. The assumed indirect and direct, or conscious and unconscious, influences on health behaviours give an impression of the complexity of the interactions between factors at the

intrapersonal and environmental levels. I assume that these interactions may differ for specific energy-balanced behaviours.

Studies have found support for the moderating and mediating effects of

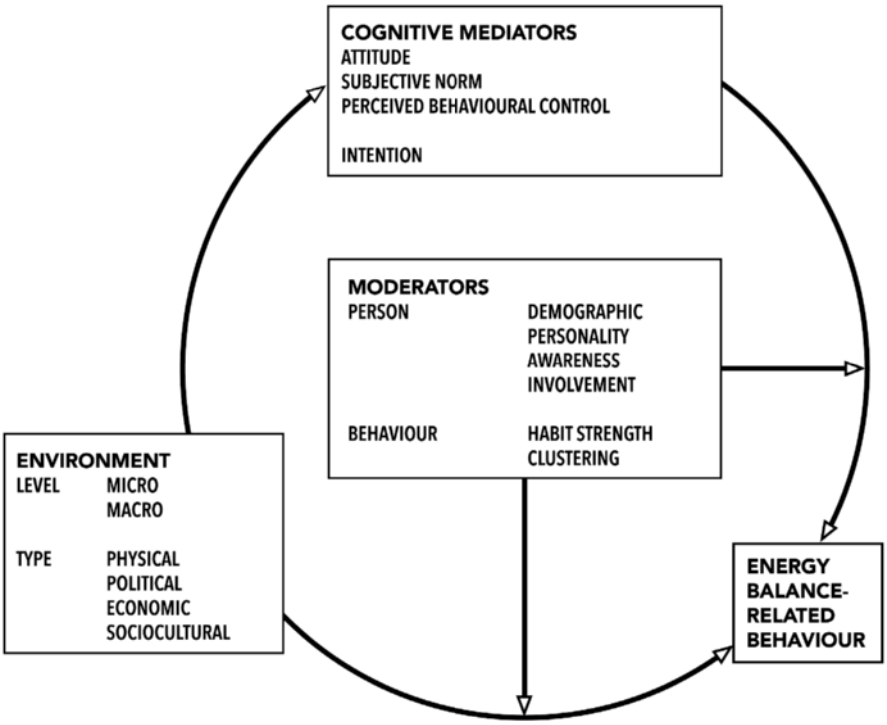

Figure 1.2 Environmental Research framework for weight Gain prevention (EnRG) [94]

intrapersonal psychosocial characteristics such as cognitions, attitudes, self-efficacy and intentions on the relationship between the physical environment and physical activity [43,97–103]. However, despite much theoretical support, empirical evidence for interactions between intrapersonal and environmental factors (e.g. whether physical environmental associations with behaviour depend on intrapersonal characteristics) is still limited, and studies seem to find interactions that exist only in very specific combinations [38,104]. Whereas attitude towards physical activity is found to interact with perceived neighbourhood characteristics (such as feeling at home, feeling safe, and perceived accessibility in terms of presence and quality of available pavements) in explaining leisure time physical activity, the direction of the interactions

differs by neighbourhood factor and physical activity outcome [102,103,105]. For instance, Deforche et al. [100] found that self-efficacy interacted significantly with multiple neighbourhood factors in explaining active transportation while for leisure-time sport fewer interaction effects were found. In addition, lower perceived neighbourhood safety and poorer access to recreational facilities were only associated with lower active transport among youth with lower self-efficacy. That interactions only exist in specific combinations suggests that much is still unclear about the moderating mechanisms underlying health behaviours. According to Beenackers [43], there is a need for more focused socioecological models that address specific interaction mechanisms in order to generate concrete hypotheses on how multilevel factors interact and may determine specific health behaviours. However, little is known about these 'intrapersonal–environmental interactions' in the specific context of sports participation. It is likely that the interactions that play a role in sports participation are different from those that play a role in physical activity, and that interactions may differ for different types of sports and the various organizational settings and geographical locations used for sports participation.

Intrapersonal determinants of sports participation: motivation and goals

Instead of focusing on interactions between characteristics at multiple environmental levels, most previous studies on sports participation focused solely on the direct influences of determinants at the intrapersonal and interpersonal levels [38]. Those studies used theories that deal more specifically with aspects of one of the socioecological levels. This section highlights empirical evidence and some of the most commonly used theories on the intrapersonal-level determinants of sports participation, including motivation and goals.

Much evidence has been found for intrapersonal correlates such as age, sex, self-efficacy and SES, working and household characteristics of sports participation and sports frequency [50,106–108] as well as of dropout from organized sports [40,57,109–113]. Some studies also suggest that preferences for specific sports settings depend on sociodemographic characteristics. For instance, women are more likely to engage in informal and flexible sports in commercial or alternative settings [20,60,68], and adults of higher social classes and with

higher incomes are more likely to engage in non-organized sports [65,108]. In addition to these sociodemographic characteristics, at the psychological level determinants such as self-determined or intrinsic motivation (i.e. the reason why a person participates in sport), goals (i.e. what an individual is expecting to achieve with sport), as well as the underlying basic psychological needs of behaviour (i.e. autonomy, competence and relatedness) have been found to be strong intrapersonal determinants of sports participation and persistence in sport [40,114–117].

Most studies investigating motivation for sports participation build on self-determination theory (SDT) [118,119], one of the most commonly used motivational theories. SDT postulates that different types of motivations are situated along a continuum ranging from extrinsic motivation to intrinsic motivation, and they are assumed to vary in their degree of self-determination [118]. Based on the degree of self-determination, motivation can be classified as autonomous or controlled. Autonomous motivation comprises types of motivations in which people have identified with the value of a behaviour and have integrated it into their sense of self [120]. Controlled motivation refers to motivation that is less self-determined in nature and is characterized by the experience of pressure to think, feel or behave in particular ways [120]. In addition to motivation, people can pursue certain goals or have certain motives that can be intrinsic (e.g. developing skills, seeking challenge, gaining social affiliation and improving health) or more extrinsic (e.g. having an appealing appearance, losing weight or being recognized by others) [115,121].

Another main motivational approach that is applied to understand the role motivation plays in sports participation is achievement goal theory (AGT) [122]. AGT distinguishes between two types of goal orientations or personal definitions of success: task orientation and ego orientation. Whereas task-oriented individuals focus on maximal effort and personal improvement, ego-oriented individuals believe that winning and favourable outcomes are the markers of success in sport [123]. The two theories (AGT and SDT) are complementary and studies have found evidence for the beneficial role of high task orientation in promoting self-determination in sport. In general, task orientation relates to a

higher level of self-determined or intrinsic motivation and has been associated with persistence in sport, whereas ego orientation relates to controlled forms of motivation and has been associated with dropout [116,123–125].

However, the aforementioned motivational theories have been criticized for focusing only on cognitive and motivational variables. They pay little attention to or neglect other, non-voluntary factors that are beyond the control of the individual, such as the physical environment. To better understand human behaviour and to increase the likelihood that people can change their behaviour towards more healthy choices, it is important to also take into account contextual influences and interrelations between intrapersonal and physical environmental levels [86].

Physical environmental determinants of sports participation: objective and perceived characteristics

The influence of the physical environment on health behaviours, including physical activity and sports participation, has recently attracted much attention from scholars in both the public health and the health geography domains [38]. Scholars increasingly recognize that both people and places can make a difference [126–128]. Studies have shown that the physical environment plays an important role in physical activities [76,129–132]. In addition, environmental characteristics have been associated with sports participation. These characteristics include both factors related to the provision of sports facilities (e.g. their availability and proximity) and more general characteristics related to the residential neighbourhood (e.g. population density, SES and safety) [84,105,108,133–135].

Environmental factors can be measured using different methods. They can be objectively measured or related to individuals' perceptions of the environment. Studies that use objective methods rely on, for instance, geographic information system (GIS)-based measures. Objective measures of the physical environment have recently received much attention in the literature because these concrete measures can link research findings more directly to policy interventions in the built environment [136]. Objectively measured environmental factors include, for instance, travel distance to and the availability and proximity of sports

facilities [39,133,134,137–141]. However, studies have shown inconsistent results regarding the influence of sports infrastructure on sports participation, partly due to the use of different definitions and measurements [84,137,139,140]. Differences in results were found between, for instance, different types of sports [137,138,142], age groups and sex [143,144], and residential neighbourhood characteristics such as population density, safety and SES [84,108,145]. For example, studies have shown that although people who live in rural areas in the Netherlands have to travel further to sports facilities and the density of sports facilities is lower in these areas, their weekly sports participation rates are higher than those of people living in urban areas [146]. However, another Dutch study showed that these rural–urban differences in sports participation rates could partly be explained by objective neighbourhood characteristics, including SES and safety, instead of by objective sports infrastructure characteristics [84]. An Australian study showed slightly different results, namely that non-metropolitan areas generally had higher participation rates and better provision of facilities than metropolitan areas. Although a better provision of sports facilities was generally associated with increased sports participation in this study, SES and urban density level were also important explanatory factors [142]. In addition, results may differ per age group. Whereas no associations were found between the availability of sports facilities and sports participation in Dutch adolescents [140], in another study a greater variety of sports facilities nearby was found to be associated with participating at least once a month in sport among Dutch adults [84]. Besides the variety in the results found, these examples show the inconsistency in the concepts and definitions used regarding the accessibility and availability of sports facilities. Nevertheless, the findings also indicate that a person's residential neighbourhood environment matters.

The perceived environment has mostly been investigated by self-reported measures in cross-sectional studies. Studies show, for instance, that the perceived presence and proximity of facilities, shops, services, pavements, quiet and green areas, and aesthetics are positively associated with physical activity and recreational walking [131,147–151]. Perceptions of the environment that are positively associated with sports participation differ slightly from those that

are positively associated with physical activity. The former include perceived proximity and availability of sports facilities, proximity of green spaces, safety, and attractiveness of the neighbourhood [105,108,152].

Despite the shift towards objective measures, perceptions and experiences of the physical environment still play an important role in explaining whether and, if so, how frequently people participate in sport. Since the 'mobility turn' or 'the new mobilities paradigm' in the social sciences, even more attention has been paid to these perceptions, emotions and embodied experiences [153]. For instance, Cresswell [154] introduced a more holistic view of mobility, wherein the complex interplay between movement, experience and representation or meaning is central, instead of the perception of mobility as 'getting from A to B'. In this perception, doing sport can be seen as a continuous interaction between the body, the senses and the environment. The experiences of the body are lived through the senses. Senses – such as touching, smelling, feeling, hearing and seeing – function as conditions for choosing and recognising sports settings and terrains, adapting one's pace and taking into account other sports participants and road users [155–157]. These experiences of sports participants can be both positive and negative [158]. Therefore, I assume that experiences are likely to be associated with whether people participate, how frequently, and whether people continue or drop out of sport. Experiences are also likely to relate to sports participants' choices of sports settings and locations. For instance, sports participants can be hindered by other road users or unpleasant surfaces, or they may feel unsafe at the sports facility, in the park or on their way to the facility/park. This may have an impact on how frequently people go for a run or continue being a member of a sports club.

Perceived constraints and time use factors

Whereas motivations are determinants at the intrapersonal level, the constraints people may perceive on participating in sport can be experienced at multiple socioecological levels. People may perceive all kinds of constraints that may hinder them from participating in sport, indicating that constraints can be an important determinant of sports participation. Below, I explain the role of constraints as well as of factors related to time use. Although constraints and temporal factors are often neglected in studies on health behaviours and

in socioecological models, they are potentially important in relation to sports participation.

According to the hierarchical leisure constraints theory [159,160], decisions to undertake behaviours such as sports participation are influenced by three types of constraints, namely constraints at the intrapersonal, interpersonal and structural levels. These types of constraints correspond largely to the levels distinguished within socioecological models. Intrapersonal constraints refer to physical or psychological constraints – such as fatigue, health problems, stress and lack of self-confidence – and to constraints regarding a lack of the skills or knowledge required for sports participation. Interpersonal constraints include, for example, the inability to find a partner to take part in a sports activity. Structural constraints correspond to the level of the physical environment and include constraints related to the accessibility of sports facilities, lack of transport, lack of financial resources, the quality of sports facilities or sports activities provided, and time constraints [161–163]. Theoretically, these constraints are experienced in a sequential hierarchical order: intrapersonal constraints are seen as the most powerful, and structural constraints as the least powerful and less difficult to overcome [159,160]. It is assumed that if intrapersonal constraints are not overcome, the desire to participate in or the preference for a sports activity may not even come into being or will disappear. On the other hand, a higher demand or need to participate will increase structural constraints, such as financial barriers, transport issues and probably also time constraints. However, the importance of constraints always depends on individual characteristics and the individual's socioeconomic and cultural background [160]. For instance, studies have shown that women and people with a lower SES perceive more constraints on engaging in leisure behaviour, and that leisure constraints are subject to cultural norms [159,160]. Furthermore, whether a person participates in sport depends on the successful application of cognitive and behavioural negotiation strategies to the constraints experienced, a process that is related to the level of self-determined motivation. Negotiation strategies are often related to time use and include planning, time management, communication and cooperation with significant others, showing flexibility, and discipline [164–167].

Several studies have shown that a lack of time is often mentioned as an important constraint that may hinder people from participating in sport [41,168–171]. However, little is known about the relative importance of time constraints and other constraints on sports participation. In addition, much is unknown about how daily time use patterns (i.e. time spent on other activities at certain locations) are related to sports participation or dropout. Whereas health behaviours often have a clear temporal structure – sports activities, for example, have certain durations or frequencies and club training sessions are scheduled for specific times – time-related factors are not yet fully integrated into socioecological models and research on sports participation and its relation with the physical environment [126,172,173].

Insights from time geography can be used to better understand the associations between time use, time constraints, and sports participation or dropout from sport. From a time–geographical perspective, only a limited set of places can be visited within a certain time window. The time window within which discretionary sports activities take place is determined by mandatory or fixed activities with certain durations and which takes place at specific locations. Participation in any activity at a specific geographical location at a specific time is subject to constraints at the biological, intrapersonal, interpersonal and institutional levels [174]. Time geography distinguishes between capability constraints (i.e. biological needs, such as time spent on sleeping and eating), coupling constraints (i.e. the need for other people in case of joint activities) and authority constraints (i.e. rules and regulations that make certain locations such as sports facilities only available during authorized opening times) [173,175]. For example, people may perceive constraints on continuing to participate in organized sports with fixed training and competition schedules, due to an increase in time spent at school or work or on studying. Furthermore, time may have a greater limiting impact at certain life stages, for instance when life events such as switching schools, starting a first or new job or having children take place [176,177]. Logically, constraints are more severe if work or study is combined with multiple leisure activities at different locations, such as engaging in multiple sports and social activities.

1.4 Research gaps and conceptual framework

Despite the existing literature on the relations between the physical environment and sports participation, some areas remain understudied. The studies in this thesis address the following three main research gaps.

First, if socioecological models are applied to understand and promote health behaviours, they should be behaviour specific [38]. However, most socioecological models in the public health domain focus on physical activity. Few socioecological models have been specifically developed to explain sports participation. Although sports participation can be seen as a specific type of physical activity [1], it differs markedly from physical activity in general because sport usually involves rules and regulations, defined goals and a decent amount of motivation. In addition, a wide range of organizational settings (e.g. one can participate individually or in a team) and geographical locations (e.g. gyms, tennis courts, or city parks or streets) are specifically used and required for sport [1,20]. Furthermore, whereas some types of physical activity, such as walking, partly take place automatically or impulsively as part of daily life activities [172], it is likely that sports participation is preceded by a more rational, planned and conscious decision or choice, and that both objective and perceived characteristics of the physical environment that may encourage or hinder sports participation differ from environmental determinants associated with other types of physical activity. Therefore, this thesis applies a socioecological approach and investigates whether a socioecological model specifically developed to explain sports participation is needed. Due to the complexity of sports participation, it is important that this approach distinguishes between different specific outcome measures. This complexity is reflected in the variety of types of sports, the phenomenon of dropout, and the different types of settings and locations used and preferred for sport. This thesis distinguishes the following outcome measures: how frequently people participate in sport, whether people continue or drop out of specific types of sports (i.e. tennis and football), and which settings and locations are used and preferred for sport. Herewith, this thesis contributes to a better understanding of specific types of behaviour related to sports participation, and its intrapersonal, and objective and perceived physical environmental determinants.

Second, although there is consistent theoretical support for the principle of multilevel influences on health behaviours, much is still unknown about the interplay between physical environmental and intrapersonal characteristics [86]. In other words, research is lacking on the extent to which associations of the physical environment with sports participation differ between people, depending on intrapersonal factors. It is likely that different groups of people – including younger vs older people and experienced vs less experienced sports participants – may have different preferences for specific settings and locations and type of sports activities. For instance, organized sports participation is more popular among youths, whereas adults who have just started participating in sport may prefer low-key, informal and flexible types and settings, such as running and cycling in the public space, whether or not under the guidance of an instructor or in the company of others. Furthermore, I assume that associations of the physical environment with sports participation may vary for people with different levels of motivation or goals, and for novice and more experienced sports participants. For instance, users of informal settings such as public spaces are more flexible regarding when they do sports, compared to participants in more traditional sports settings with fixed time schedules. Therefore, it is possible that participants in informal self-organized sports settings may need a higher level of self-determined motivation and are driven to participate frequently by different goals compared to participants in traditional sports clubs. Sports club members may find social goals more important and may have a higher social commitment that triggers them to participate in sports more often. In addition, various elements of the physical environment – including street lighting and interactions with other road users, such as cars and cyclists (or the absence thereof) – may affect whether novice sports participants experience their sports environment as attractive, more than those elements affect experienced sports participants, who may know how to deal with them and have already adjusted their preferences and expectations. By investigating such specific environment–individual interactions, this thesis provides more insight into the direct and indirect mechanisms underlying and the nuances explaining differences in sports participation and the settings and locations used for sport.

Third, although socioecological models are very comprehensive, temporal dimensions and perceived constraints are absent from these models and from studies on sports participation [126,172,173]. I assume that both space and time are important in understanding health behaviours, because these behaviours are affected and structured by how the physical environment has been designed and how individual daily activity patterns looks like. Time-related aspects such as time use (i.e. how much time is spent on activities at different locations) and changes in time use – which are often related to important life events, such as changing schools (e.g. from primary to secondary or secondary to higher education), moving to another residential environment or starting a new job – may be associated with sports frequency and dropout. In addition, the extent to which a person experiences time constraints due to time spent on other activities, such as work, school, family and traveling between different activities, may decrease the likelihood of sports participation. By taking time dimensions, time constraints and other constraints at different socioecological levels into account in research on the physical environment on sports participation, this thesis contributes to a more comprehensive understanding of sports participation.

Figure 1.3 shows the conceptual framework and the related hypotheses underpinning this thesis. The framework is based on the socioecological models described in this thesis and was inspired by the Environmental Research framework for weight Gain prevention (EnRG) [94]. It shows how characteristics of the physical environment and intrapersonal characteristics can be associated with sports participation.

Regarding the concepts used, the studies in this thesis address the frequency of sports participation as well as dropout from sport as sports participation outcomes. However, preferences for certain sports settings and locations are investigated in one of the studies as an outcome measure as well. Two types of physical environmental characteristics are distinguished: objective factors and perceived factors. The objective factors investigated in this thesis include proportions of land use, the presence and number of sports facilities in the

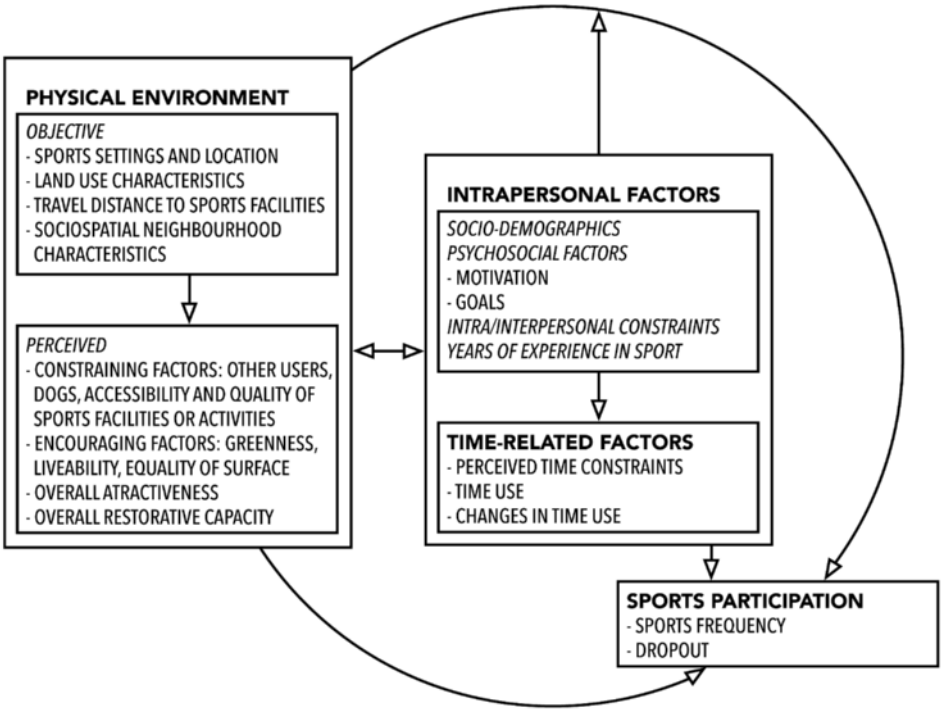

Figure 1.3 Conceptual framework

neighbourhood, travel distance to the sports facility, and other socio-spatial characteristics of the residential neighbourhood, including density, SES, safety and liveability. The perceived factors are categorized into constraining and encouraging factors. Perceived environmental constraints include hindrance caused by other road users or feeling unsafe, as well as perceived constraints related to the accessibility of sports facilities, the quality of the sports facilities and sports activities provided, and the familiarity therewith. Encouraging perceptions are, for instance, perceived attractiveness, greenness and liveliness of the sports environment. Sports settings and locations are shown in the framework as objective characteristics of the physical environment.

Concerning the hypothesized direct associations, the framework assumes that objective characteristics of the physical environment, including the presence of sports facilities and travel distance to sports facilities, are associated with sports frequency, sports dropout and preferences for a specific sports setting. Although not shown in the conceptual model, perceptions of the environment are hypothesized to relate to the perception of attractiveness and restorative

capacity of the environment. Furthermore, both intrapersonal factors – including socio-demographics and psychosocial factors, such as motivation and goals – and time-related factors are assumed to be directly associated with sports participation, but may also moderate the relationships between the physical environment and sports participation. This means that indirect associations between the physical environment and sports participation are assumed, and that environmental and intrapersonal factors interact with each other. The role of environmental associations in sports participation may thus differ along the lines of the individual characteristics of actual and potential sports participants, such as their level of self-determined motivation, goals, perceived constraints or years of sport experience.

Because constraints can be perceived at both the physical environmental and the intrapersonal level, different types of constraints are shown in the framework as part of perceived environmental factors, intrapersonal factors and time use factors. The constraining factors addressed in this thesis include both intrapersonal constraints (e.g. physical and psychological constraints, and constraints related to skills and knowledge) and interpersonal constraints (e.g. lack of one or more sports partners). Furthermore, structural constraints are distinguished. These include both environmental constraints (e.g. constraints related to the accessibility, presence and quality of the sports facilities and the sports activities provided) and time constraints. Perceived constraints are assumed to be directly associated with sports participation. Objective physical environmental characteristics, such as socio-spatial neighbourhood characteristics, may also be associated with constraints. Although time use factors are individual characteristics related to individual lifestyle choices and life stages, they are visualized as a separate factor in the model. This emphasizes the potential added value of these determinants that may directly be associated with sports participation.

1.5 Aim and research questions

In order to address the research gaps introduced, the central aim of this thesis is: to provide insight into the importance of objective and perceived characteristics of the physical environment relative to intrapersonal characteristics, in explaining sports participation in different organizational settings, at different geographical locations and for different population segments, and how intrapersonal characteristics moderate relations between physical environmental factors and sports participation.

In order to achieve the above aim, I formulated five research questions. Each question is answered in a separate chapter of this thesis.

1. *How do objective characteristics of the physical environment relate to sports participation and preferences regarding sports locations and settings?*

Previous studies that investigated the intrapersonal and physical environmental determinants of sports participation mostly focused on whether, how frequently, and in which formal or informal organizational settings people participate in sport [50,108]. However, much less is known about the environmental factors that relate to preferences for certain sports locations, such as public spaces, private sports facilities (e.g. gyms or swimming pools), or settings such as traditional sports clubs. Whether the design of a person's residential neighbourhood is conducive to sports participation may affect not only whether that person participates in sport, but also at which location she prefers to participate and whether she will do so as a member of a sports club or in a more unorganized or informal setting. It is likely that the number of sports facilities, sports clubs or attractive green and blue spaces such as city parks and natural areas in or close to a neighbourhood may affect the likelihood that people participate in sport as well as their preferences for a certain sports location. Investigating the relative importance of objective land use and socio-spatial neighbourhood characteristics for both sports participation and preferences for locations and settings for sports, adds to the knowledge on associations of objective determinants of the physical environment with specific characteristics of sports participation (i.e. locations, settings and participation) (knowledge

gap 1). This knowledge may help policymakers decide what locations and settings for sports participation they should facilitate.

2. *How is the objective physical environment associated with perceived constraints on sports participation, and what are the roles of constraints, environmental factors and personal factors in explaining sports frequency?*

Constraints can be an important barrier to sports participation [41,107,178]. However, constraints related to personal and physical environmental factors have not been studied systematically in the context of sports participation. Little is known about the extent to which characteristics of the physical environment – for example sports locations, the travel distance to sports facilities and socio-spatial neighbourhood characteristics, such as SES, population density and liveability – are related to the experience of different types of constraints. For instance, do participants living in neighbourhoods with specific sociodemographic compositions experience more intrapersonal or interpersonal constraints related to skills and knowledge or the presence of others, and are travel distance and the type of sports locations used associated with the experience of constraints such as a lack of sports facilities or time? In addition, if constraints are experienced, do they indeed lead to lower levels of sports participation and do so to a greater extent than objective environmental factors? Investigating these topics contributes to a further understanding of the relative importance of objective and perceived physical environmental factors, the role of perceived constraints (knowledge gap 3), and associations between intrapersonal and environmental factors (knowledge gap 2) in explaining sports participation (knowledge gap 1).

3. *How important are time use, changes in time use, and the physical environment in explaining dropout from organized sports among youths?*

Studies have shown that sports club membership has specific additional health benefits compared to individual and informal sports settings [28]. However, many youths drop out of organized sports. In the Netherlands, both the largest and the second largest organized sport (football and tennis, respectively) are

faced with significant declines in youth members. Whereas a lack of self-determined motivation, a high ego-orientation and competing priorities are known as important reasons for dropout [40,111,116,124], less is known about the role of time use factors and environmental determinants. It is plausible that time spent on competing activities (e.g. school, work, other sports, hobbies, social activities, and activities at the sports club), changes in time use (e.g. changing schools or starting a job) and travel distance to the sports club may relate to the probability of dropping out. More understanding of the importance of these temporal determinants (knowledge gap 3) and environmental determinants, relative to intrapersonal factors such as motivation (knowledge gap 2), contributes to the understanding of dropout from the specific sport contexts of football and tennis clubs (knowledge gap 1). This will help sports clubs, sports professionals and policymakers to devise strategies to keep youths involved in sports clubs.

4. *How do users of different sports settings differ regarding intrapersonal characteristics, and to what extent are associations between motivations, goals and sports frequency different for users of different sports settings?*

To develop targeted policy strategies to increase sports participation, more insight is needed into the behavioural patterns, preferences and requirements of sports participants across different formal and informal settings for sports participation. However, evidence on intrapersonal–environmental interactions with sports participation is currently lacking [86]. It is likely that both sociodemographic and motivational variables may have different effects on sports frequency and depend on the specific settings used for sports activities. For instance, participants using public spaces may need a higher level of self-determined motivation to participate frequently and may be driven by different goals compared to participants in traditional sports clubs. More insight into these mechanisms contributes to the knowledge about interactions between individual and physical environmental factors (knowledge gap 2) among users of specific settings for sports (knowledge gap 1), which may help to determine what strategies are useful to further promote sports participation among users and potential users of different settings.

5. *How are intrapersonal characteristics and perceptions of the physical environment associated with the perceived attractiveness and restorative capacity of the public space for running? And how does number of years of running experience moderate these associations?*

Running has proven benefits for health and has become one of the most popular sports [179–183]. Attractive environments may not only generate greater health benefits, but also increase positive running experiences, which in turn stimulates running [74,77,152]. However, little is known about which environmental characteristics (e.g. greenness and running surface) make a public space attractive and restorative for runners, and to what extent this depends on the characteristics of the runner. It is expected that novice or inexperienced runners may differ from experienced runners with regard to their perceptions of the environment, such as interactions with other road users or quality of the running surface. This investigation contributes to a better understanding of the importance of perceptions of the physical environment, and intrapersonal–environmental interactions (knowledge gap 2), specifically related to running (knowledge gap 1). More insight into the experiences of different groups of runners is important in order to understand how novice runners may be better encouraged and facilitated to remain involved in sport.

1.6 Research design

Data collection

This thesis is based on cross-sectional studies focusing on three target groups: adults aged 18–80 (chapters 2, 3 and 5), youths aged 13–21[1] (chapter 4) and one specific group of sports participants aged 18–80, namely runners with different levels of running experience (chapter 6). Data collection and the corresponding participant recruitment were conducted in the following three ways.

[1] The focus was on youths aged 13–21 because of the potential differences in time use, changes in time use and related spatial consequences in this life stage (e.g. changing schools, moving to another place due to studies, increased travel distance).

Adults

Data for chapters 2, 3, and 5 were collected in six Dutch municipalities (Amsterdam, Utrecht, Alphen aan den Rijn, Heerlen, Berkelland, and Roerdalen) in September 2014. These municipalities were selected based on their differences in area size, population density and their more central or more peripheral location in the Netherlands, in order to have sufficient variation in presence, type and accessibility of sports facilities. Three thousand adults (total N = 18,000) were randomly selected from the population register of each municipality. The municipalities were asked by the researcher to send a letter to the home addresses of these adults, inviting them to participate in an online survey. This survey was used to obtain data on intrapersonal characteristics (e.g. socio-demographics, type of sports, sports locations and sports settings) and psychosocial characteristics, including motivation[2], goals[3] and perceived constraints[4]. In total, 1,663 people completed the survey (9.2% response rate).

Youths

Data collection for chapter 4 took place via online surveys among young football and tennis players who were either sports club members or dropouts. Data collection among dropouts from and members of the Royal Dutch Football Federation (KNVB) took place between May/June 2015 and June 2016. Data collection among dropouts from and members of the Royal Dutch Lawn Tennis Federation (KNLTB) took place between December 2015 and May 2016. From each group of dropouts and members, 10,000 youths aged 13–21 years were randomly selected from the membership registration databases (total N = 40,000). The sports federations sent invitations to participate in the survey via email. For those younger than 18 years, the first question of the survey asked for both parental consent and adolescent assent. The online survey contained questions on intrapersonal characteristics, including motivation[5] and time

[2] Motivation for sports participation was measured using the 15-item Behavioural Regulation in Exercise Questionnaire (BREQ) [256].

[3] Goals to participate in sport were measured by the 20-item Goal Content for Exercise Questionnaire (GCEQ) [121]. Both BREQ and GCEQ are based on SDT [118].

[4] Constraints on participating in sport were measured by the Leisure Constraints Scale [162,163].

[5] Task and ego orientations were measured using the validated Dutch version of the Task and Ego Orientation in Sport Questionnaire (TEOSQ) [249].

spent on several activities during the previous year. In total, 2,566 respondents completed the surveys. Response rates were 10.1% for football club members, 3.5% for football club dropouts, 6% for tennis club members and 6% for tennis club dropouts. The total response rate was 6.4%.

Runners

For chapter 6, the Eindhoven Running Survey 2015 (ERS15) was used to collect data among participants of the Eindhoven Marathon in October 2015. A sub-dataset was drawn containing only those runners who had participated in the 2015 Eindhoven Half Marathon (21.1 km)[6]. After finishing the half marathon, all registered participants (N = 9,314) received an email from Fontys University of Applied Sciences/Eindhoven University of Technology explaining the research and providing a link to the online questionnaire. Data were collected on intrapersonal characteristics (e.g. socio-demographics, motivation[7] and sports participation characteristics) and perceptions of the running environment. In total, 2,477 participants completed the questionnaire (26.6% response rate).

Measures and data used

In the surveys, participation in sport was initially defined as 'participation in sport at least once during the 12 months prior to the survey'. The questions on sports participation and sports setting or sports location were derived from the standardized and validated 'Dutch guideline for sports participation research' (in Dutch: RSO) [184,185]. Respondents were provided with a list of sports, to which they could add additional ones. Dropouts were defined as those who had ended their club membership during the previous year. Data on land use and population density were obtained from Statistics Netherlands [186,187]. Land use data were used to calculate proportions of different land use types (e.g. roads, public facilities, green space and blue space) within buffers around participants' homes, by using mean coordinates of 6-digit postal codes in ArcMAP 10.3.1. The numbers and locations of sports facilities were drawn from

[6] Half-marathon runners were selected because of the heterogeneous characteristics of this group of participants, which included both highly experienced and less experienced runners [269].

[7] Motives for and attitudes towards running were measured by 25 items, based on Janssen et al. [269].

the Dutch Database Sport Aanbod (DSA) [83,188]. Travel distance from home to the sports facility or club was calculated using ArcMAP or Google's Geolocation API [189]. Data on neighbourhood liveability and SES were obtained from the 'Leefbaarometer 2.0' and The Netherlands Institute for Social Research, respectively [190,191].

1.7 Outline

This thesis unravels the complex interrelations between the physical environment, intrapersonal factors and sports participation. Chapters 2, 3, 4, 5 and 6 were written as separate articles that have been published in peer-reviewed journals. Chapter 2 contributes to a further understanding of the relative importance of the objective physical environment (e.g. land use characteristics such as the proportion of green space, presence of sports facilities and neighbourhood characteristics) for sports participation, and its role in explaining whether a person participates in sport and, if so, at which sports location or in which setting. Chapter 3 investigates the importance of perceived constraints for participation in sport. It focuses on how constraints relate to the objective characteristics of the physical environment and the extent to which these factors contribute to the explanation of sports frequency. Chapter 4 contributes to the knowledge on dropout from organized youth sports. It provides more insight into the temporal and environmental determinants of dropout among young football and tennis players. Chapter 5 focuses on motivation and goals of sports participants across different formal and informal settings for sports participation, which adds to the understanding of interactions between intrapersonal and environmental factors. Chapter 6 provides more insight into perceptions of the physical environment. It examines what environmental features make a public space attractive and restorative for runners, and the extent to which this depends on their level of experience in running. Chapter 7 presents the conclusions and implications of this PhD thesis, by providing a summary of the key findings and answers to the research questions, reflections on the research gaps, and recommendations for future research and policy. This thesis ends with a summary in Dutch.

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- CHAPTER 2 -

DO OBJECTIVE NEIGHBOURHOOD CHARACTERISTICS RELATE TO RESIDENTS' PREFERENCES FOR CERTAIN SPORTS LOCATIONS? A CROSS-SECTIONAL STUDY USING A DISCRETE CHOICE MODELLING APPROACH

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Abstract

The number of sports facilities, sports clubs or city parks in a residential neighbourhood may affect the likelihood that people participate in sport and their preferences for a certain sports location. This study aimed to assess whether objective physical and socio-spatial neighbourhood characteristics relate to sports participation and preferences for sports locations. Data from Dutch adults (N = 1,201) on sports participation, their most-used sports location and socio-demographic characteristics were collected using an online survey. Objective land-use data and the number of sports facilities were gathered for each participant using a 2,000-metre buffer around their home locations, whereas socio-spatial neighbourhood characteristics (i.e. density, socioeconomic status and safety) were determined at the neighbourhood level. A discrete choice-modelling framework (multinomial probit model) was used to model the associations between neighbourhood characteristics and sports participation and location. Higher proportions of green space, blue space and the number of sports facilities were positively associated with sports participation in the public space, at sports clubs and at other sports facilities. Higher degrees of urbanization were negatively associated with sports participation at public spaces, sports clubs and other sports facilities. Those with more green space, blue space or sports facilities in their residential neighbourhood were more likely to participate in sport, but these factors did not affect their preference for a certain sports location. Longitudinal study designs are necessary to assess causality: do active people choose to live in sports-facilitating neighbourhoods, or do neighbourhood characteristics affect sports participation?

2.1 Introduction

In many European countries, sports clubs have a long tradition in facilitating organized sports [1]. Research has shown that club-based sports participation is associated with improved psychological and social health, above and beyond the positive effects gained from other individual forms of physical activity [2,3]. However, societal developments, such as individualization, have had an important influence on leisure culture and lifestyle, and have led to a decline in participation in sports clubs. Hence, the importance of sports clubs as the main providers of sports activities is changing [4,5].

These changes have led to the development of new opportunities to practice sport. Although both traditional club-based sports participation (also referred to as 'heavy sports') and non-club sports participation (or 'light sports') have increased over time, non-club sports participation has increased more rapidly [4–6]. Over the past decades, informal, unorganized, non-competitive, individual forms of sports such as running, cycling and working out in the gym have become more popular, which has resulted in a greater variety of locations used for sports activities, including public spaces [6,7]. According to the Eurobarometer survey 2014, the largest share of European citizens aged 15 years and older engage in sport or physical activity in informal settings, such as parks and outdoor spaces i.e. 40%), 23% engage in health centres/gyms or other sports centres, and only 13% participate in sports or physical activity as member of a sports club [8]. In the Netherlands, data showed that in 2012, 43% of Dutch sports participants participated in sport as members of a sports club, whereas 63% mostly participated in sport individually, in non-organized settings [9]. These numbers indicate the growing importance of public spaces as facilitators of sports participation.

Increasing sports participation is a common policy goal in Western societies [10], and to stimulate participation in sport it is important to understand which locations are used for sports participation and by whom, as well as what determinants play a role in the use of such locations. Previous studies that investigated the determinants of sports participation have mostly investigated whether people participate in sport and how frequently they

participate. These studies showed associations between sports participation and individual determinants, such as sociodemographical and psychological factors and household factors [11–13]. Additionally, characteristics of the social and physical environment – such as safety, neighbourhood socioeconomic status, social network, social cohesion, access to sports facilities, urban density and attractiveness of the physical environment – were associated with sports participation [14–16]. Other studies focused on the organization of sport as the outcome measure. For example, research has shown that women are more likely to engage in informal (light) sports in commercial or alternative settings [4,5,7] and adults of higher social classes and with higher incomes are more likely to engage in non-organized sports [12,17].
Although these studies provide useful insights, we know much less about the factors that relate to the preferred locations for sports participation, such as public spaces, sports facilities (e.g. health centres/gyms) or traditional sports clubs. Of special interest are objectively measured neighbourhood characteristics, as these provide opportunities to develop environmental interventions (e.g. increase the availability of walking, jogging and cycling trails or improve the accessibility of sports facilities) that aim to increase sports participation. To what extent a person's residential neighbourhood is conducive to sports participation (e.g. by providing sport facilities or attractive public open spaces) may not only affect whether she participates in sport but also at which location she prefers to participate, e.g. in a city park or at a sports facility and whether they will do so as a member of a sports club. For example, adults who live near public natural spaces with good walking trails – such as city parks – may be more likely to use public spaces to go for a run than adults who live near a large business park. Additionally, adults living in areas with many sports facilities and sports clubs may be more likely to practice sport in a sports club or in a private health centre/gym or swimming pool than adults living in areas with only a few available sports facilities and sports clubs.

This study aims to examine whether objective neighbourhood characteristics (i.e. proportions of land use and the availability of sports facilities in the residential neighbourhood) and objective socio-spatial neighbourhood characteristics (i.e. urban density, neighbourhood socioeconomic status and neighbourhood

safety) relate to sports participation and preferred sports locations. To do so, we distinguish between 1) no sports participation, 2) sports participation in public open spaces, 3) sports participation as a member of a sports club (e.g. soccer and hockey) and 4) sports participation in public or private sports facilities (e.g. gyms and swimming pools). A discrete choice-modelling approach, which is a common approach in the literature on marketing and travel behaviour [18,19], but relatively new in the literature on sports participation and health, is used to model associations between neighbourhood characteristics and people's propensity to fall into one of these four different groups.

2.2 Methods

Participants

For this cross-sectional study, data were collected in six municipalities in the Netherlands (Amsterdam, Utrecht, Alphen aan den Rijn, Heerlen, Berkelland and Roerdalen) in September 2014. These municipalities were selected based on their differences in size, population density and geographical location in the Netherlands (i.e. more central versus more peripheral) to have sufficient variation in presence, type and accessibility of sports facilities.

Eighteen thousand adults – 3,000 adults per municipality –, aged 18–80 years old, were randomly selected from municipal population registers. An information letter was sent to the home addresses of these adults, in which they were invited to participate in an online survey on sports participation and the use of sports locations. The online survey was used to obtain data on sports participation characteristics, principal sports location and the personal characteristics of the respondents. Adults were asked to fill in their main type of sport, that is, the sport in which they participated most frequently during the 12 months prior to the online survey. Subsequently, they were asked where that sports activity mostly occurred (e.g. a public space, a sports club or a registered sports facility) and if they participated as member of a sports club individually or in an informal group.

In total, 1,663 respondents completed the survey (9.2% response rate). Data of respondents who met the following characteristics were excluded for analyses:

participation in an inactive form of sport (e.g. bridge) (N=20), participation in sport at home (N=40) or at non-official sports facilities (e.g. community centres) (N=64), unknown or incomplete data with regard to the postal code of their home address (N=236) and other socio demographical characteristics (N=69). Adults who were unable to participate in sport due to disabilities (N=21) or health constraints (N=12) were also excluded. Complete data were available for 1,201 adults, and these respondents were included in further analyses.

Measures

Sports participation at specific locations

Based on survey questions about sports participation (at least once per month versus less than once a month), the sports location that was used most often for sports participation over the past month (i.e. a public open space, a sports club or a sports facility) and sports club membership (yes or no), the independent variable 'sports participation at specific locations' was categorized in four groups: 1) no sports participation (i.e. no sports participation at all or less than once per month), 2) sports participation in public spaces, 3) sports participation as a member of a sports club, using sports club facilities and 4) sports participation at indoor, private or public sports facilities, without club membership, e.g. health centres/gyms and swimming pools. Sports participation in public spaces included both unorganized sports (e.g. individually, with a friend or in a small informal group) and organized sports (e.g. in a running group but without club membership). The four different types of sports participation are further referred to as no sports participation, sports participation in public spaces, sports participation at sports clubs and sports participation at sports facilities.

Objective physical and socio-spatial neighbourhood characteristics

The independent variables were objectively measured neighbourhood characteristics and included land-use data, number of sports facilities and socio-spatial data. Land-use data of respondents' home environments were obtained using ArcMAP 10.3.1. The coordinates of the 6-digit postal codes of respondents' home addresses were uploaded in ArcMAP. Mean coordinates of the 6-digit postal codes (i.e. polygon features) were calculated, and Euclidean buffers of different sizes (i.e. 400, 800, 1,600 and 2,000 metres) were drawn around these coordinates. The buffers were used to calculate the proportions

of different types of land use (available from Statistics Netherlands, 2012) and the number of sports facilities (available from the Dutch Facility Monitor Sport (FMS), see [20]). The following types of land use were distinguished, as it is plausible that these may be related to sports behaviour: roads, facilities (e.g. churches, hospitals, shops, restaurants and educational institutes), green space (e.g. parks, allotments, forest and moorland) and blue space (e.g. rivers, lakes and sea). These land use types were chosen based on associations shown in previous literature with physical activity [21,22] and sports participation [23], and they were also based on their potential relation with sports behaviour, for instance due to the sport-friendly and active design of public spaces. As there is no consensus on buffer size for assessing associations between environmental characteristics and sports participation, we assessed models with various Eucledian buffers (i.e. 400, 800, 1,600 and 2,000 metres). Based on the following reasons we decided to use the 2,000 metres buffers. First, the model with the 2000-metre buffer had the best model fit compared to the models we have tested with other buffer sizes (McFadden R^2, see Table 2.2). Second, the 2,000-metre buffer size corresponded best to our assumptions. We assumed that sports participants using the public space for sports such as running et cetera, usually go further than their immediately neighbourhood of 400 or 800 metres around their homes. For instance, a previous study found that runners not only use the public space in their neighbourhood, however, they also go outside the neighbourhood and out of town [24]. Moreover, our data showed that sports participants using sports clubs or private sports facilities on average travelled 3,082 metres (SD = 3.843 metres) to their sports activities, and those who use the public space for sports such as running will probably use an even wider area around their homes.

The socio-spatial data included urban density, neighbourhood socioeconomic status (SES) and safety. Urban density was estimated as the average number of addresses within a radius of one square kilometre (available from Statistics Netherlands (2014)). Three categories of address density were distinguished: rural (< 500 addresses per km2), hardly to moderately urbanized (500–1,500 addresses per km2) and strongly to extremely urbanized (> 1,500 per km^2). Objectively measured neighbourhood safety (on 4-digit postal code level) was

obtained from the 'Leefbaarometer 2.0' [26]. This measure includes items such as reported demolitions, crime and theft. Neighbourhood safety (mean = -0.002, SD = 0.13) was defined relative to the Dutch average score that had a standardized score of zero and was classified into three categories: safety level below the national average (score ≤ -0.05), approximately equal to the national average (score -0.049–0.049) and above the national average (score ≥ 0.05). Neighbourhood SES (mean = -0.043, SD = 1.20), on 4-digit postal code level, was obtained from The Netherlands Institute for Social Research (2014). The SES scores were based on an aggregated indicator consisting of the following variables derived from Statistics Netherlands: average neighbourhood income, proportion of residents with a low income, proportion of residents with a low education level and proportion of unemployed residents. We categorized the SES scores relative to the Dutch average score into three categories: neighbourhoods with an SES below (< -1), approximately equal to (-0.99–0.99) and above (> 1) the national average.

Confounders

We controlled for the following demographical characteristics: age, sex, education, having children who live at home (yes or no) and employment (yes or no). Education was classified into three levels based on the self-reported highest level of completed education: 1) lower education (i.e. no education, primary education and lower professional education), 2) middle education (i.e. intermediate and higher general education) and 3) higher education (i.e. higher professional education and university).

Statistical analysis

SPSS 23.0 was used to provide descriptive statistics on respondents' personal characteristics and objective neighbourhood characteristics (i.e. socio-spatial characteristics and proportions of land use). The influence of the discussed determinants on the use of different locations for sports participation (i.e. participants belonging to one of the four distinguished type of sports participant categories) was analysed through the application of a discrete choice modelling approach. In this approach, type of sports participant is considered to be a choice out of four alternatives available: non-participants, public space participants,

sports club participants and other sports facility participants. In discrete choice modelling, individuals are assumed to choose the alternatives that provide the highest utility [18,19]. The utility of alternative j (j = 1,...,*J*) for individual n can be represented by the following function:

$$U_{nj} = \beta' X_{nj} + \varepsilon_{nj}$$

Here, *X_nj* is a vector of the observed characteristics (i.e. objective physical and socio-spatial neighbourhood characteristics and individuals' socio-demographic characteristics), which is the deterministic part of the utility function and in the context of this study only includes individual-specific variables, and an error term *ε_nj*, which is the stochastic component of the utility function. The probability that individual n will choose alternative *i* is the probability that the utility derived from alternative *i* exceeds the utility of the other alternatives, which can be represented by:

$$P_{ni} = P(i|j) = P\left(\varepsilon_{nj} - \varepsilon_{ni} < \beta' X_{ni} - \beta' X_{nj}, \forall\, j \neq i\ \right)$$

Under the assumption of independently and identically distributed (IID) error terms, the logit probabilities underlying the popular multinomial logit (MNL) model become:

$$P_{ni} = \frac{exp^{\beta' X_{ni}}}{\sum_j exp^{\beta' X_{nj}}}$$

Central to the MNL model is the independence of irrelevant alternatives (IIA) property, which implies that the preference for an alternative is not affected by the inclusion or exclusion of other alternatives in the choice set. This property allows the use of independent standard normally distributed error terms and thus is fundamentally related to the IID assumption. However, many choice situations do not comply with IIA, as alternatives often share certain attributes that are unobserved by the researcher and therefore lead to correlations in the error terms of these alternatives. Additionally, in the case of sports location choice, such correlations can potentially be present. For example, being a 'public space participant' or an 'other sports facility participant' might be

a shared preference of persons motivated to participate in individual sports but with a dislike for joining formal sports clubs. The Hausman-McFadden test [28] offers a procedure to test the IIA hypothesis for an MNL model, and applying this test, our data showed that the IIA property was violated for the estimated MNL model. In the presence of only individual-specific variables, the multinomial probit model (MNP) offers an attractive alternative model specification that can handle dependence across alternatives. The MNP model assumes that errors follow a multivariate normal distribution with mean 0 and covariance matrix ∑ [18]. The probabilities can be written as:

$$P_{ni} = P(i|j) = \int_{-\infty}^{\beta^* X_1} \dots \int_{-\infty}^{\beta^* X_{j-1}} f(\varepsilon_{i1}^*, \dots, \varepsilon_{ij-1}^*) \partial \varepsilon_{i1}^*, \dots, \partial \varepsilon_{ij-1}^*$$

For the estimation of our MNP model, the software platform 'R', with the 'mlogit' package, has been used [29,30].

Table 2.1 Respondents' characteristics and environmental factors

	Total study population	Non-sports participants	Sports participants		
			Public space	Sports club	Other sports facility
	(N = 1,201)	(N = 383)	(N = 313)	(N = 211)	(N = 294)
Sociodemographical factors					
Age (Mean, SD)	51.3 (15.5)	52.8 (15.1)	51.9 (15.1)	47.9 (17.3)	51.1 (14.9)
Female (%)	54.3	54.8	46.6	53.1	62.6
Education (%)					
Low	15.9	24.5	11.8	9.5	13.6
Middle	37.4	41.0	31.9	37.9	38.1
High	46.7	34.5	56.2	52.6	48.3
Employed (%)	55.2	48.0	58.8	59.2	57.8
Children living at home (%)	32.2	31.6	27.8	41.7	31.0
Neighbourhood characteristics					
Municipality (%)					
Amsterdam	12.5	14.6	16.3	8.1	8.8
Utrecht	10.7	8.6	10.9	10.9	12.9
Alphen aan den Rijn	20.0	19.3	15.7	22.7	23.5
Heerlen	18.2	22.2	13.7	11.8	22.4
Berkelland	16.8	14.9	19.5	19.4	14.6
Roerdalen	21.8	20.4	24.0	27.0	17.7
Proportions of land use[a] (Median % (IQR))					
Roads	3.7 (2.6)	3.6 (2.6)	3.6 (2.6)	3.7 (2.7)	3.9 (3.0)
Green space	47.4 (49.6)	68.5 (44.1)	46.6 (57.1)	46.0 (54.3)	40.7 (54.8)
Blue space	1.9 (5.1)	0.5 (1.1)	3.6 (7.2)	3.5 (5.1)	3.9 (6.3)
Facilities	2.6 (5.8)	1.7 (4.0)	2.6 (7.6)	3.1 (6.7)	3.4 (6.9)
Sports facilities[a] (N)	34.0 (46.0)	15.0 (33.0)	35.0 (58.0)	37.0 (56.0)	43.5 (57.0)
Urban density (%)					
Rural	47.1	44.9	49.2	54.0	42.9
Hardly - moderately urbanized	13.6	12.3	13.1	14.2	15.3
Strongly - extremely urbanized	39.3	42.8	37.7	31.8	41.8
Neighbourhood safety (%)					
Below national average (<-0.05)	32.8	38.9	31.3	23.7	33.0
About national average (<-0.049 - 0.049)	20.0	17.2	19.8	18.5	24.8
Above national average (> 0.05)	47.2	43.9	37.7	57.8	42.2
Neighbourhood SES status (%)					
Below national average (<-1)	20.5	27.2	16.0	13.7	21.4
About national average (-0.99 - 0.99)	61.2	58.0	63.6	68.7	57.5
Above national average (> 1)	18.3	14.9	20.4	17.5	21.1

Note: SD = Standard Deviation. SES = Socioeconomic status. [a]Calculated for a 2,000 metre buffer around the center of the 4 digit postcal codes that correspond to adults' home addresses.

2.3 Results

Table 2.1 shows socio-demographic characteristics of the four groups of non-sports participants and sports participants using different locations and environmental characteristics of their residential neighbourhoods.

Table 2.2 shows the results of the raw (model 1) and adjusted (model 2) multinomial probit analyses. Green space, blue space and number of sports facilities showed significant positive associations with sports participation in the public space, in sports clubs and in other sports facilities. Of these three variables, blue space showed the largest effect size. Hardly to moderate urbanity was negatively associated with sports participation in the public space and in other sports facilities. Strong urbanity was negatively associated with participating in sport in public spaces, sports clubs and other sports facilities. High education was positively associated with sports participation in all three types of sports locations. Significant associations of neighbourhood characteristics with sports participation (i.e. regarding the direction and size) were similar for each of the sports locations.

The significant correlation between the error terms of public space and other facilities shows that the multinomial probit model is an appropriate model to use to analyse the data. The correlation between public space and other sports facility participants indicates a shared preference for sports participants in public spaces and sports participants in other sports facilities based on non-measured factors, such as attitudes towards club membership. A potential explanation is that those who do not want to participate in organized sports because of obligations and fixed times prefer sports activities that are more flexible in time and space, which may occur either in public spaces or other facilities such as gyms and swimming pools.

Table 2.2 Multinomial probit model

	Model 1 - raw analyses						Model 2 - adjusted analyses					
	Public space		Sports club		Other sports facility		Public space		Sports club		Other sports facility	
Ref = non-participants	B	SE	B	SE	B	SE	B	SE	B	SE	B	SE
Constant	-4.019	0.699	-4.165	0.837	-4.092	0.761	-4.377	0.738	-4.090	0.939	-4.469	0.813
Physical environment characteristics[a]												
Roads	-0.032	0.064	-0.033	0.064	-0.024	0.064	-0.020	0.067	-0.024	0.068	-0.012	0.066
Facilities	0.057	0.055	0.054	0.054	0.045	0.055	0.046	0.056	0.043	0.056	0.032	0.056
Green space	0.034**	0.006	0.028*	0.009	0.034**	0.006	0.034**	0.006	0.028**	0.010	0.034**	0.007
Blue space	0.650**	0.081	0.638*	0.091	0.652**	0.081	0.637**	0.082	0.625**	0.091	0.639**	0.082
Number of sports facilities	0.030	0.010	0.027	0.011	0.032*	0.011	0.031*	0.011	0.028*	0.012	0.033*	0.011
Socio environmental characteristics[b]												
Urbanity (ref. =rural												
Hardly - moderately urbanized	-0.677	0.359	-0.598	0.379	-0.681	0.356	-0.740*	0.359	-0.654	0.379	-0.731*	0.355
Strongly - extremely urbanized	-0.779*	0.357	-0.758*	0.371	-0.759*	0.356	-0.825*	0.360	-0.825*	0.374	-0.800*	0.359
Neighbourhood safety (ref. = below nat. average)												
About national average	-0.117	0.504	-0.039	0.508	-0.084	0.497	-0.110	0.517	-0.004	0.526	-0.078	0.509
Above national average	0.607	0.542	0.840	0.543	0.658	0.534	0.601	0.534	0.872	0.556	0.647	0.524
Neihbourhood SES (ref. = nat. average)												
About national average	0.131	0.501	0.147	0.501	0.078	0.496	0.051	0.504	0.046	0.510	-0.008	0.499
Above national average	0.430	0.519	0.363	0.522	0.385	0.509	0.304	0.534	0.199	0.538	0.260	0.524
Socio-demographic factors												
Age (in years)							0.002	0.005	-0.007	0.006	0.001	0.005
Female							-0.098	0.132	-0.098	0.127	-0.007	0.145
Children living at home							-0.018	0.143	0.202	0.166	0.021	0.139
Education (ref. = low)												
Middle							0.251	0.156	0.309	0.179	0.277	0.157
High							0.478*	0.163	0.514*	0.194	0.463	0.166
Employed							0.119	0.128	-0.009	0.143	0.103	0.126
Error structures												
Public Space - Sports club	0.647	0.560					0.617	0.596				
Public Space - Other sports facility	1.005**	0.066					1.000*	0.082				
Sports club - Sports club	0.819	0.575					0.852	0.543				
Sports club - Other sports facility	0.139	0.296					0.139	0.293				
Other sports facility - Other sports facility	0.189	0.353					0.212	0.381				
Model fit												
Log-likelihood	-1276.7						-1249.9					
McFadden R^2	0.22117						0.23752					
Chisquare	725.12						778.73					

[a]Within a 2,000metre buffer around the home. [b]On postcode 4 digit level. *Significance < 0.05, **Significance < 0.001. The reference category was non-sports participants in all models, i.e. the categories public space, sports club and other sports facility are all compared to non-participants. SES = Socioeconomic Status.

2.4 Discussion

This study adds to the existing literature on relationships between neighbourhood environments and sports participation by examining whether objectively measured residential neighbourhood characteristics (e.g. availability of sports facilities and green spaces) not only relates to sports participation but also to the preferred sports location of sports participants (e.g. an indoor sports facility or a city park). The results indicate that those with more green space, blue space or sports facilities in their residential neighbourhood were more likely to participate in sport, but it did not affect their preference for a certain sports location. Neighbourhood blue space in particular was associated equally strongly with sports participation at public spaces, sports clubs and other sports facilities.

That natural environmental characteristics (i.e. green and blue space) are related to sports participation is in line with previous research that showed that attractive and liveable environments stimulate and invite people to be physically active or participate in sport [31,32]. Moreover, such environments are associated with less experienced constraints to participating in sport more frequently [16]. The strong association of green, and particularly blue space, with sports participation in all types of locations might be related to different types of sports that different natural areas are suitable for. For instance, previous research has shown that different green and blue areas, with different sizes, are related to different modalities and intensities of physical activity [22]. However, it would be of great interest to explore the importance of blue space for sports participation in more detail, as this may provide policy makers and urban designers with more accurate information on how to design sport-friendly environments and environments that encourage people to be more active.

Moreover, higher proportions of green and blue space in the residential neighbourhood were also associated with a higher chance of sports participation in sports clubs and other public or private sports facilities. Additionally, sports facilities within a 2,000-metre buffer around the home were positively associated with sports participation at sports facilities and also

with increased sports participation in public open spaces. Somehow, a sport-promoting neighbourhood environment increases the likelihood that residents participate in sport, but it does not affect their preference for a certain location. One explanation could be processes of 'modelling' and perceived social norms [33,34]. In a sport-facilitating neighbourhood, more people are out on the streets running, biking, walking or travelling in their sportswear to their sport. Viewing these active people may make residents more likely to participate in sport themselves ('modelling') or make them feel that being active is the social norm, which in turn increases their likelihood to become active. Another explanation may be that people with active lifestyles choose to live in, for instance relatively blue or green neighbourhoods that facilitate such lifestyles; they may not necessarily use their neighbourhood facilities to practice sport but may use facilities in other parts of the city. Due to the cross-sectional design of this study, it remains unclear whether more green or blue space and sports facilities within the residential environment contribute to an increase in sports participation at public spaces, sports clubs and other sports facilities or if adults who participate in sport choose to live in an environment that has a certain amount of sports facilities and green or blue space available. Hence, to better inform policy and intervention development, longitudinal or retrospective research is needed.

Regarding socio-spatial neighbourhood characteristics, we only found an effect of urban density. With higher urbanity levels, the chance of participating in sport declined in all types of sports locations. Similarly, hardly to moderate urbanity levels were negatively associated with participation in public space and other private or public sports facilities. In other words, the higher the urbanity degree, the more likely it is that adults do not participate in sport. This is supported by existing evidence that sports participation rates are higher in rural areas in the Netherlands [14]. Literature has explained such urbanity differences in sports participation by determinants related to socio-spatial neighbourhood characteristics, such as neighbourhood SES and safety [14,35]. However, these associations between safety, neighbourhood SES and sports participation were not found in the current study. This inconsistency with previous research regarding the role of safety may be due to differences in

measures of safety (i.e. objective versus subjective measures). For example, it may be that perception of safety – which is mostly how safety was measured in previous studies – plays a different role in sports participation than objectively measured safety, which is how safety was measured in this study. Although neighbourhood SES was not associated with sports participation in any of the three types of sports locations, education on the individual level was associated with sports participation in all types of sports locations. This finding is in accordance with many other studies [12,36] and implies that associations of green space, blue space and sports facilities with sports participation occur irrespective of education.

Strengths of this study include the novel approach within sports participation literature, focusing on an outcome variable that allows for a distinction between non-participants and different types of sports participants related to their sports location. Moreover, we used a strong analytical discrete choice approach and took various objectively measured environmental measures into account. We have checked for correlations between the independent variables and found no issues with collinearity.

The low response rate (9.2%) is a limitation of this study. The response rate was lowest in the largest municipalities of Amsterdam and Utrecht (Table 2.1), which is probably related to underrepresentation of adults of non-native Dutch origin in the sample (10.8% compared to 21.4% nationally in 2014) [37], who more frequently live in the larger cities. Furthermore, lower educated respondents were underrepresented as they represented 15.9% of our sample whereas their share of the total population is 33%, according to 2014 data [25]. It is unclear how these issues affected the representativeness of the results. However, the high share of higher-educated and native Dutch adults did not lead to an overrepresentation of sports participants in this study, as according to the national Dutch figures for sports participation, 30% of adults do not participate at all or participate less than once per month in sport [9], which is similar to the percentage of non-participants in the current study. This suggests that a selection bias toward more sports minded respondents is unlikely. In addition, the fact that we correct for education level in our multivariate analysis implies

that the effects of e.g. environmental factors represent the general effect across education levels in a reliable way. Another limitation of this study was that we were unable to include various buffers to compare with the 2,000-metre buffer, due to data loss when using smaller buffers.

Future research should consider taking the use of multiple sports locations into account for adults who participate in more than one type of sport because this might have an impact on sports location choice. For instance, adults who participate in multiple sports may join a sports training programme at a sports club but may also engage in sports in a public space. With regard to buffer sizes used to calculate the proportions of land use available around a person's home, future research could investigate if different buffer sizes can be used for different land use variables to better reflect the characteristics of these land-uses for sports participation behaviour. For example, it could be that the presence of larger green and blue environments lead to effects on sports participation that manifest themselves at a larger distance than the presence of roads and public facilities. In addition, to provide more insight into the importance of public space for sports participation, research should investigate which, how frequently, by whom and for what reasons specific locations in public space are used for sports participation. Moreover, more insight into the motivations of participants might add to the understanding of the use of different locations for sports. Longitudinal or retrospective research is needed to provide insight into the causality of the relationships between environmental characteristics, including the difference between green and blue spaces and sports participation, as well as sports participation in different locations.

2.5 Conclusions

More and more, sports participants find their way to alternatives to traditional sports clubs. This study is among the first to investigate the extent to which characteristics of the physical and socio-spatial environment are associated with the use of different locations for sports participation and whether these are traditional sports clubs, private or public sports facilities – such as gyms and swimming pools – or the more informal, flexible public spaces. We found that neighbourhood characteristics were similarly associated (i.e. their direction

and size of the effect) with sports participation in public space, sports clubs and sports facilities. The more green space, sports facilities and blue space in particular available around the home environment, the greater the chance a person participates in sport in each of the three types of sports locations. In other words, physical neighbourhood characteristics do not affect an individual's preferences for a certain sports location to use most often. Furthermore, higher urbanity levels were associated with lower chances of participating in sport in all three types of sports locations. For hardly to moderate urban areas this applies especially to lower probabilities participating in sport in public space and other private or public sports facilities. The associations we found indicate the possibly important role that the environment may have in facilitating and stimulating sports participation. For policy makers in the sport and health domains, this underlines the importance of facilitating and investing in sport-friendly and active public spaces, whether participants will use these for sports activities or join a municipal subsidized sports club or other sports facility. However, longitudinal study designs are necessary to assess the causality of these associations in order to adequately inform policy makers and urban designers for intervention development.

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- CHAPTER 3 -

TOO BUSY OR TOO FAR AWAY? THE IMPORTANCE OF SUBJECTIVE CONSTRAINTS AND SPATIAL FACTORS FOR SPORTS FREQUENCY

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Abstract

Previous studies on the association between the availability of sports facilities and sports participation have neglected the influence of subjective constraints that individuals experience with regard to sports participation. This paper investigates to what extent constraints experienced by sports participants are associated with their spatial circumstances and whether these subjective constraints or objective spatial circumstances have a greater impact on sports frequency. Based on a survey among 776 adults in urban and rural municipalities in the Netherlands, regression analyses revealed that constraints were related to neighbourhood liveability and distance to indoor sports facilities and swimming pools. Time constraints had a strong negative effect on sports frequency, but the effect of distance to indoor facilities and swimming pools was even more important. Our results furthermore indicate a growing need for flexibility in the spatiotemporal organization of sports activities and an increased importance of the public space for sports participation.

3.1 Introduction

The provision of a varied, safe and accessible sports infrastructure for all groups in society is a key policy focus in many Western countries in order to promote participation in sport and physical activity [1–3]. This policy objective is particularly challenging in the context of changes in the organization of sports facilities and sports activities in the Netherlands. As the market share of memberships of organized sports clubs is decreasing, participation in flexible forms of sports, often taking place in public space is increasing [4,5]. These developments raise questions about the importance of heavily subsidized official sports facilities for sports participation, relative to informal sports facilities such a public spaces [6–8].

The issue to what extent official and informal sports facilities stimulate participation in sport has been addressed from different angles. Most prominently, one strand of research has addressed effects of objectively measured accessibility and availability of sports facilities on sports participation and sports frequency [9–11]. In addition, studies have shown the importance of social neighbourhood characteristics such as socioeconomic status and safety in explaining differences in sports participation [12–15]. However, as discussed in the next section, the effects of accessibility of sports facilities and neighbourhood characteristics that are found differ significantly between different geographical contexts.

An alternative approach to analyse participation in sport has focused on subjective factors such as the experience of constraints that withhold individuals from participation in sport [16]. Constraints are experienced on multiple levels and may be intrapersonal (e.g. lack of skills or self-confidence), interpersonal (e.g. lack of social support) or structural (e.g. lack of appropriate accommodation) [17]. Those subjective constraints to sports participation have been found to play a significant negative role on sports participation and sports frequency [18–20].

While both objective spatial factors and subjective constraints may influence participation in sport, little is known about how they interact. First, insight

is lacking how subjective constraints differ between places with different neighbourhood characteristics and if constraints are related to variations in individual travel distance to sports facilities. For instance, do participants living in neighbourhoods with specific socio-demographic composition experience more intrapersonal or interpersonal constraints, and how is the experience of structural constraints related to the actually distance travelled and type of sports facilities? Insight into such issues would facilitate the development of place specific policies aimed at relieving certain constraints. Second, insight is lacking into the importance of subjective constraints for sports participation relative to objective spatial factors. In particular, if constraints are experienced, do they indeed lead to lower levels of sports participation, and more so than objective spatial factors? Such insight is relevant when deciding whether policies targeting physical sports infrastructure or policies aiming at relieving constraints would be a better option to promote sports participation.

This paper addresses these research gaps by analysing the relative role of objective spatial factors, such as the distance travelled to sports facilities and socio-spatial neighbourhood characteristics, and subjective constraints for sports participation based on a dataset of sports participation from the Netherlands. The paper investigates to what extent various types of constraints are experienced with respect to sports participation, how constraints are related to spatial factors as well as personal characteristics, and to what extent these constraints as well as spatial factors influence sports frequency. Given the increasing role of the public space as a facility for sport, we investigate how objective spatial factors and subjective constraints may have different effects on sport in official facilities (indoor-, outdoor facilities and swimming pools) than on sport in public spaces.

3.2 Literature review and theory

Despite theoretical agreement on the positive effect of sports facilities being available at an acceptable distance [21,22], empirical studies have shown mixed results regarding the influence of objectively measured accessibility and availability of sports infrastructure on sports participation, partly due to the use of different definitions [9,10,12]. Some studies have shown a positive association

between the accessibility of sports facilities and sports participation in adults. However, differences were found between different types of sports [9,15,23], age groups and sex [11,24]. Karusisi et al. [23] found a significant association between access to and engagement in sports activities for swimming but not for team sports, racket sports or workouts in gyms in the Paris Ile-de-France region in France. Steinmayr et al. [25] reported that distance to the nearest sports facility did not influence the engagement in sports activities of children in and outside sports clubs in larger towns and cities, but this distance did matter in smaller towns in the countryside in Germany. In contrast, Prins et al [26] found no association between the availability of sports facilities and sports participation in Dutch adolescents.

Besides the effect of travel distance to or availability of sports facilities, also other factors of the spatial environment do affect sports participation. For instance, various characteristics of the neighbourhood have been shown to influence sports participation behaviour. Recent studies in the Netherlands have shown that weekly sports participation rates in rural areas are higher than those in urban areas [12], although in rural areas individuals have to travel further and the density of sports facilities available is lower [27]. Hoekman et al. [12] concluded that the variety and accessibility of sports facilities is hardly related to this 'rural-urban' divide in weekly sports participation, but instead is attributed to neighbourhood socioeconomic status and safety. Although there is inconsistency in the literature about effects of perceptions of neighbourhood safety or crime on physical activity [28–30], several Dutch studies have confirmed a positive association of perceived neighbourhood social safety, social capital and higher socio economic status with the likelihood of sports participation [13,31]. The association between perceived neighbourhood safety and sports participation was found for both 'neighbourhood oriented' sports and organized types of sports, although the effect was stronger for those who participated in 'neighbourhood oriented' sports [13]. Another Dutch study also emphasized the importance of neighbourhood safety for participation in indoor sports clubs, suggesting the importance of distinguishing between various types of sports locations [14].

To conclude, the literature suggests that travel distance to sports facilities may affect sports participation, but the extent to which this is the case seems to vary significantly between geographical settings and types of sports. However, it is still unclear what the impact is of the actual travel distance to different types of sports facilities for sports participants who already have chosen a particular sports location. Furthermore, objectively measured characteristics regarding the liveability of the neighbourhood may have a significant impact on sports frequency, potentially offsetting the impact of distance to facilities. However, to what extent the objective spatial factors of individual travel distance and neighbourhood characteristics affect subjective constraints, is still unknown.

Subjective constraints

A useful framework to study subjective constraints affecting sports participation is the hierarchical leisure constraints theory [17,32,33]. According to this theory, the decisions to undertake leisure activities, including sports participation, are influenced by three types of constraints: intrapersonal, interpersonal and structural constraints. These constraints are experienced in a sequential hierarchical order. Intrapersonal constraints are the most powerful or proximal, whereas structural constraints are the least powerful or distal [17,32,33]. Intrapersonal constraints refer to individual physical or psychological constraints such as fatigue, health problems, self-confidence, stress or anxiety and to constraints regarding lack of skills or knowledge for sports participation. Interpersonal constraints relate to the constraints stemming from the dependency on other people, such as the inability to find a partner to take part in a sports activity. Structural constraints correspond to spatial determinants and include problems related to the accessibility of sports facilities, transport, financial resources and the quality of sports facilities or the activities provided but also time constraints [18,34,35]. Structural constraints thus refer to the perception of objective external issues such as travel time, availability of sports activities and time. Godbey et al. [17] state that if intrapersonal constraints are not overcome, the desire or preference for a sports activity might not even come into being or will disappear or diminish. In turn, a higher demand to participate will increase structural constraints. The importance of constraint factors, however, varies depending on individual characteristics and context [17]. Furthermore, Jackson et al. [36] suggest that leisure behaviour depends on

the successful negotiation of constraints. Individuals use negotiation strategies such as time management, skill acquisition, interpersonal coordination and financial strategies to overcome constraints [37].

Empirical studies that apply the hierarchical leisure constraints theory to sports participation are scarce. Alexandris and Carroll [18] found in a study in Greece in which nonparticipants experienced significantly more intrapersonal constraints than participants. Constraints were experienced most frequently by women, lower educated people, the elderly and people with a minority background, indicating a relationship between the experience of constraints and social class [34,38,39]. Alexandris et al. [40] stressed the importance of intrapersonal constraints for involvement and loyalty among skiers. In addition, Alexandris [41] found associations of intrapersonal constraints with lower levels of involvement and motivation in recreational tennis players. As far as we know, only one study investigated spatial aspects of leisure constraints. Jackson [36] reported that geographical constraints (distinguished by a lack of opportunities near home, transportation costs and a lack of transportation) were less influential than other types of structural constraints (e.g. lack of time and quality of facilities) in starting a new leisure activity. However, a more explicit linking of subjective constraints to objective spatial factors, by specifying how constraints experienced by sports participants depends on these objective factors, is lacking to date.

Overall, this literature review suggests the importance of objectively measured spatial factors of travel distance to sports facilities and socio-spatial neighbourhood characteristics on the one hand, and subjective constraints at different intrapersonal, interpersonal and structural levels on the other, in explaining sports participation and frequency of participants. Because an integrative approach of spatial factors and constraints is still missing in empirical studies, our study investigates this interrelatedness by examining the conceptual relationships as illustrated in Figure 3.1. We address the following research questions:

1. *To what extent are various subjective constraints experienced with respect to participation in sport, and does the experience of constraints depend on spatial factors and personal characteristics?*
2. *What is the impact of constraints on the actual sports frequency of participants, compared to spatial factors and personal characteristics?*
3. *To what extent are the effects of constraints and objective spatial factors different for official sports facilities (indoor facilities, outdoor facilities and swimming pools), as compared to sport in public spaces*

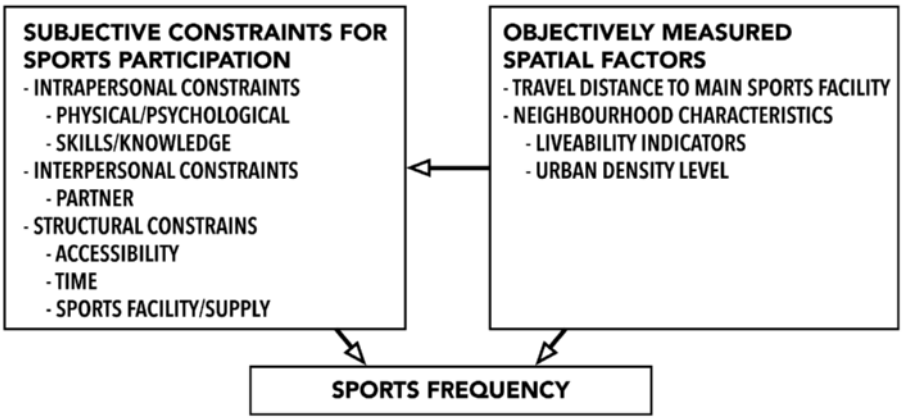

Figure 3.1 Conceptual model

3.3 Methods

Sample

The role of constraints and spatial factors is investigated based on an online survey conducted in September 2014 that recorded information about sports participation and sports facilities used, and was enriched with geodata. Data were collected in 6 municipalities in the Netherlands that varied in urban density levels: Amsterdam and Utrecht (highly urban and densely populated), Alphen aan den Rijn and Heerlen (mid-sized and moderately densely populated) and Berkelland and Roerdalen (small and rural). Eighteen thousand adults (3,000 per municipality), aged 18-80 years old, were randomly drawn from municipal population registers and invited to fill out an online questionnaire by postal letter, sent from the corresponding municipalities. Complete questionnaires were obtained from 1,663 respondents (9.2% response rate). From this sample, we included respondents who participated at least once a month in one vigorous

type of sports during the past year (70.1%) and primarily used official indoor sports facilities (e.g. sport hall or gym), official outdoor sports facilities (e.g. soccer field, athletics track or tennis court), swimming pools or public spaces (park, forest, beach, road or sports court in the neighbourhood) for their sports activities. We excluded respondents engaging in non-active forms of sports, elite athletes and participants travelling more than 55 kilometres to reach their sports activity. The final sample was comprised of 776 participants.

Measures

Sports frequency

Participants were asked about their average sports participation during the 12 months prior to the survey. The self-reported sports frequency of the main sports activity of the participants was measured as a categorical variable ranging from 1 to 3 times a month to at least three times a week.

Constraints to sports participation

We used the Leisure Constraints Scale to measure constraints to participate in sport. This scale was developed and applied to sports participation by Alexandris and Carroll [18,34]. Sports participants were asked to indicate the extent to which they had experienced the 29 formulated items as constraining factors when participating in their main type of sport during the past year using a 7-point Likert scale ranging from 1 (very unimportant) to 7 (very important; see Table 3.2). The 'results' section details how we distinguished between the following six factors of constraints: 'physical/psychological' and 'skills/knowledge' constraints (intrapersonal constraints), 'partner' constraints (interpersonal constraints) and 'accessibility', 'time' and 'sports facility/supply' constraints (structural constraints).

Objectively measured spatial factors

Individual travel distance to the main sports facility. Because we focus on sports participants who already have made a choice for a sports location, travel distance to the sports facility was expressed as the actually distance travelled between the respondent's home and the sports facility that was principally used for the main sports activity of the respondent. It was objectively measured using the Model Builder Analyst Tool of Geographic Information Systems (GIS)

software, ArcMap version 10.1 (ESRI, 2012), taking into account the transport mode (motorized or active transport) that was primarily used to reach the sports facility. The individual travel distance was categorized per type of sports facility (indoor, outdoor and swimming pools) into the following more or less equally sized groups: 1-1.7 km; 1.7-4.5 km; > 4.5 km. In the analyses, these categories were included as dummy variables with public space users being the reference category.

Socio-spatial neighbourhood characteristics. Liveability variables on the 6-digit zip code level were obtained from the 'Leefbaarometer' (2012) [42]. The Leefbaarometer distinguishes the following 6 dimensions: composition and quality of the housing stock (in the rest of this paper referred to as 'housing stock'), public space, facility level, demographics, social cohesion and safety. These dimensions were derived from 49 objectively measured items. Based on multivariate analysis of variance, we included only the separate liveability dimensions (measured as continuous scores) that were associated with sports frequency. These were housing stock (e.g. dominance of houses regarding type, price, date of construction, ownership, density and % social housing), demographics (e.g. % unemployed jobseekers, income, non-western immigrants and % highly educated) and safety (e.g. reported demolitions, crime and theft). We also added an indicator of nature (proximity to nature reserves, forests and coasts). Higher scores on these dimensions of liveability should be interpreted as better neighbourhood liveability. For instance, a higher score on safety means less reported demolitions, crime and theft. Urban density levels are based on the average number of addresses within a radius of one kilometre and were derived from address density classification data from Statistics Netherlands (2014). Residential locations were classified into 5 categories: rural (< 500 addresses per km^2), hardly urbanized (500-1,000 addresses per km^2), moderately urbanized (1,000-1,500 addresses per km^2), strongly urbanized (1,500-2,500 addresses per km^2) and extremely urbanized (> 2,500 per km^2).

Control variables

We controlled for several individual characteristics. With regard to sports membership, we distinguished members of sports clubs or sports unions,

participants in other organized forms (informal sports or running groups, healthcare or socio-cultural work), participants of gyms/fitness centres and unorganized participants (those who participate individually or together with friends, family or colleagues). The flexibility of conducting sports activities was measured to provide insight into the importance of flexibility in time allocation. 'Type of athlete' was measured by asking respondents the extent to which they saw themselves as recreational/novice or more competitive/experienced types of athletes.

Furthermore, we controlled for the following (dummy-coded) socio-demographic variables: sex, age, attained education level, self-reported health status, youngest child living at home (age categories < 4, 5-11 and 12-17 years old), living together with a partner and having a partner with a paid job. Self-reported health status was measured by asking respondents to indicate how they would describe their health. Individual (net) income level was excluded because of the large share of the sports participants (25.7%, N = 197) that answered 'don't know/I prefer not to mention'.

Analytical approach

First, we performed principal component analyses on the scores of the items of the Leisure Constraints Scale [18,34] to identify underlying factors representing types of constraints. Because of theoretical assumptions about existing correlations between the constraint factors and the underlying dimensions [17], we decided to use oblique rotation (direct oblimin). Second, hierarchical regression analyses were carried out to investigate how the constraint factors are explained by objectively measured spatial factors (model 1) and individual sports participation and socio-demographic characteristics as control variables (model 2). We used separate models to test the associations of the included variables with each of the 6 constraint factors as outcome measures. We tried to include the municipality of the respondents into the multivariate analyses. However, the use of dummy variables with one of the municipalities functioning as the reference category, made the results difficult to interpret. In addition, within some municipalities significant differences in urban density level do exist, which made it less meaningful to make statements on the municipal level. We therefore chose to use urban density level as a measure to differentiate

between respondents' residential locations. However, because of problems with the multicollinearity (VIF rate > 8) of the urban density level with scores on the liveability dimensions of safety and housing stock, we had to exclude urban density level from the regression analysis. Finally, ordinal regression analyses were performed to explain how the sports frequency of participants was determined by objectively measured spatial factors, individual sports participation and socio-demographic characteristics (model 1) and constraints (model 2).

3.4 Results

Sample description

The sample included 776 sports participants, distributed across the municipalities of Roerdalen (22.3%), Alphen aan den Rijn (21%), Berkelland (17.9%), Heerlen (16.1%), Amsterdam (11.3%) and Utrecht (11.3%). The mean age was 50.6 years (SD = 15.6). As presented in Table 3.1, 54.3% were female, 52.4% had attained higher levels of education, and 39% lived in households with children. Of the original sample, 63.8 % was participating at least once a week in sport, which is higher than the Dutch average (53%; GGD et al., 2016). Working out individually in a gym was the most popular type of sports in the sample (17.8%), followed by running (14.9%) and cycling, race cycling or mountain biking (12.9%). Most participants practised sport in the public space (39.1%), followed by indoor sports facilities (37.5%), outdoor sports facilities (15.5%) and swimming pools (7.9%).

Constraint factors to sports participation

An initial principal component analysis resulted in five factors of constraints. However, the items concerning the accessibility of sports facilities and sports facility/supply characteristics were loaded onto the same factor, which hampered the interpretation. Therefore, analyses were re-run with a fixed number of factors (6). We deleted the items 'I am not interested in my sport', 'I practised my sport but I did not like it' and 'I do not like social situations' from further analysis because of low factor scores (< 0.45). In the final analysis, six constraint factors remained: accessibility (4 items), physical/psychological (6 items), time (5 items), partners (3 items), skills/knowledge (3 items) and sports facility/supply (5 items), which accounted for 72.9% of the variance (Table 3.2).

Table 3.1 Sample descriptions (N = 776)

	%
Age (%)	
18-25	7.3
26-45	29.1
46-65	44.1
66-80	19.5
Sex (% female)	54.3
Household characteristics (%)	
Youngest child at home < 4 years old	5.7
Youngest child at home 5-11 years old	10.2
Youngest child at home 12-17 years old	8.3
Living together with partner	69.8
Employed partner	48.3
Education (%)	
Low	11.1
Middle	36.5
High	52.4
Weekly working hours (%)	
0-18 hours	7.6
19-35 hours	22.4
36-40 hours	21.0
>41 hours	12.5
Not working	36.5
Health status (%)	
Bad/very bad	2.0
Moderate	19.4
Good	64.9
Very good	13.7
Sports frequency (%)	
1-3 times a month	8.6
Once a week	31.4
Twice a week	33.2
At least three times a week	26.7
Sports facility (%)	
Indoor sports facility	37.5
Outdoor sports facility	15.5
Swimming pool	7.9
Public space	39.1
Travel distance to sports facility, mean (SD)	
Indoor	4.3 (5.1)
Outdoor	4.1 (5.0)
Swimming pool	4.3 (3.7)
Public space	0
Type of sports (%)	
Individual workout in gym	17.8
Running	14.9
Other individual sports	10.3
Team (ball) sports	9.0
Exercise classes and dance	5.5
Racket sports	11.5
Swimming	7.5
Cycling/Race cycling/mountain biking	12.9
Walking	10.6
Sports membership (%)	
Organized - member sports club/union	27.2
Organized - gym/fitness centre	19.7
Organized - other	5.0

Unorganized - group	22.9
Unorganized - individual	25.1
Type of athlete (%)	
Recreational - novice	18.8
Recreational - experienced	60.2
Competition - pleasure oriented	6.2
Competition - achievement oriented	6.4
Don't know	8.4
Flexibility of sports activity (%)	
Fixed days of fixed times in week	23.7
Fixed days and times	49.5
Flexible	26.8

Accessibility constraints accounted for the largest share of the total variance (37.0%), whereas the sports facility/supply constraints accounted for only 3.6%. The eigenvalue of this last factor was 0.94, which is below Kaiser's criterion of 1 [45]. However, we decided not to delete this factor because it was well interpretable and distinct from the other factors. To measure internal consistency for both the whole scale and each subscale, we estimated Cronbach's alpha coefficients (Table 3.2). These ranged from $\alpha = 0.82$ to $\alpha = 0.92$, with $\alpha = 0.93$ for the total scale, which is relatively high [46]. Mean scores per subscale were calculated, and they showed that time constraints were on average the most important constraints ($M = 2.8$), followed by constraints regarding sports facilities/supply ($M = 2.6$) and physical/psychological constraints ($M = 2.5$; Table 3.2).

Associations of spatial factors and individual characteristics with constraint factors

The results of hierarchical regression analyses (Table 3.3) showed that the baseline models, which included the distance travelled to sports facilities and neighbourhood liveability characteristics, turned out to be significant for the following subjective constraints: accessibility, physical/psychological, skills/knowledge and sports facilities/supply. Spatial factors contributed with a larger extent to explaining sports facility/supply (adj. $R^2 = 0.06$) and accessibility constraints (adj. $R^2 = 0.04$) than to physical/psychological (adj. $R^2 = 0.02$) and skills/knowledge constraints (adj. $R^2 = 0.02$). Adding the individual sports participation and socio-demographic control variables to the models led to a significant increase in the adjusted R^2s of all models. Models for all constraint factors turned out to be significant. Time (adj. $R^2 = 0.24$), physical/psychological

Table 3.2 Principal Component Analysis of the constraints experienced by participants to participate in sport (N = 776)

Construct/item	Accessibility constraints	Physical/ psychological constraints	Time constraints	Partner constraints	Skills/ knowledge constraints	Sports facility/ supply constraints	Total
Travelling taking too much time	0.85						
I do not have access to transportation	0.82						
I cannot afford it	0.75						
There are no opportunities to participate in my sport near my home	0.75						
Health problems are hindering me		0.85					
I am not fit enough		0.81					
I feel too tired to participate in my sport		0.64					
Practicing my sport makes me feel tired		0.61					
I am afraid of getting hurt		0.57					
I do not feel confident		0.54					
I experience time constraints due to work or study			0.90				
I experience time constraints due to social commitments			0.88				
I experience time constraints due to family			0.86				
Participating in my sport does not fit my timetable			0.62				
Participating in my sport interrupts my daily routine			0.53				
My friends do not like my sport				0.93			
My friends do not have time to participate in my sport				0.93			
I do not have anyone to participate with				0.91			
I do not have anyone to teach me my sport					0.87		
I am not skilled enough in my sport					0.82		
I do not know where to participate					0.78		
Sports facilities of my sport are poorly kept						0.93	
Sports facilities of my sport are inadequate						0.90	
Sports facilities of my sport do not meet my requirements						0.90	
Sports facilities of my sport are too crowded						0.73	
I do not like the sport activities provided (trainings, lessons) of my sport						0.66	
Eigenvalues	9.61	3.47	2.03	1.56	1.39	0.94	
Explained variance (%)	36.97	13.35	7.80	6.00	5.11	3.62	
Explained variance, cumulative (%)	36.97	50.32	58.12	64.12	69.23	72.85	
Cronbach's alpha (based on standardized items)	0.89	0.92	0.87	0.92	0.91	0.93	0.93
Scale mean	2.25	2.50	2.83	2.10	1.80	2.62	2.35

Notes. Although the Leisure Constraints Scale of Alexandris and Carroll (1997a, 1997b) refers to 'it' and 'sport', we have chosen to refer to 'my sport'. In the survey the actual name of the main type of sport of the respondent was filled in. Factor loadings < 0.5 are not displayed.

(adj. R^2 = 0.17) and to a lesser extent skills/knowledge constraints (adj. R^2 = 0.10) were well explained from both individual and spatial factors.

Concerning *accessibility constraints*, the baseline model showed that participants using indoor sports facilities further than 1.7 km and swimming pools at a 1.7-4.5 km distance were more constrained than participants who used public space. Better neighbourhood safety, as well as a more liveable neighbourhood housing stock were associated with the experience of fewer accessibility constraints. Adding the individual control variables led to insignificant effects of neighbourhood safety and indoor facility users at a 1.7-4.5 km distance. Higher educated individuals experienced fewer accessibility constraints.

Physical/psychological constraints were initially negatively associated with neighbourhood demographics and positively associated with indoor sports facility users at a 1.7-4.5 km distance in the baseline model. After controlling for individual characteristics, these effects became insignificant. Male participants, competitive and achievement-oriented athletes and participants with a very good health status experienced significantly fewer physical/psychological constraints.

Regarding *time constraints*, also after adjustment, only participants who used indoor sports facilities at a 1.7-4.5 km distance experienced more time constraints than participants who used public space. However, the second model showed that participants with young children living at home, younger people, participants who worked many hours, less competitive and less experienced athletes and participants with a moderate and good health status, experienced more time constraints. In addition, the flexible scheduling of sports activities (the more fixed, the less constrained) was negatively associated with time constraints.

For p*artner constraints*,we found, in both models, that a safer neighbourhood was associated with more partner constraints. Being a novice athlete, being a member of a gym/fitness centre, being lower educated and having a child

younger than 4 years old were significantly associated with the experience of more partner constraints.

Concerning *skills/knowledge constraints*, the baseline model showed that neighbourhood liveability characteristics (housing stock, demographics and safety) and the use of outdoor sports facilities at a 1.7-4.5 km distance were associated with skills/knowledge constraints. After adding the individual control variables, only the effects of housing stock and safety remained significant. Both a higher score on housing stock liveability and a higher score on safety were associated with fewer skills/knowledge constraints. Lower and middle educated participants, novice recreational participants and participants visiting gyms/fitness centres experienced more skills/knowledge constraints.

Finally, indoor sports facility and swimming pool users that travelled less than 4.5 km experienced more sports *facilities/supply constraints* than public space participants. Furthermore, proximity to nature led to fewer constraints. Although decreasing, these effects remained significant after adjusting for individual factors. More recreationally oriented athletes and younger and higher educated people were less constrained with regard to the sports facilities/ supply.

Associations of constraints and spatial factors with sports frequency

Table 3.4 shows the results of ordinal logit regressions in which spatial factors and constraint factors explain sports frequency. A baseline model with a Nagelkerke R^2 of 0.18 suggests that type of sports facility and travel distances of participants significantly influenced sports frequency (X^2 (41) = 139.99; $p < 0.001$). The model indicated that sports frequency was higher among outdoor sports facility and public space users. With regard to individual characteristics, we found that competitive achievement-oriented athletes participated more frequently in sport than less competitive/less experienced participants. Very good health status and being a non-organized individual participant were associated with a higher sports frequency. Working more than 41 hours a week was associated with a lower sports frequency.

Table 3.3 Multiple Linear Regression on Constraints factors (N = 763)

	Accessibility constraints		Physical/ psychologicals constraints		Time constraints		Partner constraints		Skills/knowledge constrains		Sports facilities/ supply constrains	
	Model 1 β (stand.)	Model 2 β	Model 1 β	Model 2 β	Model 1 β	Model 2 β	Model 1 β	Model 2 β	Model 1 β	Model 2 β	Model 1 β	Model 2 β
Constant (B)	-0.20	-0.48	0.02	-0.71	0.15	-0.89	0.07	0.60	-0.07	0.34	-0.35	-0.01
Neighbourhood liveability												
Housing stock	-0.13*	-0.14*	-0.01	0.03	-0.08	-0.06	0.10	0.11	0.014*	0.13*	-0.01	0.01
Demographics	-0.05	-0.01	-0.13**	-0.07	-0.05	-0.06	0.02	-0.01	0.11*	0.05	-0.07	-0.04
Safety	0.16*	0.10	0.05	-0.05	0.03	0.07	-0.17**	-0.12*	-0.23***	-0.15*	0.04	-0.02
Nature	-0.04	-0.02	-0.06	-0.05	0.02	0.03	0.04	0.04	0.00	-0.02	-0.10*	-0.08*
Sports Facility x distance (ref = public space)												
Indoor 0-1.7 km	0.07	0.01	-0.01	-0.06	-0.07	-0.09	0.04	0.02	0.03	0.01	0.15***	0.14**
Indoor 1.7-4.5 km	0.13**	0.07	0.09	0.03	0.02*	0.00*	-0.06	-0.06	-0.00	-0.03	0.15***	0.15**
Indoor > 4.5 km	0.17***	0.1*	0.04	-0.02	-0.08	-0.09	0.01	-0.02	0.02	-0.02	0.17***	0.17***
Outdoor 0-1.7 km	0.00	0.00	-0.07	-0.03	-0.07	0.01	-0.01	-0.03	0.01	-0.05	0.06	0.07
Outdoor 1.7-4.5 km	-0.05	-0.05	-0.03	-0.02	-0.02	-0.03	0.01	-0.01	0.09*	0.04	0.03	0.05
Outdoor > 4.5km	0.06	0.06	-0.07	-0.05	0.01	0.03	0.02	-0.02	0.04	-0.02	0.06	0.08
Swimming pool 0-1.7 km	0.00	-0.02	0.02	0.01	-0.01	0.01	-0.01	-0.01	-0.04	-0.04	0.12**	0.10**
Swimming pool 1.7-4.5 km	0.10**	0.09*	-0.02	-0.03	-0.03	0.01	-0.03	-0.03	-0.06	-0.05	0.13***	0.12**
Swimming pool > 4.5 km	0.02	0.00	-0.04	-0.05	-0.03	0.01	0.00	0.00	-0.04	-0.03	0.05	0.04
Sports membership (unorganized individual = ref)												
Organized - member sports club/union		0.04		0.03		-0.02		-0.11		0.02		-0.03
Organized - gym/fitness centre		0.11		0.07		0.09		-0.01		0.11*		-0.02
Organized - other		-0.01		-0.02		-0.00		-0.06		0.03		-0.02
Unorganized - group		0.01		-0.03		-0.02		-0.1*		0.01		-0.03
Flexibility of sports activities (flexible = ref)												
Fixed days or times in week		0.02		0.02		-0.07		-0.03		0.00		0.01
Fixed days and times in week		0.03		-0.02		-0.12**		0.07		-0.01		0.02
Type of athlete (competition - achievement oriented = ref)												
Recreational - novice		-0.03		0.22**		0.2**		-0.16*		-0.22**		-0.14
Recreational - experienced		-0.03		0.13		0.19**		-0.11		-0.07		-0.20*
Recreational - pleasure oriented		-0.03		0.09*		0.02*		-0.02		0.00		-0.16**
Don't know		0.08		0.15**		0.10		-0.15*		-0.13*		-0.03
Sex (female = ref)												
Male		0.01		-0.11**		-0.01		-0.05		0.04		-0.01
Age (66-80 = ref)												
8-25		-0.03		0.04		0.14**		0.02		0.09		-0.11*

26-45		0.04		-0.05		0.14*		-0.04		0.03		-0.05
46-65		0.02		-0.06		0.03		0.00		0.00		0.01
Education (high = ref)												
Low		0.15***		0.13		-0.01		-0.11**		-0.19***		0.09*
Middle		0.15***		0.09		-0.03		-0.08		-0.12**		0.07
Household characteristics												
Youngest child at home < 4 y. old (no child or youngest child at home > 4 y. old = ref)		0.02		0.05		0.16***		-0.12**		0.01		0.06
Youngest child at home 5-11 y. old (no child or youngest child at home > 12 y. old = ref)		-0.01		0.05		0.11**		0.01		0.06		-0.02
Youngest child at home 12-17 y. old (no child or youngest child at home > 18 y. old = ref)		0.06		0.05		0.11**		-0.06		-0.00		-0.02
Living together with partner (no partner/not living together with partner = ref)		0.02		0.01		0.01		-0.02		-0.05		0.03
Employed partner (no partner/partner is not employed = ref)		0.01		0.01		0.07		0.07		0.04		-0.06
Weekly working hours (no work = ref)												
0-18		0.02		-0.07		0.12**		0.01		0.02		0.07
19-35		-0.04		-0.05		0.17***		0.04		-0.04		-0.01
36-40		-0.04		-0.01		0.14**		0.02		-0.03		-0.02
> 41		-0.01		0.01		0.25***		0.05		-0.01		0.04
Health status (very good = ref)												
Very bad/bad		0.05		0.2***		0.06		-0.02		-0.04		0.07
Moderate		0.03		0.35***		0.11*		-0.09		-0.07		0.02
Good		0.03		0.19***		0.11*		0.02		-0.02		0.01
Adjusted R^2	0.04	0.07	0.02	0.17	0.01	0.24	0.00	0.06	0.02	0.10	0.06	0.08
P Model	<.001	<.001	<.01	<.001	.163	<.001	.248	<.001	<.01	<.001	<.001	<.001

*:p <0.05; **: p<0.01; ***:p<0.00

Finally, adding the six constraint factors to the model led to a significant increase in the Nagelkerke R^2 to 0.24 (X^2 (47) = 185,81; $p < 0.001$). Only time and accessibility constraints significantly influenced sports frequency, with time constraints showing the strongest (negative) effect on sports frequency. Accessibility constraints positively affected sports frequency. Working 0-18 hours a week now turned out to have a positive effect on sports frequency. Although all other effects remained significant, they decreased slightly, excluding the effect of health status.

Table 3.4 Ordinal Regression on sports frequency (N = 776)

	Model 1		Model 2	
	Estimate	**SE**	**Estimate**	**SE**
Threshold parameters				
Sports frequency (at least 3 times a week = ref)				
1-3 times a month				
Once a week				
Twice a week				
Sports facility x distance (public space = ref)				
Indoor 0-1.7 km	-0.79**	0.27	-0.87**	0.28
Indoor 1.7-4.5 km	-1.11***	0.27	-1.12**	0.27
Indoor > 4.5 km	-0.65*	0.27	-0.83**	0.28
Outdoor 0-1.7 km	-0.13	0.36	-0.04	0.36
Outdoor 1.7-4.5 km	-0.11	0.40	-0.09	0.40
Outdoor > 4.5 km	-0.11	0.40	-0.09	0.40
Swimming pool 0-1.7 km	-0.65	0.53	-0.43	0.54
Swimming pool 1.7-4.5 km	-1.07**	0.41	-1.06*	0.42
Swimming pool > 4.5 km	-1.71***	0.45	-1.60***	0.46
Neighbourhood liveability				
Housing stock	0.00	0.01	-0.00	0.01
Demographics	0.00	0.01	-0.00	0.01
Safety	-0.00	0.00	0.00	0.00
Nature	-0.00	0.01	-0.00	0.01
Constraints factors				
Accessibility constraints			0.24*	0.10
Physical/psychological constraints			0.14	0.09
Time constraints			-0.47***	0.09
Partner constraints			0.17	0.09
Skills/knowledge constraints			0.10	0.09
Sports facility/supply constraints			-0.13	0.09
Sports membership (unorganized individual = ref)				
Organized - sports club/union	-0.62*	0.27	-0.64*	0.28
Organized - gym/fitness centre	0.15	0.27	0.20	0.27
Organized - other	-0.63	0.36	-0.63	0.36
Unorganized - group	-0.72**	0.21	-0.68**	0.21
Flexibility of sports activity (flexible = ref)				
Fixed days or times in week	0.24	0.21	0.18	0.21
Fixed days and times in week	0.36	0.19	0.25	0.19
Type of athlete (competition - achievement oriented = ref)				
Don't know	-2.00***	0.43	-1.94***	0.43
Recreational - novice	-2.01***	0.38	-1.86***	0.39
Recreational - experienced	-1.54***	0.35	-1.45***	0.36
Competition - pleasure oriented	-1.08**	0.41	-1.22**	0.42

Sex (female = ref)				
Male	-0.27	0.16	-0.26	0.16
Age (66-80 = ref)				
18-25	-0.32	0.37	-0.23	0.38
26-45	-0.58	0.30	-0.50	0.30
46-65	-0.17	0.24	0.08	0.16
Education (high = ref)				
Low	-0.35	0.24	-0.39	0.25
Middle	0.14	0.16	0.08	0.16
Household characteristics				
Youngest child at home < 4 y. old (no child or youngest child at home > 4 y. old = ref)	0.51	0.34	0.08	0.35
Youngest child at home 5-11 y. old (no child or youngest child at home > 12 y. old = ref)	0.24	0.26	0.09	0.27
Youngest child at home 12-17 y. old (no child or youngest child at home > 18 y. old = ref)	-0.20	0.27	-0.36	0.27
Living together with partner (no partner/not living together with partner = ref)	0.04	0.18	0.05	0.18
Employed partner (no partner/partner not employed = ref)	0.01	0.17	0.05	0.18
Weekly working hours (no work = ref)				
0-18	0.42	0.33	0.68*	0.33
19-35	-0.44	0.23	-0.23	0.23
36-40	-0.25	0.24	-0.06	0.24
> 41	-0.56*	0.27	-0.21	0.28
Health status (very good = ref)				
Very bad/bad	-1.95***	0.56	-1.93**	0.57
Moderate	-0.71**	0.25	-0.73**	0.27
Good	-0.71**	0.21	-0.75**	0.22
Nagelkerke R^2	0.18		0.24	
P Model	<.001		<.001	
Pearson Chi-Square Model 1	2358.81*		2262.42	
Test of Parallel Lines			Test of Parallel Lines	
-2 Log Likelihood: 1673.55			-2 Log Likelihood: 1631.86	
Chi-Square: 154.56			Chi-Square: 150.43	
Sign: <.001			Sign: <.001	

*: p <0.05; **: p<0.01; ***:p<0.03.5 Discussion

3.5 Discussion

Interpretation of the main findings of spatial determinants of constraint factors

Our results showed that spatial factors were associated significantly with sports facility/supply and accessibility constraints and to a lesser extent with skills/knowledge constraints. Constraints concerning the sports facility/supply were significantly more experienced by users of indoor sports facilities and swimming pools (except for swimming pool users in the farthest distance category), compared to public space and outdoor facility users. This finding might be related to requirements regarding the quality of equipment, dressing rooms, atmosphere, crowdedness or opening hours that might be more critical to the perception of indoor sports facility and swimming pool users. For indoor

sports facilities, our results showed an effect of distance: participants who travelled further to an indoor sports facility, have experienced more sports facility/supply constraints. Individuals might experience constraints regarding the quality of indoor sports facilities, such as higher costs and crowdedness, as more serious when they have to make a greater effort by travelling further. In addition, indoor sports facility users who travelled more than 4.5 km experienced significantly more accessibility constraints than public space participants. We noticed a similar trend for swimming pool users at a 1.7 to 4.5 km travel distance. These results confirm that travelling longer distances translates into experiencing accessibility constraints to a higher degree and that this occurs for relatively short distances.

Neighbourhood liveability characteristics also contributed, after adjusting for individual characteristics, to the explanation of constraint factors. Housing stock (e.g. dominance of houses regarding type, price, ownership and density) was significantly associated with accessibility and skills/knowledge constraints, indicating that participants living in a more liveable neighbourhood regarding the housing stock experienced significantly less accessibility and skills/knowledge constraints. Because the housing stock indicator includes several items including density, further research is needed to investigate which characteristics of the housing stock composition and quality are associated with accessibility and skills/knowledge constraints. Furthermore, our results showed that living in a safer neighbourhood was associated with the experience of fewer partner and skills/knowledge constraints. Because our data showed that a higher score on neighbourhood safety was correlated with rural environments, it is likely that it is less difficult for rural participants to find likeminded sports partners and sports opportunities in their neighbourhood. In addition, we found that proximity to nature reserves, forests or coasts was negatively associated with sports facility/supply constraints. People who live closer to natural environments will likely make more use of these natural environments for their sports activities instead of using sports facilities and experience no constraints in doing so.

Individual socio-demographic and sports participation characteristics were important confounders in explaining most constraints, which corresponds to

findings reported by Godbey et al. [17] and Shores et al. [38]. In particular, physical/psychological constraints and to a lesser extent partner and time constraints were not significantly associated with spatial determinants but could to a large degree be explained by self-reported health status, type of athlete and sex. Although all constraint factors were affected by individual characteristics, the extent differed per type of constraint. Specifically, type of athlete was an important confounder, except for accessibility constraints. Attained education level was particularly important for explaining accessibility, partner, skills/knowledge and sports facility/supply constraints. A possible explanation is that higher educated individuals have better access to social capital, which provides them with knowledge about sports activities and partners for sports participation [47–49]. Time constraints were associated with having children living at home and working hours but not with (disadvantaged) social class, which was also found in adolescents by Shores et al. [38]. Because these variables are highly significant and have relatively large effect sizes, these findings confirm outcomes of previous studies indicating the existence of time pressure for these groups of individuals in relation to participation in leisure activities [50–53].

Interpretation of the main findings of effects on sports frequency

After adjusting for spatial and individual variables, we found that only time and accessibility constraints significantly accounted for the explanation of sports frequency. The strongest effect was found for time constraints, which affected sports frequency negatively. This major effect of time constraints is plausible because it is hard to make time for sports activities when handling busy work- and private-life schedules with multiple responsibilities and interests. Again, this finding confirms earlier studies indicating time pressure for these population segments [50–53]. Our results did not support the hierarchical proposition of the leisure constraints theory [17,32,33], which states that intrapersonal constraints (physical/psychological and skills/knowledge constraints) and subsequently interpersonal constraints (partner constraints), are more important in determining sports frequency than structural constraints (time, accessibility and sports facility/supply constraints). However, it is argued that time constraints can be internalized as intrapersonal constraints by participants, instead of structural constraints [17,38]. Participants might perceive their time

constraints as personal, autonomous constraints, which might explain their effect on the frequency of sports participation. In addition, we have to note that our participants already participated in sport. Time constraints might have more effect on the frequency of engaging in sports activities than on the decision to participate in sport. Therefore, nonparticipants might experience a different hierarchy of importance of constraints. This is in line with Godbey et al. [17], who state that constraints can be very personal and related to all types of individual characteristics, including stage and level of participation.

Unexpectedly, we found that participants who to a large extent experienced accessibility constraints had a higher sports frequency. It is likely that a higher sports frequency leads to both more travelling and more expenses at transport and sports activities. Experiencing more accessibility constraints might therefore not cause a higher sports frequency but rather be an effect of having a higher sports frequency. The successful use of negotiation strategies (e.g. managing time, combining sport with other activities or using public space to save travel time and costs) might explain why people who experienced more constraints may still participate and may actually participate more than people with fewer constraints [37,54]. Both the effects of time and accessibility constraints might apply even more strongly for participants combining multiple types of sports at multiple locations.
Regarding the relative influence of spatial factors on sports frequency, we found a significant effect only of travel distance to swimming pools. Participants who had to cover the biggest distance to their swimming pool, engaged less frequently in swimming. This finding is in line with the findings of Karusisi et al. [23] and Wicker et al. [55], who reported positive significant associations between access to swimming pools and participation in swimming and general sports frequency in general. Furthermore, we found that travel distance to indoor sports facilities also negatively affected sports frequency, compared to participants using public space.

Despite the influence of liveability characteristics on several constraint factors, those neighbourhood characteristics did not significantly affect sports frequency. Additionally, we did not find any direct effect of individual socio-demographic

characteristics of education, age, sex and household characteristics on sports frequency. Theoretically, it is possible that sports frequency is influenced only indirectly by individual characteristics, via subjective constraints. However, to investigate these indirect relations, further research is needed. The only indication we found for an indirect effect is the result that participants who had been working more than 41 hours a week showed a significant lower sports frequency. After adjusting for the constraint factors this effect decreased, showing an indirect effect of working hours via time constraints on sports frequency. Strikingly, adjustment for the constraint factors now led to a significant effect of working 0-18 hours a week on sports frequency, compared to non-working. Furthermore, health status was an important determinant of physical/psychological constraints. However, the negative effect of health status on sports frequency, which was also found by Downward [56], remained significant after adding the physical/psychological constraints and other constraint factors to the model. Apparently, sports frequency was determined not by the constraints with respect to sports participation but rather by the direct measurement of health status. It is possible that the constraints were experienced when participating in sport but did not play a role when deciding about the frequency of participating in sport.

Finally, our finding that a more competitive attitude or experience in sports was associated with a higher sports frequency seems to be related to the importance of motivation and negotiation strategies. However, we cannot explain why members of sports clubs and unofficial (self-organized) participants that engaged in sport with other(s) participated less frequent in sport than non-organized individual participants.

Strengths and limitations

This study is among the first to investigate the relative importance of subjective constraints, compared to objectively measured spatial factors and individual characteristics on sports frequency. By using a geographical approach and applying insights from leisure constraints theory studies, we contribute to a further understanding of the determinants of sports participation. Focusing on sports participants, rather than comparing participants and nonparticipants, allowed us to deepen our knowledge of variations in the constraints of

participants with different frequencies of sports participation. In contrast to existing studies, we also included participants that participated in sports activities in public space. Furthermore, our study design allowed us to include respondents living in urban, moderately dense and rural municipalities.

A limitation of our study was that more than half of the sample (466 out of 776 respondents) was living in a neighbourhood with a very positive general liveability score. In addition, higher educated respondents were overrepresented and respondents with a non-Dutch origin were underrepresented, leading to a sample of the population that was not fully representative. Although sports participation rates differed by municipality, these rates were greatly in accordance with data on the population level, and the distribution of participants per education level corresponded to data on the national level. However, the two rural municipalities of Berkelland and Roerdalen had high response rates (probably due to a greater willingness to participate in the survey), with a relatively large amount of sports participants compared to averages at the municipal level. Furthermore, in this study we focussed only at constraints regarding the main sports activity of participants. The results were not controlled for a potential second sport of participants or for participation in the same sport in different geographical settings. Participation in multiple types of sports or the use of multiple locations may, however, have impact on the daily activity patterns, time use, the experience of constraints and total sports frequency of participants. It may even have impact on the choice for a sports location and willingness to travel. Finally, no data was available on the travel distance of participants that use the public space for their sport. This is a limitation as not only neighbourhood parks or streets are used for sports participation, but also more remote locations such as natural areas or city parks. Also, whereas some start using the public space directly outside their front door (e.g. for running), others may deliberately travel to public spaces for specific forms of sport (e.g. team sports or skating). Further research should address the question which types of public spaces for different sports activities are used and what this implies for travel distances.

3.6 Conclusions and practical implications

This study has shown that spatial factors, including both socio-spatial factors (e.g. neighbourhood liveability characteristics) and physical spatial factors (e.g. travel distance to sports facilities), are significantly associated with subjective constraints with regard to sports participation. Whereas the effect of distance seems logical and straightforward, further research is needed to assess how neighbourhood liveability characteristics such as social composition, safety and urban form are associated with constraints regarding acquiring knowledge and skills about sports facilities, finding partners and the quality and accessibility of facilities.

In explaining the participants' frequency of engaging in sport, time and accessibility constraints are the only constraint factors that have a significant effect on sports frequency. Travel distance to swimming pools and indoor sports facilities appear to affect sports frequency significantly. Furthermore, health status, type of athlete and to a lesser extent type of sports membership affects sports frequency. Time constraints appear to be a major limiting factor of sports participation. Geographical theories [50,57] suggest that the distance between locations plays a major role in the possibility of spending time participating in activities and therefore also affects time pressure. However, our results do not support this assumption because time constraints are not associated with travel distance to sports facilities. Apparently, in the Dutch context, with a high accessibility and density of facilities even in rural areas [6], distance is not decisive, whereas personal factors such as work hours and household responsibilities play a key role in the experience of time pressure. Unexpectedly, accessibility constraints were associated with a higher sports frequency. Because both time and accessibility constraints are regarded as structural constraints in the hierarchical leisure constraints perspective, we cannot support that intrapersonal constraints have the strongest effect on the sports frequency of participants despite theoretical assumptions. The positive effect of accessibility constraints on sports frequency makes it plausible that accessibility constraints are easier to overcome and negotiate than other constraints (including time constraints), particularly for participants who prioritize their sports activities. In addition, the effect of time constraints and

other structural constraints, which is often related to a higher demand for activities, might be more important for adults who already engage in sport than for nonparticipants. It is also likely that the impact of constraints and distance differs per day and per participant, and that those factors are not always having impact on their sports frequency. However, for nonparticipants, the decision to participate in sport may be accompanied by personal reasons, and those intrapersonal constraints might be more difficult to overcome [17].

Further research could focus on the interplay between direct and indirect effects of determinants of sports frequency, including motivation, negotiation techniques, constraints and individual and spatial factors. In addition, further research is needed to interpret the influence of neighbourhood liveability characteristics on constraint factors. Another avenue for further research concerns objective and perceived neighbourhood characteristics of the sports location, as well as the travel route between home and the sports location. Furthermore, both participants and nonparticipants should be taken into account in future research while paying attention to people participating in multiple types of sports or using multiple sports locations. In particular, nonparticipants with an indicated intention to participate in sport are important from both a sport marketing and policy perspective.

Practical implications

Our results have various implications for sports managers and policy makers. First, they suggest that the extent to which sports participants experience constraints may differ between neighbourhoods and type of sports facility. In majority, better liveability scores of a neighbourhood correspond with the experience of fewer constraints of all kinds. Even if these constraints do not translate into lower sports frequencies, this suggests that area specific interventions would be useful to lower these constraints in order to avoid drop out of sport on the longer term. Such interventions might be aimed at infrastructural improvements or modifications of the public space in case inhabitants face accessibility or sports facility constraints. If inhabitants are lacking skills or knowledge about where to participate in sport, solutions might be found in the social environment: for instance by the attainment of community sports coaches. A key characteristic of such an approach is that

area specific interventions are needed based on the characteristics of the neighbourhoods involved. However, such approaches require a thorough investigation of constraints experienced by different groups of inhabitants (regarding for instance age, sex and ethnic background) on the neighbourhood level.

Second, our results suggest that travel distance and facility type have impact on the experience of accessibility and sports facility/supply constraints. In particular, users of indoor facilities and swimming pools at larger distances are associated with these constraints. Again, even if these constraints do not influence sports frequency directly, it implies that the quality of indoor facilities and distance remain a concern for policy makers and sport providers. Also, travel distance to these sports facilities was found to have a direct effect on sports frequency. Sport managers and urban planners may respond to this by facilitating sports facilities on strategic places such as work places and take care of the accessibility of sports facilities, in particular by bicycle and car. For swimming pools, the effect of distance becomes increasingly important in the context of considerations about prospective closing down of swimming pools due to the population decline in (mostly) rural areas. Closing down swimming pools in such areas might result in excessive travel distances and increase the risk of drop out of participants in swim related sports, and for nonparticipants it might lead to even more constraints to participate in sport.

Third, we found that especially time constraints have a large impact on sports frequency, and that time constraints were associated with the number of working hours and having children. To promote sports participation among time pressed groups, sports providers and policy makers can respond to the increasing demand for flexibility in the temporal organization of sports activities and locations. For instance, by stimulating innovations and collaboration between traditional sports organizations (e.g. voluntary sports clubs) and commercial and flexible and societal initiatives. Relevant examples are 'open club' initiatives, whereby sports clubs are stimulated to increase their public role [58], for instance by sharing (public) sports facilities with multiple sports providers or other parties or by offering sports activities in the neighbourhoods and strengthening the relationship with neighbours.

Fourth, we found that recreational sports participants and people with poorer health appear to be vulnerable groups, as they experience more constraints and have lower sports frequencies. This suggests that sports managers might develop interventions to relieve constraints for these groups, for instance by investigating and developing forms of sports that reflect the needs of these participants.

Finally, our results stress the importance of the public space as a sports facility. With 39% of the participants primarily using public space for their sports activities, and public space being associated with less accessibility and supply related constraints and higher sport frequencies, public space is a potentially attractive sports facility for many, including both participants and nonparticipants. In addition, due to its flexibility in accessibility regarding time and costs, the public space is also popular among sports participants that combine multiple types of sports. Planners should therefore optimise the attractiveness of the public space for sports for different groups of participants. Yet, our insight in how to do this, and how participants are using the public space for sport, is only in its infancy. This calls for extensive research in this domain. In the context of the urgency of insight in this area, we believe that learning from planned interventions in the public space such as fitness equipment or bark running tracks [59] and innovations such as real time and personalized feed back for recreational sports participations via smartphone apps and connecting sports accommodations by attractive routes for runners, cyclists and hikers would be a fruitful approach. Collaboration between scientists, urban planners and sport managers in living labs might deliver both scientifically and policy relevant insights that lead to public spaces that are conducive to sport and physical activity.

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- CHAPTER 4 -

TIME-USE AND ENVIRONMENTAL DETERMINANTS OF DROPOUT FROM ORGANIZED FOOTBALL AND TENNIS

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Abstract

Many adolescents drop out of organized sports. Lack of motivation and competing priorities are known as important reasons for dropout. However, time use factors and environmental determinants have been largely neglected in the current literature on dropout from youth sports. The aim of this study is to investigate how (changes in) time use and characteristics of the physical environment determine dropout from football and tennis among adolescents. Data on time use and background characteristics were collected through online surveys in 2015 and 2016 among adolescents aged 13-21 (N = 2,555), including both the dropped outs and those who still continued membership of their football or tennis clubs. Physical environmental determinants (travel distance to the sports club and neighbourhood density) were measured objectively. Binary logistic regression analyses were carried out for football and tennis separately to examine the associations between time use (i.e. time spent on various activities and changes related to the school and job situation) and environmental factors on the probability of dropping out from sport. Time spent on sport outside the context of the sports club and time spent on social or voluntary activities at the sports club was positively associated with continuing being football and tennis members. Tennis players who changed schools or participated in two sports at the same time had a higher probability of dropping out, whereas tennis players who travelled greater distances from home to the tennis club were less likely to drop out. Determinants of dropout differed between football and tennis. However, time use variables were important predictors of dropout from football and tennis, whereas environmental determinants hardly contributed to the prediction of dropout. To keep youths involved in organized sport, this study recommends that sports professionals should: 1) offer flexibility in training and competition schedules, 2) stimulate participation in social activities and voluntary work at the sports club, 3) pay special attention to their needs and preferences and 4) encourage possibilities to practice and play sport outside of regular training hours, for instance at the sports club or at playgrounds or parks in the neighbourhood.

4.1 Introduction

Ample evidence exists that children and adolescents participating in sport improve their physical and mental health [1,2]. Particularly, participation in organized sports has been found to be associated with greater psychological and social benefits in children and adolescents compared to individual, unorganized types of sports [1]. Because physical activity levels decline and sedentary lifestyles increase during adolescence [3,4], particularly among girls [5–7], policies encourage a rise in sports participation among youths. Previous studies have shown that youths that do participate in organized sport show higher overall leisure time physical activity levels than youths not participating in sport [8–10]. Furthermore, studies also show that sports participation and other vigorous types of physical activity have positive health effects, independent of overall physical activity levels [11,12].

In many European countries, sports clubs are the most common setting for sports participation among youths [13]. About 74% of all Dutch children aged 6-11 and 58% of adolescents aged 12-20 participate in sport at least once a week as member of a sports club [14]. However, sports membership rates decline sharply after the age of 14 [15] and this pattern is observed internationally [5,16,17]. Dropout rates from at least one type of organized sport have been estimated at 30% and 35% yearly among Canadian and Australian youths aged 5 – 15 and children aged 10, respectively [18,19]. Møllerløkken et al. [20] reported in their international review that the annual weighted mean dropout rate in football was 23.9% among youths aged 10-19. However, dropout rates were higher for girls (26.8%) than for boys (21.4%).

Although participation in sports clubs is traditionally high among youths in the Netherlands, both the largest (football) and second largest organized sport (tennis) have to deal with significant declines of youth members. Data of Dutch sports federations showed that 31% of girls and 26% of boys aged 13-21 dropped out from football during the 2015/2016 season (total dropout rate 27%), in contrast to an increase of only 12% new youth members in this age group ('dropped ins'). For tennis, dropout rates for girls and boys aged 13-21 were both 28%, whereas the annual drop-in rate was 11% in 2015/2016.

To reduce dropout from organized sport during adolescence, a better understanding of the determinants of dropout is required. In the literature, dropout or youth sport attrition has been addressed from various theoretical perspectives, focussing on different determinants. Particularly, intrapersonal determinants have been studied extensively [18,21]. Studies showed that important intrapersonal determinants associated with dropout during late childhood and adolescence were: biological factors that include physical maturation and injuries; and socio-demographic determinants such as sex (girls), age and lower socioeconomic household status [18,19,21–26]. Much evidence has been established for psychological determinants of dropout, which include lack of (intrinsic or a high level of self-determined) motivation and lack of (perception for) competence, autonomy and relatedness; concepts derived from the self determination theory (SDT) [18,27–29]. Another main theoretical approach used to understand the role motivation plays in understanding sports participation is the achievement goal theory (AGT) [30]. The AGT distinguishes between two types of goal orientations or personal definitions of success: task orientation and ego orientation. Whereas task orientated individuals focus on maximal effort and personal improvement, ego orientated individuals believe that winning and favourable outcomes are markers of success in sport [31]. Based on the AGT framework, several studies revealed that a task orientated personal goal orientation and a task-orientated training climate, were associated with persistence in sport. This is in contrast to ego-orientation and the perception of an ego-orientated motivational climate, which were associated with dropout from youth sports [27,31,32]. Both theories AGT and SDT are complementary and studies have shown evidence for the adaptive role of high task orientation in promoting self-determination in sport. Task orientation was related to a higher level of self-determined or intrinsic motivation and ego orientation with controlled forms of motivation [33]. Both theories emphasize the important (mediating) role of competence and predict that high perceived competence will sustain and increase a person's motivation to sport [18,33,34]. For instance, sports participants with a high task orientation are less likely to feel incompetent in sport than those with a high ego orientation [35]. Other studies highlight the importance of interpersonal determinants of dropout from organized youth sports, such as the social environment (e.g. lack of support from significant

others such as parents, coaches and peers), and developmental factors (e.g. early diversification, later specialization in sports training, training patterns and being older than the rest of the team, which is known as the relative age effect) [19,32,36,37].

While intrapersonal and interpersonal determinants of dropout from youth sports have been studied extensively, other determinants are largely neglected in the literature. In this study, we identified the role of time use and change in time use, as well as factors related to the physical environment in determining dropout from football and tennis among adolescents to fill this gap. Time pressure and competing life priorities are often mentioned as reasons for adolescents' dropout from sport [21–23]. However, little is known about how time spent on different activities at certain locations is related to dropout. Insights from time-geography might add to the understanding of associations between time use and dropout from sport. From a time-geographical perspective, in a certain time window only a limited set of places can be visited. Time use and participation in activities at a specific geographical location at a specific time are subject to constraints at biological, intrapersonal, interpersonal and institutional levels [38]. For example, some adolescents might experience constraints to continue participating in organized sport with fixed training and competition schedules, due to an increase in time spent in schools or studies, or the start of a job. Logically, such constraints are more severe if work or study is combined with multiple leisure activities, such as engaging in multiple sports and social activities. In addition, change of schools (from elementary to secondary education or from secondary to higher education), might increase travel time and study load, which might influence dropout from sport. A similar association has been found for declines in physical activity among adolescents who have changed schools, those who have started university or college or engaging in full-time work [39,40].

Many studies investigating determinants of sports participation and physical activity built on socioecological models and consider the effect of the physical environment on sports participation and physical activity [41,42]. Various studies have demonstrated that the physical environment (e.g. distance to

sports facilities, availability of sports facilities, green space and neighbourhood characteristics such as neighbourhood density) is associated with an increase in participation in sport and physical activity [43,44]. However, with regard to the effect of these factors on sports participation, the research findings are mixed and seem to apply to the youth living in low-socioeconomic areas or in rural communities [45–47]. Environmental characteristics that are modifiable are of special interest as they provide opportunities to develop environmental interventions (e.g. to improve the accessibility to sports facilities and sports clubs) that may prevent dropout from sports. However, little is known about how and which characteristics of the physical environment influence dropout from sport among adolescents. For example, a review on dropout from youth sports carried out by Balish et al. [18] shows only one environmental determinant, which correlates only weakly with dropout. Contrary to their expectations, Boiché & Sarrazin [48] found that adolescents who continued with sport reported longer travel distances to their sports activities than those who dropped out.

This present study explores the effects of time use and the physical environment on dropout from organized sport among youths, with a focus on football and tennis. This study focuses on a relatively broad age range (13-21) compared to other studies [18], in order to explore how important changes in the lives of adolescents that may affect time use, spatial setting and travel distance to the sports club, such as changing schools (from primary to secondary or from secondary to higher education) or entering the labour force are associated with dropout from sport. First, we investigate how time use in competing activities (school, work, other sports, hobbies, social activities and activities at the sports club), influences the probability of dropping out from organized football and tennis. Moreover, we investigate the role of the physical environment, which includes distance to the sports facility and neighbourhood density, on the probability of dropping out. Finally, we investigate the relative importance of temporal and environmental determinants, compared to intrapersonal factors, such as task and ego orientation and socio demographic factors on dropout from sport. Figure 4.1 shows the conceptual framework of this study.

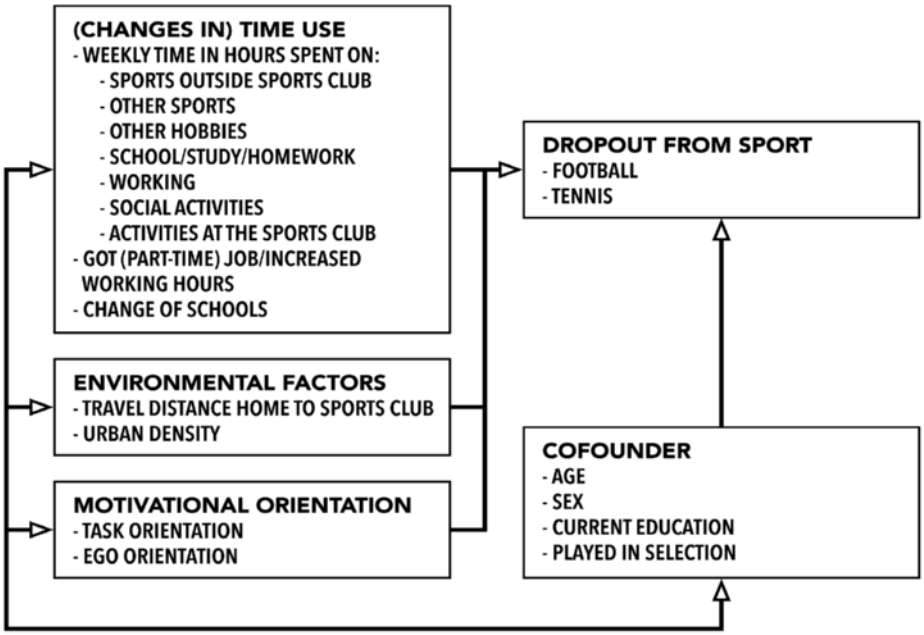

Figure 4.1 Conceptual framework

4.2 Methods

Design, setting and respondents

Data were collected via online surveys among adolescent football and tennis players, including both dropouts and those who continued with club membership. Dropouts were defined as those who ended their club membership over the past year. Data collection among dropouts and members of the Royal Dutch Football Federation (KNVB) took place in a year interval between May/June 2015 and June 2016. Moreover, data were collected between December 2015 and May 2016 among the dropouts and members of the Royal Dutch Lawn Tennis Federation (KNLTB). From each group 10,000 adolescents aged 13-21 years old were randomly selected from the membership registration databases. We focussed on youths aged 13-21 because of the potential differences in (changes in) time use and its' spatial consequences in this life phase (changing schools, moving to another place due to studies, increased travel distance). The sports federations sent invitation letters for the survey via email. For those below 18 years old, written parental consent and adolescent assent were asked in the first question

of the survey. In total 2,566 respondents completed the surveys. Response rates varied from 10.1% for football members, 3.5% for football dropouts, 6% for tennis members to 6% for tennis dropouts (total response rate was 6.4%). Respondents with inaccurate socio-demographic data or inaccurate contact addresses (N = 11) were excluded from further analysis. Complete data of 2,555 adolescents were available as shown in Table 4.1. A comparison of age and sex distributions between our study subsamples and the national membership and dropout data of the Dutch football and tennis unions, did not point towards a selection bias regarding age groups or sex. However, an exception is the sex distribution for football dropouts. In our study sample, 43% of the football dropouts were women whereas nationally 19% of the dropouts were women.

Measures

The online survey aimed to collect data on sports participation characteristics, time-use and recent changes in job, home or school situation, and task and ego orientation. Socio-demographic characteristics and contact addresses of the home and sports club of the participants were obtained via membership registration databases of the sports federations.

Outcome variable

The outcome variable (dropout) was defined as a decision to resign from sports membership over a year prior to the survey (dropout = 1 and member = 0).

Time use characteristics

Time use items included time (in hours) spent on: 1) football or tennis outside the sports club, 2) another type of sports than football or tennis, 3) regular hobbies or activities outside of home, 4) school and homework or study, 5) part-time or fulltime work and 6) social activities (in number of times per week). These questions on time use are referred to the time spent on these activities at the moment the survey took place. Since the time use items were assessed as categorical variables with a large number of categories, we convert them into continuous scores of the average hours spent on activities. Time spent on the activities at the sports club, such as coaching, being member of the board or social activities was dichotomized into ‘yes’ and ‘no’. These items were referred to the previous year, when dropouts were still members

Table 4.1 Personal characteristics of football and tennis players and dropouts, time use, environmental and motivational factors

	Total (N 2,555)	Football members (N = 1,014)	Footbal dropouts (N = 346)	Tennis members (N = 602)	Tennis dropouts (N = 593)
Socio-demographic factors					
Age (%)					
13-16	52.4	61.4	37.6	44.9	53.3
17-21	47.6	38.6	62.4	55.1	46.7
Mean (SD)	16.5	16 (2.3)	17.5 (2.3)	17.1 (2.6)	16.5 (2.5)
Female (%)	39.1	19.7	43.1	59	49.7
Current education (%)					
No	3.3	3.6	1.4	4.8	2.4
Low	37.9	57.2	42.2	19.3	21.2
Middle	38.2	32.4	26.9	43.2	49.4
High	20.6	6.7	29.5	32.7	27
Sports participation characteristics					
Played in selection team (%)					
Yes	40.4	53	34.7	39.7	22.8
No/don't know	59.6	47	65.3	60.3	77.2
Past sports frequency (tennis/football) (%)					
No or less than once a week	14.7	2	7.5	9.6	45.7
Once a week	17.2	5.6	14.7	24.6	30.9
Twice a week	30.6	25.8	68.8	29.6	17.5
> Twice a week	37.5	66.6	9	36.2	5.9
Time use factors					
Time use indicators at this moment (average hrs per week), mean (SD)					
Tennis/football outside sports club (hrs)	1.7 (2.4)	2.8 (2.6)	0.4 (1.3)	1.9 (2.4)	0.1 (0.5)
Other sports (hrs)	2.6 (2.8)	2.0 (2.4)	2.2 (2.7)	2.3 (2.5)	4.1 (3.3)
Other (fixed) hobbies (hrs)	1.5 (2.4)	1.4 (2.4)	1.6 (2.6)	1.5 (2.2)	1.7 (2.5)
School and homework/studying (hrs)	19.8 (13.9)	17.5 (13.5)	17.9 (13.8)	22.2 (13.9)	22.3 (13.9)
(Part-time) job (hrs)	7.6 (10.1)	7.6 (10.4)	10.5 (11.3)	7.5 (9.9)	6.2 (8.6)
Social activities (no of times)	2.6 (1.3)	2.6 (1.4)	2.5 (1.3)	2.4 (1.2)	2.6 (1.4)
Total amount of time spent on social and other activities[1] at sports club per week past season (hrs)	1.3 (4.7)	1.2 (3.3)	0.4 (1.6)	2.1 (7.0)	1.0 (4.8)
Changes in job or school situation between membership and dropout time (dropouts)/ during the previous year (members) (%)					
Got (part-time) job/increased work hrs	18.9	22.7	19.9	21.9	8.9
Changed schools/further education	26.2	21.4	23.4	22.1	40.1
Environmental factors					
Travel distance to sports club (km), *mean (SD)*	3.9 (11.2)	3.6 (9.0)	3.9 (14.0)	6.0 (16.2)	2.5 (4.5)
Neighbourhood density (%)					
Rural	30.3	32.3	36.4	27.4	26.3
Hardly - moderately urbanized	40.4	37.2	37.6	42.5	45.4
Strong - extremely urbanized	29.3	30.6	26	30.1	28.3
Motivational factors					
Motivational orientation for sport during membership, mean (SD)					
Task orientation	0.0 (1.0)	0.1 (1.0)	-0.2 (1.1)	0.1 (1.0)	-0.1 (0.9)
Ego orientation	0.0 (1.0)	0.0 (1.0)	-0.2 (1.0)	0.1 (1.0)	0.0 (0.9)

Notes: [1]Other activities at the sports club such as (assistant) trainer, bar keeper, committee/board member, arbitrator (only in football)

of the sports club. Furthermore, changes in job or school situation (as dummy variables) included: 1) starting a (part-time) job and/or increase in working hours during the past year (yes/no) and 2) changing schools (from primary to secondary or secondary to higher education) or change of school location over the past year (yes/no).

Environmental factors

Environmental determinants included travel distance from home to the sports club and density of the residential neighbourhood. Travel distance was measured objectively, as the distance in metres from home location to the location of the sports club. Both locations were determined by Google's Geolocation API based on their full addresses (street name and house number) [49]. Bicycle paths were used as the transport network because the majority of respondents cycled to the sports club (79.1%).

Neighbourhood density was based on the number of addresses within a radius of one square kilometre from the home location [50] and was aggregated to a 4-digit postal code level. Three categories of address density were distinguished: rural (< 500 addresses per km2), hardly to moderately urbanized (500-1.500 addresses per km2) and strongly to extremely urbanized (> 1.500 per km^2).

Task and ego orientation

Task and ego orientations were measured by using the validated and reliable Dutch version of the Task and Ego Orientation in Sports Questionnaire (TEOSQ) [51]. Respondents were asked to indicate when they felt most successful in sport, by indicating to what extent they agreed with 7 items that reflected task orientation and 6 items that reflected ego orientation. Examples of such items are "I learned a new skill by trying very hard" (for task orientation) and "I could do better than my teammates" (for ego orientation). A 5-point Likert scale was used ranging from 1 (strongly disagree) to 5 (strongly agree). In this study, Cronbachs' alpha levels for the task and ego orientation scales were 0.91 and 0.88, respectively and 0.88 for the total scale (Table 4.2). Table 4.2 also shows the results of a Principal Component Analysis (PCA) for the items of the TEOSQ. Average PCA scores for the task and ego orientation were used as continuous measures for task and ego orientation.

Table 4.2 Principle components analysis on task and ego orientations for participation in football/tennis

Construct/item "I feel/felt successful as a tennis/football player when…"	Task orientation	Ego orientation	Total
Something I learned makes me want to go and practice more	**0.81**	0.21	
I learned something that was very fun to do	**0.79**	0.10	
I learned a new skill by trying very hard	**0.78**	0.17	
I did my very best	**0.77**	0.17	
I learned a new skill and it made me want to practice more	**0.77**	0.24	
I worked really hard	**0.74**	0.21	
A skill I learned really felt right	**0.73**	0.32	
I was the best	0.10	**0.86**	
The others couldn't do as well as me	0.08	**0.86**	
I could do better than my teammates	0.25	**0.81**	
I contributed most to the victory	0.24	**0.74**	
I was the only one who could do the play or skill	0.40	**0.63**	
Others messed up and I didn't	0.22	**0.62**	
Eigenvalues	6.18	2.11	
Explained variance (%)	34.71	29.04	
Explained variance, cumulative (%)	34.71	63.75	
Cronbach's alpha (based on standardized items)	0.91	0.88	0.88
Scale mean	3.71	3.122	3.41

Confounders

We controlled the following socio demographic characteristics: age, sex (13-16 and 17-21) and education. For education, we distinguished between four levels of the level of current education: 1) no education, 2) lower education (i.e. primary education, lower professional education), 2) middle education (i.e. intermediate and higher general education) and 3) higher education (professional education and university). Furthermore, we controlled whether the participants ever played in a selection team (yes or no), because the competitive level of sports participation might influence dropout [18].

Statistical analysis

Descriptive analyses were carried out to determine respondents' personal characteristics, time use characteristics and environmental determinants. Subsequently, binary logistic regression analysis on the probability of dropping out of sport (dropout versus member as the outcome variable) was estimated to examine the effects of confounders (Model 1). Moreover, time use variables (Model 2), environmental factors (Model 3) and task and ego orientation (Model 4) were added for subsequent analysis. The analyses were performed for football and tennis separately, because descriptive results showed significant differences between football and tennis. All the analyses were carried out with SPSS version 24.0.

4.3 Results

Descriptive results

Table 4.1 shows socio-demographic, sports participation, time use and environmental characteristics of the study sample. Mean age was 16.5 (SD = 2.5) years and 61.9% was male. Sex differences in types of sports and dropout status were found, with relatively large shares of male football members (80.3%) and female football dropouts (43.1%). Tennis members (32.7%) and dropouts (27%) were more frequently higher educated, compared to football members (6.7%) and dropouts (29.5%).

Time spent in schools and homework/studying consumed the highest time, especially in tennis members and tennis dropouts. Tennis dropouts most frequently changed schools (40.1%). Football members and football dropouts spent more time on work and experienced a change in their work situation (e.g. started a new job or increased work hours during the past year) more frequently. Tennis members travelled on average 6 km (SD = 16.2) from home to their tennis club, which was more than the average of the sample (3.9 km; SD = 11.2 km). In contrast, travel distance among tennis dropouts was relatively low (2.5 km; SD = 4.5 km).

Multivariate analyses of football dropout

The results of binary logistic regression analysis on the probability of dropout from football (Table 4.3), showed that time use variables were important in the prediction of drop out of football: Nagelkerke R-squared was 0.21 in the baseline model with confounders, compared to 0.50, in the model when time use variables were added. The results showed that girls who played football were more likely to dropout than boys. Those with a higher level of education and those who played in a selection team were associated with lower odds on dropout. The second model showed that adolescents who spent more time on football outside the sports club, and those who spent more time on voluntary/social activities at the sports club, were less likely to drop out from organized football. Environmental factors (model 3) did not significantly explain the probability of dropout. The final model showed that both football players who were more task orientated, and those more ego orientated were less

Table 4.3 Binary logistic regression on dropout (yes/no) in sport - FOOTBALL (N = 1,360)

	Model 1 (socio-demographic factors)			Model 2 (model 1 + time use factors)			Model 3 (model 2 + environmental factors)			Model 4 (model 3 + motivational orientation)		
Outcome = Dropout vs Member	**Exp (B)**	**95% CI**	**P**	**Exp (B)**	**95% CI**	**P**	**Exp (B)**	**95%**	**P**	**Exp (B)**	**95% CI**	**P**
Constant	1.71		0.005	5.24		0	4.53		0	4.00		0
Control variables												
Age (17-22 = ref)												
13-16	0.48	0.36-0.64	0.000	0.90	0.62-1.32	0.597	0.90	0.61-1.31	0.597	0.90	0.61-1.33	0.598
Sex (male = ref)	2.41	1.81-3.20	0.000	1.73	1.23-2.43	0.002	1.71	1.22-2.41	0.002	1.78	1.26-2.51	0.001
Current education (high = ref)						0			0			0
No	0.13	0.05-0.34	0.000	0.08	0.03-0.27	0	0.08	0.03-0.26	0	0.07	0.02-0.24	0
Low	0.25	0.17-0.37	0.000	0.28	0.17-0.45	0	0.27	0.17-0.45	0	0.27	0.16-0.44	0
Middle	0.27	0.18-0.41	0.000	0.30	0.18-0.50	0	0.30	0.18-0.50	0	0.29	0.17-0.49	0
Played in selection (team) (no = ref)	0.46	0.35-0.61	0.000	0.68	0.48-0.95	0.023	0.67	0.48-0.94	0.022	0.70	0.50-0.99	0.041
Time use factors												
Time use indicators at this moment (average hrs per week)												
Tennis/football outside sports club				0.30	0.25-0.36	0	0.30	0.25-0.36	0	0.31	0.26-0.37	0
Other sports				1.03	0.97-1.10	0.387	1.03	0.97-1.10	0.387	1.04	0.97-1.11	0.254
Other (fixed) hobbies				1.04	0.98-1.11	0.206	1.04	0.98-1.11	0.21	1.04	0.98-1.11	0.205
School/study and homework				0.99	0.98-1.0	0.187	0.99	0.98-1.00	0.176	0.99	0.98-1.01	0.212
(Part-time) job				1.01	1.00-1.03	0.125	1.01	1.00-1.00	0.13	1.02	1.00-1.03	0.073
Social activities (no of times)				0.97	0.86-1.09	0.599	0.97	0.86-1.09	0.593	0.98	0.86-1.10	0.687
Time spent on side activities at sports club past season (hrs)				0.89	0.81-0.89	0.019	0.89	0.81-0.98	0.016	0.89	0.81-0.98	0.019
Changes in job/school situation since past season												
Got job/increased work hrs (no=ref)				0.70	0.46-1.06	0.089	0.69	0.46-1.05	0.083	0.67	0.44-1.02	0.064
Changed schools/further educ. (no= ref)				0.80	0.53-1.21	0.294	0.81	0.53-1.22	0.31	0.78	0.51-1.20	0.255
Environmental factors												
Travel distance to sports club (km)							1.00	0.99-1.01	0.878	1.00	0.99-1.01	0.832
Neighbourhood density (strong – extremely urbanized = ref)							1.23		0.42	1.19		0.484
Rural							1.29	0.82-1.85	0.314	1.27	0.80-1.80	0.393
Hardly – moderately urbanized							4.53	0.87-1.92	0.203	0.77	0.85-1.90	0.236
Motivational factors												
Task orientation										0.85	0.66-0.89	0
Ego orientation										4.00	0.73-1.00	0.047
-2 Log likelihood	1332.57			977.88			976.13			960.20		
Cox&Snell R^2	0.14			0.34			0.34			0.35		
Nagelkerke R^2	0.21			0.50			0.50			0.51		

likely to drop out compared to those who were less motivated no matter their motivational orientation.

Multivariate analyses of tennis dropout

Table 4.4 presents the results of binary logistic regression analyses on the probability of dropout from tennis. The results demonstrated that girls and those who played in a selection team were less likely to drop out. The time use variables increased the explanatory power of the model (Nagelkerke R-squared) from 0.07 to 0.51. When time use variables were added to the model, education became significantly associated with tennis drop out: tennis players with a middle/intermediate level of education were more likely to quit tennis compared to those with a higher level of education. Tennis players who spent more time on tennis outside their sports clubs were less likely to drop out, whereas tennis players who spent more time on other sports than tennis and on social activities, were more likely to drop out of tennis. Change of schools much more increased the odds of dropping out of tennis (odds ratio 2.96, 95% CI 2.04 – 4.28), whereas starting a (part-time) job or an increase in work hours decreased the likelihood of dropping out. The results of the third model showed that those who travelled larger distances to the tennis club were less likely to drop out. Lastly, both task and ego orientated tennis players were less likely to dropout. The significant effect of sex disappeared when time use and environmental factors were added to the model.

Table 4.4 Binary logistic regression on dropout (yes/no) in sport - TENNIS (N = 1,195)

	Model 1 (socio-demographic factors)			Model 2 (model 1 + time use factors)			Model 3 (model 2 + environmental factors)			Model 4 (model 3 + motivational orientation)		
Outcome = Dropout vs Member	**Exp (B)**	**95% CI**	**P**	**Exp (B)**	**95% CI**	**P**	**Exp (B)**	**95%**	**P**	**Exp (B)**	**95% CI**	**P**
Constant	1.71		0.005	0.58		0.111	0.67		0.257	0.63		0.208
Control variables												
Age (17-22 = ref)												
13-16	1.14	0.83-1.56	0.424	0.96	0.64-1.45	0.852	0.96	0.64-1.45	0.853	0.95	0.63-1.43	0.808
Sex (male = ref)	0.70	0.55-0.89	0.003	0.74	0.54-1.00	0.049	0.75	0.55-1.01	0.061	0.74	0.55-1.02	0.063
Current education (high = ref)			0.165			0.039			0.107			0.093
No	0.54	0.27-1.08	0.080	0.91	0.37-2.23	0.837	0.86	0.35-2.11	0.74	0.83	0.34-2.04	0.682
Low	1.09	0.75-1.60	0.640	1.42	0.86-2.32	0.169	1.28	0.78-2.11	0.336	1.21	0.73-2.00	0.464
Middle	1.19	0.83-1.72	0.343	2.00	1.21-3.31	0.007	1.78	1.07-2.96	0.026	1.77	1.06-2.94	0.028
Played in selection (team) (no = ref)	0.45	0.35-0.58	0.000	0.53	0.38-0.74	0	0.57	0.40-0.79	0.001	0.59	0.42-0.82	0.002
Time use factors												
Time use indicators at this moment (average hrs per week)												
Tennis/football outside sports club				0.27	0.22-0.34	0	0.27	0.22-0.34	0	0.28	0.22-0.34	0
Other sports				1.22	1.15-1.29	0	1.22	1.15-1.29	0	1.22	1.15-1.29	0
Other (fixed) hobbies				1.03	0.97-1.10	0.375	1.03	0.97-1.10	0.326	1.04	0.97-1.11	0.277
School/study and homework				1.00	0.99-1.01	0.756	1.00	0.99-1.01	0.726	1.00	0.99-1.01	0.84
(Part-time) job				1.02	1.00-1.03	0.135	1.02	1.00-1.04	0.108	1.02	1.00-1.04	0.12
Social activities (no of times)				1.16	1.04-1.31	0.011	1.16	1.03-1.31	0.013	1.17	1.04-1.32	0.01
Time spent on side activities at sports club past season (hrs)				0.97	0.94-0.99	0.014	0.97	0.94-1.00	0.019	0.97	0.94-1.00	0.028
Changes in job/school situation since past season												
Got job/increased work hrs (no=ref)				0.45	0.29-0.72	0.001	0.47	0.29-0.74	0.001	0.48	0.30-0.76	0.002
Changed schools/further educ. (no= ref)				2.96	2.04-4.28	0	2.97	2.04-4.31	0	2.92	2.01-4.26	0
Environmental factors												
Travel distance to sports club (km)												
Neighbourhood density (strong – extremely urbanized = ref)							0.97	0.94-0.99	0.007	0.96	0.94-0.99	0.006
Rural									0.684			0.72
Hardly – moderately urbanized							0.94	0.63-1.40	0.761	0.98	0.65-1.46	0.901
Motivational factors							1.10	0.77-1.57	0.599	1.12	0.78-1.60	0.544
Task orientation										0.84	0.71-0.99	0.032
Ego orientation										0.90	0.77-1.05	0.166
-2 Log likelihood	1595.78			1082.24			1068.95			1062.54		
Cox&Snell R^2	0.05			8.49			0.39			0.93		
Nagelkerke R^2	0.073			0.51			0.52			0.52		

4.4 Discussion

This paper adds to the existing literature on dropout from youth sports by examining the extent to which factors related to time use and changes in time use and the physical environment (e.g. travel distance and neighbourhood density) were associated with the probability of adolescents' dropping out from football and tennis clubs.

First, the results indicate that determinants of dropping out from organized sport differed between young football and tennis members. For instance, time use characteristics affected adolescents' dropout from football differently than it did for tennis. However, for both types of sports, time use determinants were more important predictors of dropping out than the environmental determinants of distance to the sports club and neighbourhood density. Change of schools (mainly the transition from high school to higher education) was by far the most important predictor of dropout from tennis, whereas this factor was not significantly associated with dropout from football. This is probably caused by the difference in time use and activity patterns of adolescents involved in football and tennis. For instance, tennis players spent significantly more time in school or on study than football players, whereas football players significantly spent more time on (part-time) jobs. Not surprisingly, tennis players had a higher education level than football players. Contrary to our expectation, starting a job or an increase in working hours decreased the odds of dropping out of tennis compared to those whose job situation remained the same, whereas this factor was of no significance in determining dropout from football. However, the total amount of time spent on jobs was not significantly associated with dropout from both sports. Furthermore, time spent on other sports was an important determinant of dropout from tennis. In contrast to football players, many young tennis players participate in one or more sports besides tennis. However, adolescents probably quit tennis as their 'secondary' type of sport because of time constraints and an increase of other responsibilities (such as studying or working) and change in interests [15]. In addition, tennis players, and also football players who spent more time practicing their sport outside the sports club were less likely to drop out. Apparently, their preference to practice their sport in an unorganized way, with flexible times, locations and people [16],

translates into a lower dropout probability. Another explanation might be that youths who are also outside the sports club being active practising their sport might have a higher level of (task oriented) motivation and involvement and are therefore less likely to quit their membership. Interestingly, time spent on social activities outside the sports club (tennis) or in social or other voluntary activities at the sports club (tennis and football), showed a negative association with dropout. The effect of time spent on social activities and other voluntary activities at the sports club, is of interest for sports federations and sports clubs who want to maintain their members and prevent youngsters from dropping out. Participating in voluntary and social activities at the sports club increases social connectedness, feeling of involvement and social capital [52,53].

Our results indicate that environmental factors were the least important for dropping out compared to individual and time use factors, especially in football. The only significant effect was that members of tennis clubs who travelled larger distances to their tennis club were less likely to dropout. These results corresponded to the findings of Boiché & Sarrazin [48] who found that adolescents who continued with sports participation travelled more than those who dropped out. Youths with longer travel distances who continue to play tennis might be more motivated and/or are more task oriented to play, or might play at a higher competitive level (which may be associated with a higher ego orientation [18]), which requires more travel time to selection trainings and competitions. The relatively small travel distances by former football players correspond to the relatively great density and spread of football clubs across the country and the moderate effect that travel distance has as a barrier for sports participation in the Netherlands [54]. A rather dense sports infrastructure in the Netherlands might also explain why neighbourhood density was not significantly associated with dropout.

In accordance with previous research [18,21], we found that intrapersonal factors were important in explaining the probability of dropping out. Particularly, sex played an important role in predicting dropping out from football: girls aged 13-21 dropped out more frequently from football than boys. This seems striking, because football is increasingly popular among girls and numbers of

female's football clubs members have been growing in the Netherlands over the last decade [55]. Probably, there is also a group of girls who decides to quit their membership rather quickly, more so than boys. However, due to the low response rate among the football dropped outs and the overrepresentation of female dropped outs, this result has to be interpreted carefully. For tennis players, time use factors appeared to be more important predictors of dropout than sex, as the significant effect of sex disappeared when time use and environmental factors were added to the model. Sex differences in dropout determinants apparently can be explained by differences in time use between boys and girls. Furthermore, football and tennis players who had ever played in a selection team (as an indication of a higher competitive level) were less likely to drop out. This might be explained by a higher level of ego orientation and competiveness to play and practice sport, whereby dropout is less likely, as suggested by Balish et al. [18]. Finally, our results confirm the important role motivation plays for continuing participating in organized sport, as shown in previous studies [18,22,27]. Contrary to our expectations based on AGT and existing literature [27,31,32], we found that both task and ego orientations were associated with a lower probability of dropout, whether or not the sport itself was more team (football) or individual (tennis) orientated. Adolescents, who want to continue participating in organized sport and to actively engage within their sports teams and sports clubs, may benefit from having both task (wanting to learn and/or improve themselves) and ego (wanting to compete and win) orientations. In other words, having a high ego orientation does not need to have negative consequences for performance [56] and (continuing) sports participation [33]. It may however, be related to a higher level of competitiveness [18].

Strengths and limitations of this study and future directions

A strength of this paper is the relatively large number of respondents in our total sample (N = 2,555), compared to other studies on dropout from youth sports (with a range of N = 12 to N = 2,180) [18]. Furthermore, our sample and study design allowed us to compare between members and former members of the two most important organized sports in the Netherlands. Despite the large number of respondents, the total mean response rate of this study was relatively low (6.4%). This may be related to our retrospective cross-sectional

study design, whereas the majority of studies on dropout used prospective study designs in which participants were followed for a certain time period (on average 20.6 months) [18]. Especially the football dropouts showed a low response rate (3.5%) with a relatively overrepresentation of female dropouts and results regarding this subsample should therefore be interpreted carefully. Probably, the response rate among dropouts in general was lower because youths who already quitted their sports club membership felt less involved with the sport anymore and were therefore less likely to fill in the questionnaire while women were more likely to fill in. Furthermore, the differences in dropout determinants between football and tennis indicated that each (organized) sport has its unique sport specific characteristics and attracts different youth. It is likely that dropout determinants may differ for each type of organized sport in general, which has consequences for the generalizability of results of this study.

From a health perspective, we recommend that future research distinguish between youth who drop out of sport completely and those who continue to participate in another type of organized or flexible sport. Moreover, determinants of dropout could be linked to actual motivations young people have for quitting their sport. Longitudinal research is needed in gaining insight into the sports participation behaviour of young people after dropping out of sport and the causality of the relationships between time use and environmental characteristics, and participation in (different types of) sports.

4.5 Conclusions and practical implactions

Although time use has been mostly neglected in studies focusing on adolescent's dropout from sport, this study showed that time spent on activities and important changes related to the school and job situations of adolescents were important predictors of dropout. However, determinants of dropout from sport differed to a great extent between football and tennis. Football and tennis probably attract different types of youth, with different interests, needs and preferences for activities in time and space. In addition, differences in social context and organization of sports clubs may account for the different effects found. Furthermore, change of schools as well as the time spent on another type

of sport, increased the odds of dropout from tennis. Interestingly, time spent on social and voluntary activities at the sports club showed a positive association with continued membership of football and tennis clubs. Furthermore, longer travel distances between home and the tennis club decreased the probability of dropout from tennis. Similar to previous studies, intrapersonal factors, such as socio-demographic factors, education and motivational orientation (both task and ego orientated) showed significant associations with the probability of dropping out.

Practical implications

Based on the findings from this study, we recommend to take time use variables into consideration as determinants of sports participation and dropout in socio-ecological models. Moreover, recommendations to sport and health professionals to keep young people involved in organized football and tennis include:

1. Offer more flexibility in schedules of training and competitions, to make it easier to accommodate sports club activities and competitions with other obligations and interests of youth.
2. Stimulate participation in social activities and voluntary work at the sports club as it enhances continuing sports participation.
3. Pay special attention to prevent girls from dropping out. In this respect, future research could focus on how to further stimulate involvement with the sport and within the sports club, for instance by adjusting to the needs and interests of youths.
4. Encourage possibilities for youths to practice and play their sport outside of regular training hours, for instance at the sports club itself or at playgrounds or parks in the neighbourhood, as particating in these 'free' sports activities prevent from dropout.

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- CHAPTER 5 -

SPORTS PARTICIPATION IN SPORTS CLUBS, GYMS OR PUBLIC SPACES: HOW USERS OF DIFFERENT SPORTS SETTINGS DIFFER IN THEIR MOTIVATIONS, GOALS AND SPORTS FREQUENCY

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Abstract

To develop targeted policy strategies to increase sports participation, more insight is needed into the behavioural patterns and preferences of users of different club-organized (i.e. sports clubs) and non-club organized (i.e. gyms, health centres or swimming pools) or informal sports settings such as public spaces. This study investigates 1) how users of different settings differ regarding self-determined motivations and goals and sociodemographic and sport-related characteristics, and 2) how the association of motivations and goals with sports participation may differ between users of different sports settings. Data were collected through online surveys among Dutch adults aged 18-80 years (N = 910). Ordinal regression analyses were used to investigate the effects of sports settings, the level of self-determined motivations and goals and interaction effects of motivations and goals with different sports settings, on sports frequency. Users of different sports settings differed in their personal characteristics, motivations and goals. In general, controlled motivations were negatively associated with sports frequency (B = -0.46). However, among club members, extrinsic goals related to image (B = 0.44), and also intrinsic goals related to skill development (B = 0.40) and social affiliation (B = 0.47) had significant positive associations with sports frequency. Health-related goals significantly increased sports frequency among users of informal settings, such as public spaces. The association of motivational variables with sports participation differs between settings. This implies that sports frequency is higher when participants engage in settings that better fit their motivations and goals. Because of the growing importance of informal and flexible settings and health goals, professionals in the sport and health domains should take into account the motivations, goals and needs of different target groups who use or want to use unorganized, informal sports settings including public spaces.

5.1 Introduction

Increasing participation in sport and physical activity is an important health objective in developed countries [1,2]. An important way for local governments to achieve this objective is to provide easily accessible facilities where sport can be practised. While the term 'facilities' traditionally referred to indoor or outdoor public facilities for specific types of sports, often facilitating voluntary sports clubs, it currently refers to a wide spectrum of settings. Recently, several new opportunities to practice sport have emerged, and especially informal and flexible types of sports participation (also referred to as 'light' sports settings) have increased more rapidly than traditional organized club-based sports participation (or 'heavy' sports settings) [2–5].

Typical informal and flexible sports settings are commercial health centres and gyms, informal groups and individual participation in the public space, all of which make participants less dependent on formal structures such as membership obligations, opening hours and the availability of specific sports facilities [6,7]. Informal, unorganized and individual types of sports such as running, cycling and working out in the gym have become increasingly popular, which has resulted in a greater variety of geographical locations used for sports activities, including public spaces and natural environments [3,8,9]. According to Borgers et al. [6], these changes in sports participation can be seen as an issue of institutional change, which is related to processes of cultural and societal change and changing values, habits and attitudes of sports participants. In this paper we build upon definitions of sports participation used in the previous literature [10–12] and we distinguish between the following sports settings: 1) club-organized sports settings (i.e. voluntary sports clubs), 2) non-club organized settings (i.e. gyms, health centres or swimming pools) and 3) informal settings such as public spaces.

To develop targeted policy strategies to increase sports participation levels, more insight into the behavioural patterns and preferences of users of different sports settings is needed. Some studies suggest that preferences for specific sports settings depend on sociodemographic characteristics. For instance, women are more likely to engage in informal and flexible sports in commercial

or alternative settings [2,4,8] and adults of higher social classes and with higher incomes are more likely to engage in non-organized sport [13,14]. In addition, Borgers et al. [5] have found that participation frequency and time spent on sport is higher among members of sports clubs in certain types of sports, in contrast to the frequency of engagement of non-organized sports participants.

Previous studies have shown that a range of different factors is associated with sports participation, including sports frequency [5,15,16]. In addition to more general sociodemographic characteristics such as sex, age and working and household situations [5], psychological determinants such as motivation or behavioural regulation (i.e. the reason why a person participates in sport) and goals (i.e. what an individual is expecting to achieve with sport) have been found to be strong intrapersonal determinants of sports participation. Based on self-determination theory (SDT) [17], various studies have found that more self-determined and autonomous types of motivation have an important impact on sports participation or the persistence therein [18,19]. Other studies have highlighted the importance of intrinsic goals (e.g. developing skills, seeking challenge, gaining social affiliation and improving health) for participation in sport and physical activity and sports frequency [19].

Recently, some studies have shown that motivations and goals are related not only to sports participation but also to an individual's choice of a specific sports setting. For instance, Borgers and colleagues [6] found that sports participation in non-traditional settings including running, cycling and gym activities seemed to be driven by values related to healthism and physical appearance, whereas members of sports clubs were more likely to practice sport because of sociability or performance-related goals. For participants who participate in gym or outdoor settings under the guidance of a fitness instructor, health management and skill development goals were most important, followed by physique enhancement and social affiliation [20]. A Norwegian study showed that adults who exercise in natural environments reported stronger motives concerning convenience (e.g. easy accessibility in terms of time, location, money and 'practising at their own pace') and experiencing nature than did gym or organized sports participants, who reported stronger motives for improving physical health and sociability [9].

While these studies give a first indication of the differences in motivations and goals of users of different sports settings, a systematic comparison of possible interactions between sports settings and level of self-determined motivation and goals and the association with sports participation is currently lacking. Such a comparison would contribute to a better understanding of the variations in preferences and requirements of sports participants across different settings for sports participation. Related to the question of how users of different sports settings differ in motivation and goals is the question of how these differences relate to the frequency of sports participation, which is an important policy outcome indicator [21].

Our study applies a socioecological framework, which is frequently used in studies in the health and physical activity domains and recently in studies on sports participation [22,23]. According to the socioecological approach, there are multiple influences on specific health behaviours, including factors on the intrapersonal, interpersonal, environmental levels. All influences on behaviours potentially interact across these different levels [24]. Although most socioecological models recognize the existence of interactions between factors at multiple levels, they often do not offer clear hypotheses on how these factors interact [25]. Because the current literature shows mixed empirical evidence for individual-environmental interactions in explaining physical activity or sports participation, as results differ greatly depending on the specific interactions studied, more research is needed regarding the interactions of different socioecological levels for specific health behaviours [25]. As interactions between motivations and goals, which are important psychological determinants of sports participation, and sports settings, which are environmental determinants, have not yet been studied in relation to sports participation, this study fills this gap.

Based on the socioecological framework, we hypothesize that both sociodemographic and motivational variables may have different effects on sports frequency depending on the specific setting for sports activities. For instance, users of informal settings such as public spaces are more flexible regarding the times they want to practice sport, compared to participants

in more traditional sports settings with fixed time schedules. Therefore, it is possible that participants in informal self-organized sports settings such as public spaces might need a higher level of autonomous motivation, and are driven by different goals than participants in traditional sports clubs to participate frequently. For instance, their sports frequency could be fostered trough autonomy and flexibility. For participation in the more social settings of traditional sports clubs, it is hypothesized that social goals and commitment help trigger the autonomous motivation to participate in sport frequently. In addition, the fixed trainings, competitions and obligations or expectations from coaches and peers might stimulate their extrinsic goals and therefore sports frequency. For participants in gyms or health centres, it is more difficult to anticipate what role motivations and goals impact sports frequency. More insight into these mechanisms may help in determining what strategies may be useful to further promote sports participation among users of different settings.

In light of the above, the present study aims to investigate 1) how users of different settings differ regarding self-determined motivations and goals and sociodemographic and sport-related characteristics and 2) how the association of motivations and goals with sports frequency may differ between users of different sports settings.

5.2 Methods

Study design and respondents

Data were collected via an online survey that recorded information about motivations, goal content and sports participation characteristics, including principal sports setting. Data collection occurred in six municipalities in the Netherlands (Amsterdam, Utrecht, Alphen aan den Rijn, Heerlen, Berkelland and Roerdalen) in September 2014. These municipalities were selected based on their differences in population density to yield sufficient variation in the availability and accessibility of sports activities and facilities. Eighteen thousand adults (3,000 per municipality), aged 18-80 years old, were randomly selected from municipal population registers. They were invited to participate in the study by their municipality, by means of an official letter by post. This letter

contained the link and unique credentials for the online survey. In total, 1,663 respondents completed the survey (9.2% response rate). We have excluded the following respondents from the analyses: those who did not participate in sport or who participated less than once a month (N = 477), those who participated in an inactive form of sport (e.g. bridge) (N = 20) and respondents with missing sociodemographic data (N = 256). The final sample included 910 participants. The total study sample (N = 1,663) was not fully representative for the Dutch adult population due to a underrepresentation of low-educated respondents (12.1% compared to 33% nationally [26]) and of respondents with a non-native Dutch origin (10.8% compared to 21.4% nationally [27]). However, these issues did not lead to an overrepresentation of the share of sports participants in the sample, as 70% of our sample participated three times or more in sport per month, which is similar to the percentage of sports participants among the general Dutch population [28]. This suggests that a selection bias towards more sports minded respondents has not occurred. In addition, participants of our sample used similar sports settings than the general adult population [28]. In addition, the correction for education level in our multivariate analyses implies that the results represent the general relation across education levels in a reliable way. Furthermore, due to the cross-sectional design of the study, the directions of the associations found is unknown and do not imply causality. Ethical guidelines were followed although ethical approval was not required according to the Ethics Committee of Utrecht University.

Measures

In the survey, respondents were asked to note their principal type of sport, that is, the sport in which they participated most frequently during the 12 months prior to the survey. Subsequently, they were asked in what location that sports activity mostly occurred (referred to as sports location, which includes a traditional - often voluntary run - sports club, a registered - often commercially run - sports facility or a public space) and their organizational setting (that is, whether they participated as a member of a traditional sports club; as a participant of a gym, health centre or sports facility other than a sports club; or as part of an informal group or individually). Sports participation was defined as 'purposeful active participation in sports related physical activities performed during leisure-time' [10,29,30]. Survey questions on sports participation,

sports location and organizational setting were derived from the standardized and validated Dutch guidelines for sports participation research [31,32]. All variables that relate to sports participation – including frequency, setting, motivations, goals and type of sport – refer to the respondents' participation in their principal type of sport.

Sports frequency

Sports frequency was measured as a self-reported categorical variable with 4 categories: 1 to 3 times a month, once a week, twice a week and at least 3 times a week.

Sports setting

Based on survey questions about the sports location and organizational setting that were used most often for participation in the principal type of sports over the past year, the variable sports setting was composed. Sports setting was categorized into three groups: 1) *club-organized settings:* users of official sports club facilities, as members of sports clubs, 2) *non-club organized settings:* users of facilities such as gyms, health centres or swimming pools, without traditional club membership and 3) *informal public space settings:* users who mostly use public spaces practising sports in an unorganized or informal way (e.g. individually, with a friend or in a small group). According to Borgers et al. [10], club-organized sport refers to participation in a conventional – often voluntary run – association that offers sports activities based on formal membership agreements. Non-club-organized sport entails all other forms of participation outside of a club, which generally takes place in organizational settings, such as self-organized participation in informal groups or alone, but also in commercial health and fitness centres, alternative programmes and facilities offered by municipal sport services or company-based sport [10,29,30]. In contrast to Borgers et al. [10], we consider non-club organized sport in gyms, health centres or swimming pools as a distinct category, because municipal policies regarding these more commercial sports suppliers differ from sports clubs and public space settings.

Motivation for sports participation

The 15-item Behavioural Regulation in Exercise Questionnaire (BREQ) [33], which is based on SDT, was translated into Dutch and used to investigate intrinsic motivation and identified, introjected and external exercise-based motivational regulations. Participants responded to the question 'Why did you participate in your principal sport during the past 12 months?'. Items included, for instance, 'I participate in sport because people say I should' for external regulation and 'It's important to me to exercise regularly' for identified regulation. Each item was rated on a 5-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree). Principal components analysis (PCA) revealed a slightly different factor structure compared to the theoretical division. We removed the item 'I get restless if I don't participate in my sport regularly' because reliability analysis indicated that the internal consistency of the introjected regulation subscale was too low if we included this item. Other studies show similar measurement issues with the same item [34]. For the items that remained, we calculated mean scores per factor derived from the PCA. The internal consistency of the BREQ subscales was as follows: intrinsic motivation ($\alpha = 0.89$), identified regulation ($\alpha = 0.67$), introjected regulation ($\alpha = 0.75$) and external regulation ($\alpha = 0.82$). Based on previous research [35,36], scores from the BREQ were used to create variables representing controlled and autonomous motivation. Controlled motivation ($\alpha = 0.85$) was calculated by obtaining the average from the extrinsic subscales (external and introjected regulation). Autonomous motivation ($\alpha = 0.81$) was calculated by obtaining the average of the identified and intrinsic regulation subscales.

Goals for sports participation

The 20-item SDT-based Goal Content for Exercise Questionnaire (GCEQ) [37] was translated into Dutch and used to assess the importance that participants attribute to intrinsic goals (i.e. skill development, social affiliation and health management) and extrinsic goals (i.e. image and social recognition) with regard to sports participation. Participants responded to the question 'Why do you participate in your sport?' and rated the extent to which the goals were important for participation in their principal sport during the past year on a 5-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree).

The factor structure resulting from the PCA corresponded with the original classification. To ensure consistency with the sports motivation measure, we decided to use the mean scores of the factors instead of the factor scores derived from the PCA. The internal consistency of the five subscales was as follows: skill development (α = 0.90), social affiliation (α = 0.88), health management (α = 0.80), image (α = 0.89) and social recognition (α = 0.88).

Potential confounders

We controlled for the following demographic characteristics in the multivariate analyses: age, sex and education. Education was classified into three levels based on the highest self-reported level of completed education: 1) lower education (i.e. no education, primary education, and lower professional education), 2) middle education (i.e. intermediate and higher general education) and 3) higher education (i.e. higher professional education and university). Individual net income level was excluded because of the large share of respondents (N = 197) that answered, 'don't know/I prefer not to mention'. In addition, we controlled for neighbourhood density level because the sports settings used and the participation rates could differ between urban and rural areas [38,39]. This measure was based on the number of addresses within a radius of one square kilometre from the home location [27] and was aggregated to a 4-digit postal code level. Three categories of address density were distinguished: rural (< 500 addresses per km^2), hardly to moderately urbanized (500-1.500 addresses per km^2) and strongly to extremely urbanized (> 1.500 per km^2). Health and sports related potential confounders included perceived health, BMI, type of athlete and type of sport. Both perceived health and BMI were controlled for because because they possibly could be related to our independent and dependent variables [21,40]. Perceived health refers to how respondents described their physical health and was classified in three categories: (very) bad to moderate, good and very good. Body mass index (BMI) was calculated based on self-reported height and weight and categorized into underweight to normal weight (< 25), overweight (25 – 30) and obese (> 30). Type of athlete was self-reported and gives an indication of the level of experience and competitiveness in sport and consists of four categories: 1) those who do not know how to classify themselves as 'type of athlete' 2) novice recreational

athletes, 3) experienced recreational athletes and 4) competitive athletes who participate in competitions, matches or races.

Statistical analyses

SPSS 24.0 was used to provide descriptive statistics on respondents' personal, motivational and sports participation characteristics. Chi-squares and analyses of variance (ANOVA) were conducted to test for significant differences between participants of the three different sports settings (i.e. those mainly using sports clubs, non-club organized or informal (public space) settings) regarding their motivations and goals for sports participation and other characteristics (sociodemographic and sports-related characteristics). Furthermore, multivariate ordinal regression analyses were performed to investigate how sports frequency (outcome variable) was determined by motivations, goals and the use of sports settings, controlled for confounders. To test whether the association of motivations and goals with sports frequency differs between sports settings, interactions between types of motivations and sports settings and interactions between types of goals and sports settings were included.

5.3 Results

Descriptive results

Descriptive results are presented in Table 5.1. The mean age was 50.6 (SD = 15.8) and 55.1% of respondents were women. Most respondents engaged rather frequently in sport; 59.1% participated at least twice a week in their principal sport, and this percentage increased to 68.1% if all other sports activities were also included. Individual types of sports were most popular (70.1%), including working out individually in a gym (19.3%), running (13.2%) and types of cycling (11.6%). Most participants indicated that unorganized informal settings (mainly a public space) were their principal sports setting (55.4%), followed by sports clubs (26.3%) and non-club organized settings (facilities such as gyms) (18.4%). Most participants described themselves as an experienced recreational athlete (58.7%). Participants scored relatively high on autonomous motivation (mean score 4.1 out of 5; SD = 0.6) and health management goals (3.9; SD = 0.7), followed by image (3.0; SD = 1.0) and skill development goals (2.9; SD = 1.1).

Table 5.1 Personal characteristics of respondents using different sport settings

	Total (N = 910)	Club organized settings (N = 239)	Non-club organized settings (e.g. gyms) (N = 167)	Informal settings (e.g. public space) (N = 504)	P-values
Age (mean (SD))	50.6 (15.8)	48.2 (17.3)	48.3 (15.0)	52.5 (15.0)	0.000
Female (%)	55.1	51	70.1	52	0.000
Education (%)					
Low	12.1	9.2	8.4	14.7	0.051
Middle	36.2	38.9	41.3	33.1	
High	51.8	51.9	50.3	52.2	
Neighbourhood density (%)				2	
Rural	30.7	38.1	24.6	9.2	0.015
Hardly – moderately urbanized	31.2	31.4	34.7	30.2	
Strongly – extremely urbanized	38	30.5	40.7	40.7	
Perceived health (%)					
Very bad/bad – moderate	23.6	14.6	21	28.8	0.000
Good	63.3	66.9	66.5	60.5	
Very good	13.1	18.4	12.6	10.7	
BMI (%)					
Under – healthy weight (BMI < 25)	58.9	57.7	62.3	58.3	0.007
Overweight (BMI 25 – 30)	33.5	39.3	27.5	32.7	
Obese (BMI > 30)	7.6	2.9	10.2	8.9	
Sports frequency (main sport) (%)					
1-3 times a month	9.5	5.9	6.6	12.1	0.012
Once a week	31.3	32.6	32.3	30.4	
Twice a week	32	29.7	39.5	30.6	
At least 3 times a week	27.3	31.8	21.6	27	
Sports location (%)					
Indoor sports facility	38.4	35.6	94.1	19.6	0.000
Outdoor sports facility	15.3	48.9	0.7	2.4	
Swimming pool	6.6	5.3	1.3	9.2	
Public space	39.7	10.2	3.9	68.8	
Organisational setting (%)					
Organized – sports club member	26.3	100	-	-	0.000
Organized – in gym/health centre	18.4	-	100	-	
Unorganized/informal – with others	30.3	-	-	54.8	
Unorganized/informal – individually	25.1	-	-	45.2	
Type of sports (%)					
Individual sports	70.1	37.7	61.7	88.3	0.000
Team sports	29.9	62.3	38.3	11.7	
Type of athlete (%)					
Don't know	10.4	4.2	10.8	13.3	0.000
Novice recreational athlete	18.6	7.9	25.1	21.4	
Experienced recreational athlete	58.7	49	62.9	61.9	
Competitive athlete	12.3	38.9	1.2	3.4	
Self-determined motivation, mean (SD)					
Autonomous motivation	4.1 (0.6)	4.2 (0.5)	4.1 (0.6)	4.1 (0.7)	0.007
Controlled motivation	1.6 (0.6)	1.6 (0.7)	1.6 (0.7)	1.6 (0.6)	0.3
Goal content, mean (SD)					
Skill development	2.9 (1.1)	3.6 (0.9)	2.9 (1.0)	2.7 (1.0)	0.000
Social affiliation	2.6 (1.0)	3.3 (0.8)	2.4 (0.9)	2.4 (1.0)	0.000
Health management	3.9 (0.7)	3.8 (0.7)	4.1 (0.6)	4.0 (0.7)	0.000
Image	3.0 (1.0)	2.8 (0.9)	3.4 (0.9)	3.0 (1.0)	0.000
Social recognition	1.9 (0.8)	2.1 (0.8)	1.9 (0.8)	1.8 (0.8)	0.000

Differences between users of different sports settings

The results of descriptive analyses, Chi-squares and ANOVA analyses are presented in Table 5.1 and show that significant differences exist in personal characteristics between users of different sports settings. Compared to users of other settings, members of sports clubs more often lived in rural areas (38.1%) and perceived their health as very good (18.4%), and a relatively large number

of them participated in sport very frequently (at least 3 times a week) (31.8%). Most of them perceived themselves as competitive athletes (38.9%) and participated in team sports (62.3%) with ball sports and racket sports as the largest categories. The goals of sports club participants were relatively often related to social affiliation (M = 3.8; SD = 0.8), skill development (M = 3.6; SD = 0.9) and social recognition (M = 2.1; SD = 0.8).

Participants of non-club organized settings such as gyms and health centres were most frequently women (70.1%). Most of these sports participants participated twice a week in sport (39.5%) and engaged in individual sports activities in gyms or in exercise or dance classes. Informal sports participants more frequently perceived their health as very bad/bad to moderate than did users of other settings. These informal sports participants mostly used public spaces as their sports location (68.8%) and were diverse regarding their sports frequency. In particular, individual types of sports such as running, types of cycling and race cycling and gym activities were practised. Participants in non-club organized and informally in public spaces more frequently identified themselves as recreational athletes, whether novice or experienced: 88% in non-club organized and 83.3% in informal settings, compared to 56.9% in sports clubs. Participants in these settings reported both relatively high scores in on health management (M = 4.1; SD = 0.6 for non-club organized, M = 4.0; SD = 0.7 for informal/public space participants) and image goals (M = 3.4; SD = 0.9 for non-club organized, M = 3.0; SD = 1.0 for informal participants) as well.

Associations of motivations, goals and sports settings with sports frequency

Table 5.2 shows the results of ordinal logistic regressions in which motivations, goals and the use of a certain sports setting were related to sports frequency. The first model (Nagelkerke R^2 = 0.173) showed the main effects of sports settings, motivations, goals and confounders. In the second model (Nagelkerke R^2 = 0.183), interaction effects between motivations and sports setting were added to model 1. In the third model (Nagelkerke R^2 = 0.212), interaction effects between goals and sports setting were added to model 2. In all models, respondents with stronger autonomous motivations participated more frequently in sport, and those with stronger controlled motivations participated less frequently

Table 5.2 Ordinal regression analyses on sports frequency, with interaction effects of motivation and goals with sports setting

	Model 1 (main effects)		Model 2 (interaction effects with motivations)		Model 3 (interaction effects with goals)	
	Estimate	**SE**	**Estimate**	**SE**	**Estimate**	**SE**
Threshold parameters						
Sports frequency (at least twice a week = ref)						
1-3 times a month	-0.95	0.67	-1.23	0.78	-0.89	0.81
Once a week	1.14	0.67	0.88	0.78	1.25	0.81
Twice a week	2.68	0.67	2.43	0.79	2.84	0.82
Confounders						
Age	0.02**	0.01	0.02**	0.01	0.02**	0.01
Sex (male = ref)	-0.05	0.13	-0.06	0.13	-0.06	0.14
Education (high = ref)						
Low	-0.25	0.21	-0.26	0.21	-0.23	0.21
Middle	0.11	0.14	0.08	0.14	0.09	0.14
Neighbourhood density (strongly-extremely = ref)						
Rural	0.02	0.16	0.02	0.16	0.02	0.16
Hardly – moderately	0.40*	0.16	0.42**	0.16	0.44**	0.16
Perceived health (very good = ref)						
Very bad/bad – moderate	-0.78**	0.23	-0.76**	0.23	-0.89**	0.24
Good	-0.73**	0.20	-0.71**	0.20	-0.81**	0.20
BMI (obese = ref)						
Under – healthy weight	-0.13	0.25	-0.18	0.25	-0.23	0.25
Overweight	-0.40	0.25	-0.47	0.26	-0.49	0.26
Type of sports (team sports = ref)						
Individual sports	0.80**	0.16	0.83**	0.17	0.84**	0.17
Type of athlete (competitive athlete = ref)						
Don't know	-1.46**	0.32	-1.53**	0.32	-1.48**	0.32
Novice recreational athlete	-1.94**	0.29	-1.98**	0.29	-1.91**	0.29
Experienced recreational athlete	-1.43**	0.24	-1.50**	0.24	-1.40**	0.25
Main effects sports setting (informal settings (e.g. public space) = ref)						
Club-organized settings	0.16	0.19	0.46	1.19	0.70	1.25
Non club-organized settings (e.g. gym, health centre)	0.19	0.18	-0.64	1.29	-0.11	1.44
Main effects motivation						
Autonomous motivation	0.41**	0.12	0.44**	0.14	0.45**	0.15
Controlled motivation	-0.28*	0.12	-0.48**	0.15	-0.46**	0.17
Main effects goal content						
Skill development	0.05	0.08	0.06	0.08	0.00	0.11
Social affiliation	-0.11	0.09	-0.10	0.09	-0.22	0.12
Health management	0.10	0.12	0.12	0.12	0.37*	0.15
Image	0.16	0.09	0.14	0.09	-0.06	0.10
Social recognition	0.09	0.11	0.09	0.11	0.26	0.16
Interaction effects motivation * sports setting (informal settings= ref)						
Autonomous motivation * club-organized			-0.35	0.26	-0.49	0.31
Autonomous motivation * non club-organized			0.11	0.27	0.03	0.32
Controlled motivation * club-organized			0.72**	0.26	0.57	0.30
Controlled motivation * non club-organized			0.24	0.26	0.14	0.33
Interaction effects goals * sports setting (informal settings = ref)						
Skill development * club-organized					0.40*	0.18
Skill development * non club-organized					-0.02*	0.22
Social affiliation * club-organized					0.47*	0.22
Social affiliation * non club-organized					0.24	0.26
Health management * club-organized					-0.70*	0.28
Health management * non club-organized					-0.58	0.33
Image * club-organized					0.44*	0.21
Image * non club-organized					0.75**	0.23
Social recognition * club-organized					-0.33	0.26
Social recognition * non club-organized					-0.35	0.30
Nagelkerke R^2	0.173		0.183		0.212	
P model	0.000		0.000		0.000	
Pearson Chi-Square (P-value)	2688.62 (p=0.579)		2685.57 (p=0.574)		2722.75 (p=0.325)	
Test of Parallel Lines						
-2 Log Likelihood (general)	2135.368		2113.535		2065.735	
Chi-square	81.261		93.090		111.461	
P-value	0.001		0.001		0.003	

in sport. Only the third model showed that goals were associated with sports frequency. It showed that participants with strong health management goals participated more frequently in sport. In none of the models was sports setting directly associated with sports frequency.

Associations of interactions of motivations and goals with sports setting on sports frequency

Several significant interaction effects of motivations and goals with sports settings were found (Table 5.2). The second model (including interactions between motivations and sports settings) showed that those participating in club-organized settings with strong controlled motivations had a higher sports frequency. The third model – including interactions between goals and sports settings – indicated that having skill development goals led to a higher sports frequency among sports club members. Social affiliation goals were associated with a higher sports frequency in club-organized and non club-organized settings. Image goals had stronger positive association with sports frequency among participants in non-club organized settings and club-organized settings than among participants in informal settings such as the public space. Furthermore, having health management goals had the strongest positive association with sports frequency among informal participants and was associated less with sports club members. When the interaction effects of goals with sports settings appeared in model 3, the positive relation of controlled motivation on the sports frequency of club members (model 2) disappeared.

5.4 Discussion

In general, this study showed that different sports settings attract different types of sports participants with different levels of self-determined motivations and goals. Goals were particularly highly interrelated with sports settings and impacted sports frequency.

The results of descriptive analyses revealed that sports participants using different settings for their sports practices differed regarding their preferred type of sport and whether the participants were novice, experienced or competitive athletes. For instance, informal and non-club organized settings

attracted non-competitive, novice and experienced athletes who participated in individual and flexible types of sports such as running and types of cycling (in public spaces) and gym-related activities or group lessons (in private gyms or health centres). Members of traditional sports clubs, on the other hand, were more experienced and competitive athletes and participated more frequently in team sports. Similar findings were also found in the study of Borgers et al. [5]. Interestingly, the different sports settings also attracted participants with different perceived health statuses, with informal (e.g. public space) participants in general reporting poorer perceived health compared to club members. This finding is in line with the previous literature showing evidence for better psychological and health outcomes in club-based team sports participants than individual participants and those in less social settings [21,41]. However, sports participation in outdoor settings can also produce higher restorative health benefits than do indoor settings [42]. In addition, it might be that informal and flexible settings and types of sports that are practised in gyms and public spaces have a lower threshold for people who have physical or mental health problems or are overweight, as heavy weight might function as a barrier to joining a sports club [40].

With regard to motivations and goals, descriptive analyses showed that users of informal and non club-organized sports settings were more similar to each other than to sports club members. In accordance with Borgers et al. [6], we found that social goals were mostly found among members of traditional sports clubs. Interestingly, sports club members showed higher levels of both extrinsic goals (social recognition and image) and intrinsic goals (skill development and social affiliation). Although social recognition and social affiliation goals differ from each other, both types of goals are focussed on social relationships with peers and/or coaches. Previous research has shown that these factors are important determinants of participation and continuation in organized sports [43,44]. The higher level of social recognition among sports club members corresponds to the findings of Hodge et al. [45]., who found relative high scores on social recognition and extrinsic levels of motivation among Master athletes in sports clubs (aged 29-77 years), which could be explained by their high ego-orientation (that is, their focus on personal success) in sport. We found a strong

association between the goals related to skill development and sports club participants, which might be related to the type of sport (technical level/team sports). Furthermore, in accordance with previous studies [6,9,20], we found that sports participants with health-related goals were primarily found in the more flexible, and/or non club-organized settings such as gyms and public spaces and less in club-organized settings. In general, health improvement goals such as increasing energy level, stamina or resistance to illness and disease were the most prevalent goals for participation in sport among the sample. This could be related to the increased focus on healthy lifestyles and the current 'healthism' discourse in Western societies, within which sport is seen to provide a means to be 'fit' and to achieve a slim body [4,6,46–48]. Apparently, health goals seem to be related to individual settings and less to traditional organized settings such as sports clubs and competitive types of sports and participants. This implies that traditional sports clubs function to a lesser extent as health-oriented sporting environments. For example, if sports participants perceive the culture within sports clubs as focused on skill development, social recognition and performance and as a place where trainers and peers have expectations and limits are pushed, for instance, this might explain why novice athletes prefer more low-key, flexible opportunities with less sense of obligations [4,8]. In addition, a perceived lack of skills necessary to join a sports club might also hinder novice and non-sports participants to become a member of a sports club.

The results of the ordinal regression analyses showed that motivations, goals and interactions of motivations and goals with sports settings were related to sports frequency. In line with SDT-based research [17–19], we found that a higher score on self-determined autonomous motivations was associated with a higher sports frequency, whereas controlled motivations were associated with a lower sports frequency. However, the interaction effects showed that having strong controlled motivations was related to a higher sports frequency particularly among sports club members, in contrast to those in informal and mainly public space settings. Additionally, the extrinsic goal of image was found to be associated with a higher sports frequency in sports clubs and gym participants. On the other hand, the results revealed that having intrinsic skill development and social affiliation goals were associated with a higher sports

frequency among sports club members than among non-club organized and informal sports participants. Apparently, traditional sports clubs attract sports participants who want to improve themselves or master their sports techniques. On the other hand, despite strong controlled motivations and extrinsic goals of social recognition and image, club members participate very frequently and spend more time in sport [5]. While less self-determined or controlled motivations and goals theoretically are associated negatively with sports participation [17] and with earlier stages of behaviour change for exercise [49], more serious or competitive athletes might perceive these more extrinsic goals or motivations differently and be motivated to participate more frequently. In addition, the positive associations of social affiliation and skill development goals with sports frequency among club-organized settings and among users of non club-organized settings such as gyms and health centres implies that the social, fun and learning aspects of sport have positive associations with sports participation regardless of the sports setting [21].

Finally, we found that having health management goals had the strongest positive association with sports frequency among participants in informal settings compared to sports club members. Because sports participation in informal settings such as public spaces is often not subject to specific schedules and obligations to others and is free of charge, external triggers to go practise sport are largely lacking. This could be a reason why more individual goals related to a person's own health are needed to decide whether or not to practice. However, more extrinsic socially constructed goals related to 'healthism' such as losing weight and improving appearance might also stimulate participants to exercise more frequently.

Strengths, limitations and future research directions

Strengths of this study includes the fact that we collected sports participation data on different socioecological levels, which allowed us to investigate the association of interactions between several motivational variables and specific sports settings on sports frequency. Moreover, we measured both motivations and goals and these scales were both based on psychological theories of motivation.

Limitations of this study are the low response rate (9.2%) and a sample that consisted of a relative active older age group, whereas respondents with low income and non-Dutch migration background were underrepresented. However, as the sports settings used and the sports frequency in our sample corresponded to the statistics regarding the general Dutch adult population [28], and because we controlled for relevant intrapersonal variables, a selection bias towards more sports minded respondents is unlikely.

Future research should consider whether adults participate in more than one type of sport and/or using multiple sports settings, as this might be associated with motivations, goals and sports frequency. Moreover, for sport and health promotion purposes, it is interesting to compare the results with the motivations, goals and barriers related to the use of specific sports settings of non-participants as potential new sports participants. Person-oriented, qualitative research approaches could contribute to this.

5.5 Conclusions and practical implications

Although ample evidence exists about the importance of psychological determinants including motivations and goals for sport as well as environmental determinants for sports participation, little is known about how the relation of motivations and goals with sports frequency differs between users of different sports settings. The results of this study suggest that different settings for sports participation attract different types of sports participants. They differ in personal characteristics and in their levels of self-determined motivations and goals. Club-organized sports settings were associated with participants who were focussed on intrinsic goals related to skill development and social affiliation and on extrinsic goals related to social recognition from others and image. Users of non club-organized settings (i.e. gyms, health centres and swimming pools) and informal settings (i.e. mainly the public space) were more similar to each other than to sports club members and were associated with individual types of sports and with goals related to image and health improvement, respectively.

Moreover, the results showed that goals in particular were highly interrelated with the choice of a certain sports setting and had impact on sports frequency. Our results indicate that sports frequency is higher when participants engage in settings that are more suitable for their motivations and goals and whether these are more or less self-determined. We noticed that sports clubs, which are usually known for their higher sports frequencies and time spent on sport [5], attracted participants with intrinsic and extrinsic oriented goals. In addition, those with health goals participated more frequently in sport when practising in informal settings such as the public space.

Our findings show evidence for interactions of different socioecological levels to explain the complex behaviour of sports participation [24]. While factors of the physical environment are often taken into account as determinants influencing health behaviour, including sports participation [14,50], we recommend also considering interactions on different levels, including psychological-environmental interactions, in research on explaining sports participation.

Implications

Based on the findings of this study, we recommend policymakers and managers in the sport and health domains to be aware of the increasing importance of health goals and flexible, informal settings among the growing group of recreationally orientated sports participants [3,6,51]. To maintain or increase the number of members and to not lose ground to informal sports settings, sports clubs could offer extra (low threshold, few skills needed) trainings focused on less experienced or less competitive participants and those with poorer health status, who prefer to have more flexibility and less obligation or recognition from others. Moreover, creating a healthy, welcoming and inclusive environment might allow those with more vulnerable health status to feel more at ease at sports clubs [52]. Furthermore, the results suggest an increased attention to making public spaces more attractive and suitable for sports participation. Policymakers could investigate the motivations that different groups of actual and potential public space participants have for sports participation and for the use of specific locations. Practically, this can for instance be done by a qualitative investigation of what type of spaces sports participants actually use (for instance, where are they located, which

environmental features do they have, what is the infrastructure like, what types of sports are people practising, whether sports participants interact with each other et cetera), and asking them why they prefer that type of public places, if they are missing something and what improvements they would suggest to make it more encouraging for them to practice sport in the public space.

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- CHAPTER 6 -

ATTRACTIVE RUNNING ENVIRONMENTS FOR ALL? A CROSS-SECTIONAL STUDY ON RUNNERS' MOTIVES, ATTITUDES AND PHYSICAL ENVIRONMENTAL CHARACTERISTICS IN RELATION TO THE EXPERIENCE OF THE RUNNING ENVIRONMENT

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Abstract

Running has become one of the most popular sports and has proven benefits for public health. Policy makers are increasingly aware that attractively designed public spaces may promote running. However, little is known about what makes a running environment attractive and restorative for runners and to what extent this depends on characteristics of the runner. This study aims to investigate 1) to what extent intrapersonal characteristics (i.e. motives and attitudes) and perceived environmental characteristics (e.g. quality of the running surface, greenness of the route, feelings of safety and hinderance by other road users) are associated with the perceived attractiveness and restorative capacity of the running environment and 2) to what extent the number of years of running experience modify these associations. Cross-sectional data were collected through the online Eindhoven Running Survey 2015 (ERS15) among half marathon runners (N = 2,477; response rate 26.6%). Linear regression analyses were performed for two outcomes separately (i.e. perceived attractiveness and perceived restorative capacity of the running environment) to investigate their relations with motives and attitudes, perceived environmental characteristics and interactions between perceived environmental characteristics and number of years of running experience. Perceived environmental characteristics, including green and lively routes and a comfortable running surface were more important for runners' evaluation of the attractiveness and restorative capacity of the running environment than runners' motives and attitudes. In contrast to experienced runners, perceived hinder from unleashed dogs and pedestrians positively impacted the attractiveness and restorative capacity for less experienced runners. Perceived environmental characteristics were important determinants of the attractiveness and restorative capacity of the running environment for both novice and experienced runners. However, green and lively elements in the running environment and hinderances by cars were more important for less experienced runners. In order to keep novice runners involved in running it is recommended to design comfortable running tracks and routes and provide good access to attractive, green and lively spaces.

6.1 Introduction

Increasing participation in sport and physical activity is an important health policy objective [1–3]. Sports participation is associated with positive benefits for physical and mental health and well-being [4,5]. In particular, positive effects have been found for running as an integral part of an active and healthy lifestyle [6–9]. In recent decades, running has rapidly become more popular and accessible to many people. In the Netherlands, running is one of the most practiced sports [10]. Among Dutch adults between the ages of 20-79 years, 13.2% of men and 11.3% of women reported running at least once a month in 2012 [10,11]. These figures are similar to data from other Western countries [12]. Running has increasingly become a 'lifestyle sport', with runners focusing on improving their health, wellbeing and image [13]. Currently, more and more runners participate individually, in informal groups, in running events or in low-threshold exercise ('start to run') programmes instead of in traditional sports clubs focusing on competition [14,15]. The growing popularity of recreational running can be understood in light of the individualization of sports participation. This has resulted in an increased popularity of types of sports activities that are informal and flexible in time and space and which have increased more rapidly than sports participation in traditional organized sports clubs [1,16–19]. Informal and flexible sports activities have been referred to as 'light' sports activities that take place in light sports settings, in contrast to the 'heavy' or organized settings of sports clubs [20–23]. As a result, recreational running have become increasingly diverse and different running subcultures and identities have emerged [24].

The increased popularity of running individually or in informal groups has also led to a greater variety of geographical locations used, including public spaces such as parks and natural environments [16,19,25–29]. Various studies showed that some environments may facilitate and strengthen the health benefits of running, whereas other environments hinder running. Thus, it matters where (e.g. at what geographical location, indoors or outdoors or at which running surface) an individual runs [30–32]. Policy makers increasingly recognize that the built environment can function as an important condition for active living environments. Municipalities aspire to design cities that encourage people to

be more physically active [33–35], for example by developing attractive urban running trails and routes [19,36].

However, little is known about what specific environmental characteristics make a running environment experienced as attractive and restorative by runners and to what extent this experience depends on the personal characteristics of the runner. What makes a public space an attractive environment for specific types of runners, one that invites people to run and keep running? Understanding this is important for several reasons. Attractive environments may promote participation in sport and physical activity, including running [33,37,38], which contributes to a more physically active and healthy population [6–9]. These positive health effects of attractive environments for sports participants have been well documented. For instance, exercising in nature or green environments, also referred to as 'green exercise' [39], has been associated with greater physical and mental health benefits, including lower blood pressure, stress reduction, and with improving mood, self-esteem, perceived health and wellbeing [40–45]. In addition, the restorative capacity of the environment increases wellbeing and contributes to the adherence of healthy behaviours such as running. Furthermore, attractively designed public spaces contribute to pleasurable and liveable urban environments and can have benefits beyond health, such as the environmental sustainability and economic vitality of cities [34,46]. Therefore, designing attractive and restorative environments increases the positive experiences of users. Finally, providing more insight into the experiences of different groups of less and more experienced runners may help policy makers to make informed choices with regard to designing public spaces and professionals to gain attention for the promotion of healthy urban living.

To understand the factors that determine how the running environment is experienced, this study applies a socio-ecological framework, which is frequently used in studies on physical activity [47] and sports participation [48,49]. According to the socio-ecological approach, there are multiple influences on specific health behaviours, including factors on the intrapersonal, interpersonal and environmental level. All influences on health behaviours potentially

interact across these different levels [47]. In this paper, we particularly focus on the interplay between intrapersonal and environmental characteristics and how these relate to the experience of the running environment. Although there is much theoretical evidence for the importance of interactions on the intrapersonal and environmental level, empirical evidence is rather limited and results differ greatly depending on the specific interactions studied [50]. Therefore, more insight into the role of these interactions in the context of one specific type of sport (i.e. running) adds to the current body of literature.

Intrapersonal factors, such as motivation, the reasons why a person participates in sport, have an important impact on persistence in sports participation and the frequency of participation [51,52]. Research on running has shown that the majority of the European running population runs because of health goals, such as getting fit (54%) or losing weight (40%). Other motives are having fun (22%) and/or relieving stress (21%) [12]. However, as mentioned earlier, runners are a very heterogeneous group [14,15,28,53,54]. For example, runners differ regarding their motivations and goals related to health, competitiveness and sociality [53,54], and their meanings may be experienced both negatively and positively [28]. Furthermore, the level of competitiveness and experience in running can explain differences between types of runners. Running increasingly loses its competitive image and most runners now belong to a group of recreational 'casual' runners who are unattached to a running club. For many of them, "'completing' is much more preferred than 'competing'" [55]. In contrast to competitive runners in traditional 'heavy' settings such as sports clubs, this group of recreational 'light' runners is still underexposed in research [28]. Based on a qualitative study which included accompanied runs and interviews with 20 recreational runners in London, Hitchings and Latham [24] found that while the majority of the running activities of these runners are performed alone, they do find 'sociality' and the presence of other runners important. Especially when this sociality is characterized as 'loose' and engagement in running activities can take place without obligations or a strong sense of belonging. Interestingly, not all runners in this study perceived their running as a 'sport' and for them "doing running' does not require becoming a 'runner'" [24]. However, Shipway et al. [6] showed in a study among 25

long distance runners who trained at least five times a week for distances ranging from 5km to marathon, that more dedicated and 'serious' competitive runners may have different motives and preferences, such as a strong desire for a healthy lifestyle. The authors found that runners' desires for a healthy lifestyle and wellbeing included, - besides a strong focus on the 'running body' -, both positive aspects related to the importance of seeking self-esteem and confirmation through running, as well as negative aspects such as exercise addiction and the need to exercise [6]. In addition, differences in running motives and attitudes may also be related to runners' years of experience in running. For example, in a quantitative Danish study (N = 4,052), it was found that runners with three or fewer years of running experience focused more on health reasons, whereas runners who were running for eight or more years were more frequently running for 'the love of it' or for social reasons [56].

In addition to intrapersonal factors, the influence of the physical environment on health and healthy lifestyles including physical activity has been studied extensively in the public health and physical activity domains [35,57–59]. Objectively measured environmental factors, such as street design, land use mix, street connectivity, access to and availability of facilities, - such as shops and recreational or sports facilities, proximity of green spaces-, population density and socioeconomic status of the neighbourhood are associated with different types and intensities of physical activity [38,60–63] and sports participation [29,48,64]. In addition, perceptions of the physical environment, including perceived safety and attractiveness, are related to sports participation [64,65]. However, less is known about the environmental correlates of running (that are, the characteristics of the physical environment that may impact on running behaviour). Although running significantly differs from walking regarding pace, intensity, bodily experience and spatial reach, studies found indications that recreational walking and running may have similar environmental correlates, because recreational walkers and runners use the same public spaces [37]. Perceived characteristics of the physical environment associated with recreational walking include perceived safety, aesthetics, quality of the walking infrastructure and attractiveness of the environment (e.g. presence of cafes and other people and quiet and green areas) [59,66–68]. An indication

of the importance of the physical environment for encouraging running was provided by Titze et al. [69]. This study showed that women who perceived themselves as less healthy and who lived in an unattractive neighbourhood were more likely to quit running. Factors including an attractive neighbourhood and social support were likely to play a key role in encouraging running [69].

While many studies found evidence for the importance of objective characteristics of the physical environment for physical activity and sports participation, fewer focused on how physical environmental characteristics affects how the running environment is experienced and how this differs for different types of runners [28,70]. Since 'the mobility turn' in the social sciences, more attention has been paid to so called embodied experiences. For example, Cresswell [71] introduced a more holistic view of mobility, wherein the complex interplay between movement, experience and representation (or meaning) is central, instead of the perception of mobility as a 'getting from A to B'. Running can therefore be seen as an interaction between the body, senses and the environment. The experiences of the body are lived through the senses. Touching, smelling, feeling, hearing and seeing allows runners to run safely, choose and recognize terrain, adapt pace and take other runners and road users into account [28,72,73]. These experiences of runners can be positive and negative, pleasurable and painful [74] and are therefore likely to influence running behaviour (e.g. distance, pace and frequency), choices for specific surfaces or running environments, as well as the perseverance of running.

Several studies, all targeting different groups of runners showed that various running surfaces or terrains are experienced differently by different runners (e.g. samples with experienced and less experienced [21], novice runners participating in a start to run programme [37], recreational runners/joggers [28], and middle distance runners [73,75]) and impact whether the running environment is evaluated as attractive. For example, Borgers et al. [21] held structured face-to-face interviews with 546 randomly selected runners at various bark running tracks, (i.e. informal running facilities in the public space consisting of paths with soft surfaces), and found that these running tracks were highly valued among runners because of injury prevention. These running

facilities were experienced as attractive by unorganized recreational runners, and showed potential to reach runners at different levels and stimulate people to start running [21]. In addition, Bodin and Hartig [30] found that experienced runners prefer green environments over urban settings as they offer more fascination and help escape from daily hassles.

The above literature has shown a great variation in the motives and experiences of different types of runners. It is likely that these different types of runners also differ in their requirements and experiences regarding the running environment and therefore perceive the attractiveness or restorative capacity of the environment differently. Whereas most studies on running focus on one specific type of runners (e.g. competitive long distance runners or unorganized recreational or 'casual' runners or joggers) and are based on rich qualitative data with small sample sizes [24,28,73,75], studies investigating differences between various types of runners based on larger and representative data sets are lacking. In this paper, we specifically distinguish between significant groups of experienced and less experienced runners in order to learn more about the preferences and experiences of novice runners. We expect that novice or inexperienced runners may differ from experienced runners with regard to their running motives and attitudes and their preferences in terms of running distance, interactions with other road users or the running surface [19,37]. We expect, for example, that the presence of other road users, such as cars, cyclists and unleashed dogs, may affect whether novice runners experience their running environment as attractive, whereas experienced runners know how to address this and are less affected. From a public health and sports promotion point of view, greater insight into the experiences of different groups of runners is important to develop targeted and effective policy interventions, particularly at the level of urban planning and design. This contributes to a better understanding of how novice runners may be better encouraged and facilitated to keep active and involved in sport [70]. This study aims to 1) investigate to what extent characteristics on the intrapersonal level (i.e. motives and attitudes towards running) and the physical environmental level (i.e. perceived constraints by other road users, feelings of safety and quality and characteristics of the running surface and routes) are associated with the

perceived attractiveness and perceived restorative capacity of the running environment and 2) to what extent the number of years of running experience modify the association between perceived environmental characteristics and attractiveness and restorative capacity of the running environment.

6.2 Methods

Study design and respondents

For this cross-sectional study, the Eindhoven Running Survey 2015 (ERS15) was used to collect data among participants of the Eindhoven Marathon running event in October 2015. The survey questions were based on the Eindhoven Running Survey 2014 (ERS14), used in previous studies [46,47,70]. For the current study, a sub-dataset containing only those runners who participated in the Half Marathon Eindhoven 2015 (21.1k) was used. Consistent with Janssen et al [46], half marathon runners were selected because of the heterogeneous characteristics of this group of participants, which included both highly experienced and less experienced runners. At registration for the event, all participants agreed that they could be approached for an online questionnaire after the event. After finishing the half marathon, all registered participants (N = 9,314) received an email with an introductory letter and a web link to the online questionnaire. The introduction letter informed them about the purpose of the study and the guarantee that the data would be processed anonymously and in accordance with the ethical principles of the Declaration of Helsinki. After clicking on the link to the questionnaire, respondents were given the choice to end or to continue with the questionnaire. They also were given the opportunity to declare that they do not want to be approached more often. The questionnaire started with a similar announcement about the purpose of the study and privacy. After the announcement, the respondents again had to confirm that they wanted to start the questionnaire. None of the questions were required to fill in. In total, 2,477 participants fully completed the questionnaire (response rate of 26.6%). The socio-demographic background of the respondents was comparable to other samples in previous large-scale running studies in Western Europe [12].

Measures

Consistent with the socio-ecological approach, the online questionnaire consisted of blocks with questions representing socio-demographic and running-related characteristics, motives and attitudes towards running, and characteristics of the running environment.

Outcome variables: perceived attractiveness and restorative capacity of the running environment

Two dependent variables were analysed: perceived attractiveness of the running environment and perceived restorative capacity of the running environment. Both variables were measured with a single item and scored on a five-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree). Respondents were asked to rate the following two statements: 'the environment through which my running route passes is attractive' and 'the environment through which my running route passes is relaxing'. This approach of measuring attractiveness and restorative capacity of the environment in single-item measures is consistent with previous research on this and related topics, including satisfaction, wellbeing, preferences for places and experience of place qualities [32,71,72].

Intrapersonal characteristics: motives and attitudes, and number of years of running experience

The first set of independent variables included intrapersonal characteristics, namely motives and attitudes towards running. In total, 25 items on motives and attitudes towards running were measured (based on Janssen et al (2017) [46]). On a five-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree), runners were asked to rate the extent to which they agreed with statements. All items were included in a principal component analysis (PCA) with orthogonal varimax rotation (EVA = 59.1%). As a result, the following five psychographic components were formed: 1) bodily and mental advantages of running (e.g. running gives me energy or running is good for my health), 2) identification with running (e.g. I am proud to be a runner or I feel myself a real runner), 3) practical advantages of running (e.g. I can practise running anytime, anywhere), 4) individual motives for quitting (e.g. I would quit running if I get

injured or if my spare time would decrease) and 5) social motives for quitting (e.g. I would quit running if my trainer quits or if my running friends quit). Table 6.1 shows the components including the number of items, Cronbach's alphas, average scores and standard deviations. We included number of years of running experience as a moderator in the analyses and we distinguished between running <1 year (novice runners), 1-5 years (moderate experienced runners) and >5 years (experienced runners).

Table 6.1 Internal consistencies on motives and attitudes toward running (N = 2,477)

Motives and attitudes toward running	Items	Cronbach's alpha (based on standardized items)
Bodily and perceived advantages of running	4	0.862
Identification with running	8	0.796
Practical advantages of running	5	0.753
Individual motives for quitting	5	0.688
Social motives for quitting	3	0.912

Perceived environmental characteristics

The second set of independent variables included perceived environmental characteristics (based on Ettema [32]). Respondents were asked to indicate on a five-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree), to what extent they agreed with 10 statements on constraining/negative and encouraging/positive environmental features. Constraining items included interactions with pedestrians, cyclists, cars and unleashed dogs (e.g. I am hindered by unleashed dogs on my running route) and experiences with (verbal) harassment or threats and poor street lighting. Encouraging items included a comfortable running surface and a lively and mostly green running route.

Potential confounders

We controlled our analyses for socio-demographics and running-related characteristics. Socio-demographics included age, sex and education. Education was classified into three levels based on the self-reported highest level of completed education (lower, middle or higher education). Running-related characteristics included distance monitoring of the running route (yes/no); use of monitoring devices (watch yes/no, app yes/no) and organizational running context (individual, friends/small group or athletics club). Monitoring variables were included as confounders because the use of apps and watches have been frequently used by less experienced runners and have been associated

with being more physically active and feeling and behaving healthier and may therefore influence the motives and attitudes of runners [79,80]. In addition, monitoring devices, particularly those with a GPS feature, are one of the most frequently used functions of monitoring devices by runners [53,54] and may act as a proxy for awareness of the running environment, as runners may choose specific running routes based on their devices.

Statistical analyses

All analyses were conducted in SPSS 24.0. Descriptive statistics on respondents' socio-demographic, running related, motivational and perceived environmental characteristics were examined. Chi-squares and analyses of variance (ANOVA) were conducted to test for significant differences regarding these characteristics between respondents with different years of running experience (i.e. <1, 1-5 or >5 years). Subsequently, two linear regression analyses (Enter method) were performed for perceived attractiveness (outcome variable 1) and perceived restorative capacity of the running environment (outcome variable 2) to investigate their relationships with potential confounders, motives and attitudes, and perceived environmental characteristics (model 1). To test whether the association of perceived environmental characteristics with the outcomes differed between novice and experienced runners, interactions between perceived environmental characteristics and number of years of running experience were included (model 2).

6.3 Results

Descriptive results and differences between runners with different years of running experience

Of all respondents, 44.9% had 1 to 5 years of running experience, 42% was experienced (> 5 years) and 13.1% was relatively inexperienced (novice) and started running less than one year ago (Table 6.2). Novice runners were younger (58% was younger than 35 years old) and more frequently engaged individually in running (71.9%). They scored significantly lower on bodily and mental advantages of running (M = 4.3; SD = 0.5) compared to experienced runners (M = 4.4; SD = 0.5) and on identification with running (M = 3.5; SD = 0.5) than the average of the sample (M = 3.8; SD = 0.5). Novice runners more

frequently had individual quitting motives (M = 3.2; SD = 0.7) than the average (M = 2.9; SD = 0.7) and particularly compared to more experienced runners (M = 2.7; SD = 0.7). The average score on attractiveness (M = 4.0; SD = 0.9) and restorative capacity (M = 4.0; 0.8) suggests that runners were quite satisfied with their running environment, although these scores differed significantly for runners with less and more years of experience.

Table 6.2 Descriptive statistics of respondents with different years of running experience

	Total (N = 2,477)	**Novice runners (<1 y) (N = 324; 13.1%)**	**Moderate experienced runners (1-5 y) (N = 1112; 44.9%)**	**Experienced runners (> 5 y) (N = 1041; 42.0%)**	**P-values**
Age, mean (SD)					
≤ 35 year	32.3	58.0	39.3	16.8	<0.001
36-45 year	32.5	28.4	37.6	28.3	
≥ 46 year	35.2	13.6	23.1	54.9	
Female (%)	32.5	28.7	39.0	26.8	<0.001
Education (%)					
Lower or middle	29.6	28.4	30.0	29.4	0.841
Higher	70.4	71.6	70.0	70.6	
Monitoring of distance (%)					
Yes	57.3	70.4	62.7	47.6	<0.001
No	42.7	29.6	36.3	52.4	
Monitoring via sports watch (%)					
Yes	53.0	28.7	51.7	62.0	<0.001
No	47.0	71.3	48.3	38.0	
Monitoring via app (%)					
Yes	34.7	59.9	39.8	21.3	<0.001
No	65.3	40.1	60.2	78.7	
Organizational running setting (%)					
Individual	56.6	71.9	58.1	50.2	<0.001
Friends, colleagues, small group	32.1	23.1	22.3	24.1	
Athletics club	20.3	5.0	19.6	25.7	
Motives and attitudes, mean (SD)					
Bodily and mental advantages of running	4.4 (0.5)	4.3 (0.5)	4.4 (0.5)	4.4 (0.5)	<0.001
Identification with running	3.8 (0.5)	3.5 (0.5)	3.8 (0.5)	3.8 (0.5)	<0.001
Practical advantages of running	4.1 (0.5)	4.1 (0.5)	4.1 (0.5)	4.1 (0.5)	0.708
Individual motives for quitting	2.9 (0.7)	3.2 (0.7)	2.9 (0.7)	2.7 (0.7)	<0.001
Social motives for quitting	1.6 (0.7)	1.6 (0.8)	1.7 (0.7)	1.6 (0.7)	0.064
Experiences of the running environment, mean (SD)					
Hinderance by pedestrians	1.7 (0.7)	1.7 (0.7)	1.7 (0.7)	1.7 (0.7)	0.169
Hinderance by cyclists/mopeds	2.0 (1.0)	2.0 (1.0)	2.2 (1.0)	2.0 (1.0)	0.403
Hinderance by cars	2.1 (1.0)	2.0 (1.0)	2.1 (1.0)	2.0 (1.0)	0.044
Hinderance by unleashed dogs	2.2 (1.1)	1.9 (1.0)	2.2 (1.0)	2.3 (1.1)	<0.001
Hinderance through remarks	1.5 (0.7)	1.5 (0.8)	1.6 (0.7)	1.5 (0.7)	0.41
Hinderance through threats	1.5 (0.7)	1.5 (0.7)	1.5 (0.7)	1.5 (0.6)	0.171
Hinderance through poor lighting	2.6 (1.2)	2.7 (1.2)	2.7 (1.2)	2.5 (1.2)	<0.001
Comfortable surface	3.6 (0.9)	3.7 (0.9)	3.6 (1.0)	3.6 (0.9)	0.099
Lively route	4.0 (0.8)	4.0 (0.8)	3.9 (0.8)	4.0 (0.8)	0.175
Green route	3.6 (0.9	3.6 (0.9)	3.5 (0.9)	3.6 (0.9)	0.238
Score on attractiveness and restorative capacity (outcome variables), mean (SD)					
Attractiveness	4.0 (0.9)	4.0 (0.9)	3.9 (0.9)	4.1 (0.9)	<0.001
Restorative capacity	3.9 (0.8)	3.9 (0.8)	3.9 (0.9)	4.0 (0.8)	<0.001

Associations with attractiveness of the running environment

Table 6.3 shows the results of the regression analyses on perceived attractiveness of the running environment (adjusted $R^2 = 0.509$ in model 2). Runners who valued running highly because of the perceived bodily and mental advantages ($\beta = 0.037$ $p < 0.05$) or practical advantages ($\beta = 0.043$; $p < 0.05$), perceived their running environment as more attractive. Those who perceived hinderance by pedestrians ($\beta = -0.049$; $p < 0.01$) or cars ($\beta = -0.038$; $p < 0.05$) perceived the running environment as less attractive. Poor lighting ($\beta = 0.037$; $p < 0.05$), a comfortable running surface ($\beta = 0.17$; $p < 0.001$) and running in a lively ($\beta = 0.33$; $p < 0.001$) or mostly green route ($\beta = 0.434$; $p < 0.001$) were associated with a more attractive running environment. Hinderance by unleashed dogs was negatively associated with perceived attractiveness ($\beta = -0.287$; $p < 0.05$), but was positively associated for novice runners. A lively route was positively associated with perceived attractiveness among novice runners but not among more experienced runners. A comfortable running surface was important for the perceived attractiveness of the running environment among moderately experienced runners but less for novice or experienced runners.

Table 6.3 Linear regression on perceived attractiveness of the running environment (N = 2,477)

	Model 1 (confounders, motives and attitudes, perceived environmental characteristics)		Model 2 (model 1 + perceived environmental – number of years of running experience interactions)	
	St. Beta (p)	**SE**	**St. Beta (p)**	**SE**
Constant[1]	0.574*	0.253	1.314	0.744
Confounders				
Age (ref = ≥ 46 year)				
≤ 35 year	-0.016	0.032	-0.016	0.032
36-45 year	-0.04*	0.029	-0.042*	0.029
Male (female = ref)	-0.016	0.025	-0.015	0.025
Education (higher = ref)				
Lower or middle	-0.011	0.026	-0.011	0.026
Years of running experience (> 5 year = ref)				
< 1 year	0.009	0.039	-0.112	0.294
1-5 year	-0.025	0.026	-0.1	0.178
Distance monitoring y/n (ref = no)	0.001	0.028	-0.001	0.028
Watch use (ref = no)	0.012	0.039	0.014	0.039
App use (ref = no)	0.014	0.045	0.013	0.045
Organizational context (athletics club = ref)				
Individual	0.050*	0.034	0.052*	0.034
Friends, colleagues, small group	0.011	0.036	0.013	0.036
Intrapersonal characteristics: motivations and attitudes				
Bodily and mental advantages of running	0.037*	0.031	0.039*	0.031
Identification with running	-0.015	0.027	-0.019	0.027
Practical advantages of running	0.043*	0.027	0.043*	0.027
Individual motives for quitting	-0.015	0.018	-0.016	0.018
Social motives for quitting	-0.003	0.019	-0.002	0.019
Perceived environmental characteristics				
Hinderance by pedestrians	-0.049**	0.021	-0.089	0.158
Hinderance by cyclists/mopeds	-0.006	0.015	0.03	0.119
Hinderance by cars	-0.038*	0.014	0.046	0.112
Hinderance by unleashed dogs	0.011	0.012	-0.287*	0.097
Hinderance through remarks	-0.001	0.022	0.153	0.172
Hinderance through threats	-0.031	0.025	-0.068	0.191
Hinderance through poor lighting	0.037*	0.01	0.126	0.078
Comfortable surface	0.17***	0.013	-0.103	0.101
Lively route	0.33***	0.013	0.161	0.104
Green route	0.434***	0.014	0.606***	0.113
Interactions perceived environment characteristics * years of running experience (ref = > 5 y running experience)				
Pedestrians * < 1 y running experience			0.003	0.064
Pedestrians * 1-5 y running experience			0.048	0.044
Cyclists/mopeds * < 1 y running experience			-0.029	0.048
Cyclists/mopeds * 1-5 y running experience			-0.007	0.033
Cars * < 1 y running experience			-0.041	0.045
Cars * 1-5 y running experience			-0.058	0.031
Unleashed dogs * < 1 y running experience			0.269*	0.041
Unleashed dogs * 1-5 y running experience			0.061	0.025
Remarks * < 1 y running experience			-0.123	0.067
Remarks * 1-5 y running experience			-0.047	0.050
Threats * < 1 y running experience			-0.009	0.077
Threats * 1-5 y running experience			0.056	0.053
Poor lighting * < 1 y running experience			-0.053	0.032
Poor lighting * 1-5 y running experience		0.012	-0.05	0.021
Comfortable surface * < 1 y running experience		0.022	0.177	0.042
Comfortable surface * 1-5 y running experience		0.025	0.209**	0.027
Lively route * < 1 y running experience		0.01	0.236*	0.042
Lively route * 1-5 y running experience		0.013	-0.034	0.029
Green route * < 1 y running experience		0.013	-0.173	0.046
Green route * 1-5 y running experience		0.014	-0.078	0.031
Model fit				
Adjusted R^2	0.509		0.509	
SE	0.5607		0.5605	

[1] Constant: Unstandardized Beta instead of Standardized Beta.
*Significance < 0.05; **Significance < 0.01; ***Significance < 0.001

Associations with restorative capacity of the running environment

Table 6.4 shows the results of the regression analyses on the restorative capacity of the running environment. Runners who valued running highly because of perceived bodily and mental advantages ($\beta = 0.041$; $p < 0.05$) found their running environment more restorative. Green ($\beta = 0.686$; $p < 0.001$) and lively ($\beta = 0.128$; $p < 0.001$) running routes and a comfortable surface ($\beta = 0.037$; $p < 0.01$) were positively associated with restorative capacity. Hinderance by cars was negatively associated with restorative capacity ($\beta = -0.040$; $p < 0.01$); however, this was more so for novice and moderately experienced runners than experienced runners. Hinderance by pedestrians was positively associated with a restorative running environment among moderately experienced runners.

6.4 Discussion

In this study, we investigated how perceived attractiveness and restorative capacity of the running environment can be explained by intrapersonal characteristics and perceptions of the environment and to what extent these associations differed for novice runners and more experienced runners. Our primary finding was that perceived environmental characteristics, particularly green and lively running routes and a comfortable running surface, enhanced runners' evaluation of the attractiveness and restorative capacity of the running environment, more so than intrapersonal factors such as runners' motives and attitudes. Perceived environmental characteristics were important to all runners and only a few differences between novice and experienced runners were found. Surprisingly, hinderance from unleashed dogs and pedestrians positively impacted the attractiveness or restorative capacity for less experienced runners.

With regard to intrapersonal characteristics, (i.e. runners' motives and attitudes), our results showed that the level of perceived bodily and mental advantages of running and the practical advantages of running positively impacted the attractiveness and restorative capacity of the running environment. Bodily and mentally experienced advantages from the running practice, such as through the positive effects of running on health, stamina or mental relaxation, may increase the motivation and positive attitudes towards running (and the frequency of

Table 6.4 Linear regression on perceived restorative capacity of the running environment (N = 2,477)

	Model 1 (confounders, motives and attitudes, perceived environmental characteristics)		Model 2 (model 1 + perceived environmental – number of years of running experience interactions)	
	St. Beta (p)	SE	St. Beta (p)	SE
Constant[1]	0.258	0.237	-0.139	0.696
Confounders				
Age (ref = ≥ 46 year)				
≤ 35 year	-0.01	0.03	-0.008	0.03
36-45 year	-0.031*	0.027	-0.031*	0.027
Male (female = ref)	-0.002	0.024	-0.002	0.024
Education (higher = ref)				
Lower or middle	0.014	0.024	0.014	0.024
Years of running experience (> 5 year = ref)				
< 1 year	0.015	0.037	0.112	0.275
1-5 year	0.01	0.025	-0.023	0.166
Distance monitoring y/n (ref = no)	0.011	0.026	0.009	0.026
Watch use (ref = no)	0.025	0.037	0.029	0.037
App use (ref = no)	0.047#	0.042	0.049*	0.042
Organizational context (athletics club = ref)				
Individual	-0.016	0.032	-0.013	0.032
Friends, colleagues, small group	-0.008	0.034	-0.008	0.034
Intrapersonal characteristics: motivations and attitudes	0.041*	0.029	0.041*	0.029
Bodily and mental advantages of running	0.017	0.025	0.015	0.025
Identification with running	0.015	0.025	0.018	0.025
Practical advantages of running	-0.022	0.017	-0.02	0.017
Individual motives for quitting	0.008	0.018	0.007	0.018
Social motives for quitting				
Perceived environmental characteristics	-0.025	0.019	-0.231	0.148
Hinderance by pedestrians	0.008	0.014	0.148	0.112
Hinderance by cyclists/mopeds	-0.040**	0.013	0.304*	0.105
Hinderance by cars	0.012	0.011	-0.077	0.091
Hinderance by unleashed dogs	0.012	0.011	-0.077	0.091
Hinderance through remarks	-0.007	0.021	0.161	0.161
Hinderance through threats	-0.015	0.023	-0.167	0.179
Hinderance through poor lighting	0.016	0.009	0.023	0.073
Comfortable surface	0.037**	0.012	-0.086	0.094
Lively route	0.128***	0.013	0.127	0.097
Lively route	0.686***	0.013	0.808***	0.105
Interactions perceived environment characteristics * years of running experience (ref = > 5 y running experience)				
Pedestrians * < 1 y running experience			0.017	0.06
Pedestrians * 1-5 y running experience			0.24**	0.041
Cyclists/mopeds * < 1 y running experience			-0.044	0.045
Cyclists/mopeds * 1-5 y running experience			-0.111	0.031
Cars * < 1 y running experience			-0.205*	0.043
Cars * 1-5 y running experience			-0.192**	0.029
Unleashed dogs * < 1 y running experience			0.046	0.038
Unleashed dogs * 1-5 y running experience			0.058	0.024
Remarks * < 1 y running experience			-0.155	0.063
Remarks * 1-5 y running experience			-0.031	0.047
Threats * < 1 y running experience			0.136	0.072
Threats * 1-5 y running experience			0.034	0.05
Poor lighting * < 1 y running experience			-0.027	0.03
Poor lighting * 1-5 y running experience			0.022	0.02
Comfortable surface * < 1 y running experience			0.099	0.039
Comfortable surface * 1-5 y running experience			0.071	0.025
Lively route * < 1 y running experience			0.076	0.039
Lively route * 1-5 y running experience			-0.1	0.027
Green route * < 1 y running experience			-0.187	0.043
Green route * 1-5 y running experience			0.04	0.029
Model fit				
Adjusted R^2	0.599		0.602	
SE	0.5261		0.5244	

[1] Constant: Unstandardized Beta instead of Standardized Beta.
*Significance < 0.05; **Significance < 0.01; ***Significance < 0.001

running). In addition, the practical advantages of running refer to the flexible and autonomous characteristic of running. Running can be practiced anytime, everywhere and fits easily in busy life schedules compared to other types of sports and is therefore highly valued [14,19,55]. This flexible and autonomous characteristic of running stimulates runners to go outside, explore new routes and environments and create favourite, attractive and relaxing running routes. However, previous positive experiences and evaluations of the attractive and relaxing environment may also stimulate motives and attitudes to go for a run. Regardless of the direction and causality of the associations found, our results show that the perceived advantages and the autonomous and flexible characteristics of running are more important determinants of perceiving the environment as attractive and restorative, than motives and attitudes such as running identity and social motivation. However, our descriptive results show that bodily and mental advantages of running and identification with running are experienced to a lesser extent in novice runners, which may impact on their evaluation of the running environment. This may also indicate that it takes some time and perseverance to fall in love with running, and thus that it is important to better understand the experiences, motives and constraints of novice runners.

Characteristics at the environmental level that were positively associated with both the attractiveness and restorative capacity of the running environment included a comfortable running surface and a lively or vivid and (mostly) green environment. These results reflect findings from previous studies showing the importance of the running surface for the enjoyment of running (e.g. soft/grass or bark running tracks are more comfortable and injury-preventive but require runners to work harder; hard/stiff and flat roads are faster but have higher risk for injuries) [19,28,73,75]. The importance of running in a lively and green environment corresponds to previous findings showing positive physical and mental health benefits of these types of environments [40–45]. In addition, our results correspond with findings in the context of recreational walking, suggesting that people actively choose walking routes because of the presence of green space, which makes them more attractive and relaxed [45,81]. Furthermore, hinderance by pedestrians and cars were negatively

associated with attractiveness. Similar results were also found in the study of Ettema [37] among novice runners who took part in a 'start to run' programme. Hinderance by cars was also negatively associated with restorative capacity. It is conceivable that hinder by cars may go together with concerns about air pollution and breathing difficulties while running in urbanized areas, which was studied among urban recreational runners in London [82]. Because the number of years of running experience modified this association, showing that experienced runners who were hindered by cars evaluated the restorative capacity more positively than less experienced runners, it may be that more experienced runners choose to use different parts of the public space than less experienced runners. More experienced runners may prefer roads that they value because it allows them to run faster (and not because they prefer to encounter traffic). They also may run longer distances than less experienced runners, which allow them to run outside or longer outside crowded urbanized areas. The positive association we found for poor lighting on attractiveness of the running environment may also be related to the preferences for more attractive running paths and routes, for example in parks and natural areas, which are more poorly lit than public roads in urban areas.

Although runners in our sample generally evaluate their running environment very positively, our results show that some associations of environmental characteristics with perceived attractiveness and restorative capacity of the running environment differed for novice and experienced runners. For example, we found that hinderance by dogs was positively associated with perceived attractiveness of the running environment for novice runners (i.e. those involved in running for less than one year) and negatively for more experienced runners. In addition, hinderance by pedestrians was positively associated with a restorative environment among moderate experienced runners (i.e. those with one to five years of running experience). These findings indicate that less experienced runners likely perceive different environments as more attractive or restorative. They may run in parks, forests and natural areas. Such green spaces, however, attract other recreational users, such as pedestrians and dog-owners, as well. Although unleashed dogs [37] and pedestrians [28] may be a well-known constraint of runners, these constraints likely do not affect

their perceived attractiveness and restorative capacity of the environment to a great extent. In addition, both a comfortable running surface and hinderance from pedestrians were positively associated with attractive and restorative capacity, respectively, among moderately experienced runners. Additionally, less experienced runners who were constrained by cars evaluated their running environment as less restorative than more experienced runners. These findings indicate that more experienced runners may choose different running environments or perceive environments differently than less experienced runners. More experienced runners may have fixed routines regarding their running routes and running locations, which are based on unconscious choices [83]. They may have chosen their running routes based on the running surface (e.g. asphalt, paved paths, pavements, unpaved paths in parks or forests, tartan or a combination between them). In addition, more experienced and serious athletes are likely more focused on their training results regarding running distance, pace and achievements and may be more motivated to run and/or are less distracted by cars and less attractive routes. They may also vary their running environments to keep the running experience more attractive for themselves. Novice runners, - who to a lesser extent showed to experience bodily and mental advantages of running and identification with running -, may more urgently need an attractive running route with lively and natural elements to encourage them more than experienced runners to regularly go for a run.

Strengths and limitations of this study and future directions

A strength of this study is that we collected data on different levels as described by socio-ecological models [47], which allowed us to investigate intrapersonal and perceived environmental characteristics of different types of runners. In addition, our data on motives and attitudes and perceptions of the environment are based on existing literature.

This study also has some limitations. First, the Eindhoven Running Survey 2015 (ERS15) lacked geographical data on running locations, which would have allowed us to link objective Geographical Information Software (GIS)-data (on for instance running environments) to the survey data. It would be interesting to also link objective environmental characteristics of the running

environment to the perceived attractiveness and restorative capacity. A potential bias that may have occurred, and we could not control for because of the missing of geographical data, is an overrepresentation of respondents living in areas with similar urbanity levels (e.g. highly urbanized or rural). Such an overrepresentation could potentially have influenced the results regarding perceived attractiveness and restorative capacity of specific running environments. Furthermore, the group of novice runners (in terms of number of years of running experience) in our sample was able to complete at least one half marathon within one year of training, which indicates a moderate level of fitness. However, we believe this has not led to a bias of the results toward more experienced runners.

Future research could focus on interrelationships between perceived environmental characteristics and objective environmental characteristics. For example, GPS-based location data on running routes, running locations and running intensity and physical activity in general could be used. In addition, from a health perspective, it is interesting to apply a longitudinal research design and follow less experienced runners for a longer time period of for instance several years to investigate running adherence and quitting patterns. To what extent do characteristics of the running environment and perceptions thereof play a role herein? How do motives and attitudes change when runners become more experienced and how is this related to their experience of the running environment?

6.5 Conclusions and practical implications

Running has become one of the most popular and practised sports and it is a well-known phenomenon in the urban streetscape, public parks and natural areas. Both scholars and policy makers increasingly have become aware that an attractively designed public space may stimulate sports participation including running. We found that perceived environmental characteristics, particularly green and lively running routes and a comfortable running surface, enhanced runners' evaluation of the attractiveness and restorative capacity of the running environment. Perceived environmental characteristics were important to all runners, and more so than intrapersonal factors such as runners' motives

and attitudes. However, green and lively running routes, a comfortable running surface and hinderance by cars were more important to less experienced runners.

Our findings indicate that the built environment is particularly important for encouraging less experienced runners. To stimulate novice runners to stay involved in running, policy makers should prioritize the attention for the public space as the environment with the greatest potential for stimulating healthy lifestyles. It is recommended to design attractive, green and lively spaces with, for instance, separate lanes for runners and other road users. For example, governments could facilitate 'green' running routes by tracks - preferably with a comfortable surface - that connect parks and natural areas, while providing good access upon this green infrastructure on the neighbourhood level. Both novice runners and runners that are more experienced could benefit from this specific and low-key green running infrastructure. However, for the perseverance of running aspects including motivation and sociality and feeling of community may be important as well.

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- CHAPTER 7 -

CONCLUSION AND DISCUSSION

7.1 Sports participation, the physical environment and intrapersonal factors

This thesis focuses on the relationships between sports participation, the physical environment and the intrapersonal characteristics of different groups of actual and potential sports participants. In this thesis, the physical environment refers to the spatial context of sport (i.e. the geographical locations and organizational settings where sport takes place) and the characteristics of the residential neighbourhood. The aim of this thesis was to provide more insight into the importance of several objective and perceived characteristics of the physical environment relative to intrapersonal characteristics, in explaining sports participation in different organizational settings, at different geographical locations and for different population segments, and how intrapersonal characteristics moderate relations between physical environmental factors and sports participation.

By applying a socioecological approach, and by building on theoretical and empirical insights from several research fields – including public health, social psychology, health geography, sport sociology and leisure studies – this thesis contributes to the empirical knowledge by addressing three main research gaps. This thesis provides insight into: 1) whether a socioecological model specifically developed to explain sports participation is needed, based on associations with various sports participation outcomes for different population segments in terms of age groups, experience in sport and type of sports, related to specific and varied organizational and geographical contexts and preferences therefore, as well as other objective and perceived characteristics of the physical environment; 2) the extent to which associations of the physical environment with sports participation differ between people, depending on intrapersonal factors including level of motivation and goals to participate in sport; and 3) whether the often neglected dimensions of time and perceived constraints on participation in sport adds to a further socioecological understanding of sports participation.

This concluding chapter provides an overview of the main findings, reflects upon the theoretical contributions and methodological issues, and formulates

avenues for future research. It ends with recommendations for policy and practice related to sport, urban planning and public health.

7.2 Main findings and conclusions

To address the overall aim of this research, five research questions were formulated. This section summarizes and interprets the main findings from chapters 2–6, which have provided answers to the research questions.

1. *How do objective characteristics of the physical environment relate to sports participation and preferences regarding sports locations and settings?*

In chapter 2, it was assumed that the extent to which a person's residential neighbourhood is conducive to sports participation (e.g. by providing sports facilities or attractive public open spaces) may be related not only to whether the person participates in sport, but also to which location she prefers for sports participation – for example, a city park or a sports facility – and in which organizational setting (e.g. as a member of a sports club, individually or with friends in a more informal setting such as a gym or the public space). We expected that the number of sports facilities, sports clubs or city parks in a residential neighbourhood affects the likelihood that adults participate in sport, as well as their preferences for a certain sports location.

The results of chapter 2 showed that the more sports facilities, green spaces and blue spaces around the home environment (i.e. measured using a buffer of 2,000 metres around the home), the greater the chance that a person will participate in sport in each of the three types of sports locations. Thus, a sport-promoting neighbourhood environment increased the likelihood that residents participated in sport, but it did not affect their preference for a certain location. That natural environmental characteristics in the neighbourhood (i.e. green and blue spaces) were related to sports participation was in line with our expectations and with previous research showing that attractive and liveable environments stimulate and invite people to be physically active or to participate in sport [1,2]. The strong effect of green spaces and particularly blue spaces on sports participation at all types of locations is probably related to the different types

of sports that these natural areas attract [3]. Contrary to our expectations, the results also showed that physical neighbourhood characteristics did not affect a person's preferences for a certain sports location. Explanations can probably be found in processes of 'modelling' and perceived social norms [4,5]. This means that in a sport-facilitating neighbourhood, more people are out on the streets running, cycling, walking or travelling in their sportswear to a place to do their sport. Seeing these active people may make residents more likely to participate in sport themselves ('modelling') or make them feel that being active is the social norm, which in turn increases the likelihood that they will participate in sport, regardless of specific locations and settings. Furthermore, we found that higher urbanity levels were associated with lower chances of participating in sport in all three types of sports locations. In other words, the higher the degree of urbanity, the more likely it is that adults do not participate in sport. For hardly to moderate urbanized areas, this was especially found in lower probabilities of sports participation in public spaces and other private or public sports facilities. Thus, rural–urban differences exist with regard to sports participation, which is supported by the existing evidence that sports participation rates are higher in rural areas in the Netherlands [6].

We concluded that adults with more green spaces, blue spaces or sports facilities in their residential neighbourhood were more likely to participate in sport. However, these factors did not affect their preference for a certain sports location.

2. *How is the objective physical environment associated with perceived constraints on sports participation, and what are the roles of constraints, environmental factors and personal factors in explaining sports frequency?*

The results from chapter 3 revealed that travel distance to sports facilities and neighbourhood liveability indicators – such as social composition, safety and urban form – were related to perceived constraints on participating in sport. Furthermore, especially time constraints and travel distance to indoor facilities and swimming pools were negatively associated with sports frequency.

Having a longer travel distance to one's sports location was associated with the experience of more accessibility constraints, particularly in relation to indoor sports facilities and swimming pools, in contrast to the public space. Regarding the neighbourhood liveability characteristics, we found that those who lived in closer proximity to natural areas experienced fewer constraints related to the accessibility of sports facilities or the range and quality of the sports activities provided. People who live closer to natural environments are likely to make more use of these natural environments for their sports activities instead of using 'official' sports facilities, and they are apparently not hindered by a possible lack of the organized activities provided. Furthermore, living in a safer neighbourhood (most safer neighbourhoods were in rural environments) was associated with perceiving more accessibility constraints, but also with perceiving fewer constraints related to skills or to knowledge about where to participate in sport, and with finding it less difficult to find a sports partner. This indicates that sports participants living in a safer neighbourhood may have a more supportive social environment. This may result in facing fewer difficulties in finding a likeminded sports partner and/or with being more aware of sports opportunities.

Regarding the associations with sports frequency, chapter 3 showed that longer travel distances to swimming pools and indoor sports facilities were strongly related to lower sports frequencies. Accessibility constraints and time constraints in particular were the only constraint factors that had significant associations with sports frequency. According to our assumptions, time constraints had a strong negative effect on sports frequency. Time constraints were particularly found among time-pressed groups of the population, namely adults with children living at home and those who spent a lot of time working. Time constraints were not related to travel distance or time spent on travelling to sport. Accessibility constraints had an unexpected positive association with sports frequency. However, the extent to which sports participants perceived accessibility constraints differed between participants and it is likely that its impact on sports frequency differs too. Accessibility constraints were mostly found among sports participants who had to travel the greatest distance to their sport location and those who did sport only once a week, which would

suggest a negative impact of accessibility constraints on sports frequency. On the other hand, it is also likely that a higher sports frequency leads to both more travelling and more outlay on transport and sports activities. Thus, while for some people perceiving more accessibility constraints reflects an effect of having a higher sports frequency, for others it may have a constraining impact on the sports frequency. Other important determinants of a higher sports frequency included factors such as perceiving a good health status, engaging individually and unorganized in sport, and being a competitive or achievement-oriented athlete.

To conclude, the results of chapter 3 suggested that physical environmental factors are significantly associated with perceived constraints on participating in sports. The extent to which sports participants perceive specific constraints may differ depending on the characteristics of the residential neighbourhoods they live in and the type of sports facilities they use.

3. *How important are time use, changes in time use and the physical environment in explaining dropout from organized sports among youths?*

The results of the study in chapter 4 showed that both time spent on sport outside the context of the sports club and time spent on social or voluntary activities at the sports club, decreased the probability of youths dropping out of football and tennis. Furthermore, tennis players who changed schools and those who participated in two sports (which is relatively common among young tennis players) had a higher probability of dropping out. Longer travel distances between home and the tennis club decreased the probability of dropping out of tennis.

A preference for practising sport in an unorganized way with flexible times, locations and people [7] – as well as participating in social activities or volunteering at the sports club, which are known to stimulate feelings of involvement and social connectedness [8] – appears to translate into a lower dropout probability. These patterns could also be related to an increased level of motivation. The positive effect of a longer travel distance to tennis clubs may

be related either to a higher motivation to play tennis or to playing at a higher competitive level, which requires more travel time to specific training sessions and competitions at the regional level. Besides this effect of travel distance to tennis clubs, the results showed that physical environmental factors had hardly any effect on the probability of dropout. The high density, good distribution and high quality standard of the sports infrastructure in the Netherlands, as well as the moderate effect that travel distance generally has as a barrier to sports participation in the Netherlands [6,9,10], may explain why socio-spatial neighbourhood characteristics, including urban density and neighbourhood SES, were not significantly associated with dropout. For example, the travel distances of football players were rather small on average and were not associated with the probability of dropping out of football.

Interestingly, time use and environmental determinants of dropout differed greatly for football and tennis, which is probably caused by the differences in time use and activity patterns and related personal interests of the youths involved in football and tennis. For instance, the results showed that tennis players, who generally had a higher education level, spent more time at school or on study than football players, whereas football players spent more time doing fulltime or part-time jobs.

Similar to previous studies [11,12], intrapersonal factors, such as sociodemographic factors and task and ego motivational orientation, proved to be important determinants of dropout. For instance, girls and youths with a higher level of education were more likely to drop out of football than boys and those with lower levels of education. Those who had been playing in a selection team were less likely to drop out of both sports. Contrary to our expectations based on the achievement goal theory (AGT) and previous literature [13,14], both football and tennis players with a higher task orientation (i.e. those wanting to learn and/or improve themselves) and those with a higher ego orientation (i.e. those focusing on competing and winning) were less likely to drop out, compared to youths who were less motivated, no matter what their motivational orientation. High levels of both task and ego orientations may thus contribute to actively engaging within sports teams and sports clubs and to continuing participation in organized sports over time.

We concluded that, as expected, time spent on several activities and important changes related to the school and job situations of youths, which often also have spatial consequences, were important predictors of dropout. While time use variables were important predictors of dropout, physical environmental determinants were the least important. Another conclusion was that the determinants of dropout from sports differed greatly between football and tennis. Different types of sports probably attract youths with different interests, needs and preferences for activities in time and space, resulting in different time use patterns.

4. *How do users of different sports settings differ regarding intrapersonal characteristics, and to what extent are associations between motivation, goals and sports frequency different for users of different sports settings?*

The results of chapter 5 suggested that different settings for sports attract different types of participants. Participants differ in their personal characteristics and in their levels of self-determined motivation and goals. For instance, informal and non-club organized settings attracted non-competitive, novice and experienced recreational athletes who participated in individual and flexible types of sports, such as running and cycling in public spaces, or in gym-related activities and group lessons in commercial gyms or health centres. Sports club members, on the other hand, were more experienced and competitive athletes who participated more frequently in team sports. With regard to their motivation and goals, users of informal and non-club-organized sports settings were more similar to each other than to sports club members.

The results showed that personal goals for sports participation were highly interrelated with the preference for a certain sports setting and significantly impacted on sports frequency. Sports club members, who are usually known for their higher sports frequencies and time spent on sport [15], were found to have both intrinsically oriented goals (e.g. skill development and social affiliation) and extrinsically oriented goals (e.g. image and social recognition). Health goals were the most prevalent among the sample, and participants who scored high on health goals participated more frequently in sport when practised in

informal settings, such as the public space. In addition, participants who were less experienced or less competitive, or perceived a poorer health status more frequently used these more informal sports settings too. This implies that traditional sports clubs function to a lesser extent as health-oriented sporting environments, probably because people perceive the social atmosphere as too focused on competition and social obligations. More informal and flexible settings and locations may better fit the preferences and needs of people with a more vulnerable health situation and those focusing on health goals. The increased use of informal and flexible 'light' settings for sports [16] seems to go along with the current individualizing 'healthism' discourse, in which sport is seen as a means to be fit, to achieve a slim body and to maintain a healthy lifestyle [17–19].

We concluded that our findings show that interactions of factors at different socioecological levels contribute to the explanation of the complex behaviour of sports participation [20]. As expected, the associations of motivational variables with sports participation differed between settings. Our results imply that the sports frequency is higher when participants engage in settings that better fit their motivation and goals, whether these are intrinsic or extrinsic.

5. *How are intrapersonal characteristics and perceptions of the physical environment associated with the perceived attractiveness and restorative capacity of the public space for running? And how does number of years of running experience moderate these associations?*

Chapter 6 focused on a specific group of sports participants, namely adult half-marathon runners with a great variety in running experience, who took part in a large running event. The results showed that perceptions of the physical environment, and particularly preferences for green and lively running routes and a comfortable running surface, enhanced runners' evaluation of the attractiveness and restorative capacity of their running environment.

These perceived environmental characteristics were important to both novice and experienced runners and more so than intrapersonal factors such as

runners' motives and attitudes. However, the positive associations of green and lively elements in the public space and the negative associations with perceived hinderance caused by cars were particularly important for less experienced runners. Surprisingly, less experienced runners who perceived that they were hindered by pedestrians and unleashed dogs while running were more positive about the perceived attractiveness and restorative capacity of the running environment. These findings indicate that the environments that less experienced runners perceive as attractive or restorative are different from those that more experienced runners perceive as attractive or restorative. More experienced runners probably use different parts of the public space than less experienced runners. For instance, they may prefer to run on public roads because this allows them to run faster (and probably not because they prefer to encounter traffic). They may also run longer distances than less experienced runners, whereby they run outside, or for longer outside, crowded urbanized areas [21]. In addition, novice runners may prefer to run in parks, forests and natural areas, which are public spaces that also attract other recreational users, such as walkers and dog-owners. However, although encounters with unleashed dogs may be a well known constraint on both runners [21] and pedestrians [22], it did not unduly affect the perceived attractiveness and restorative capacity of the running environment.

To conclude, this chapter found evidence for interaction effects between factors at different socioecological levels in relation to perceptions of the physical environment. The results indicate that the physical environment, and in particular how the environment is perceived by runners, is important to encourage running. This particularly applies to less experienced runners using public spaces.

General conclusion

The results of the studies in this thesis have shown that the physical environment matters for sports participation. The findings repeatedly stressed the importance of informal and flexible settings and locations for sport, including public spaces but also commercial sports locations, such as gyms. However, these informal and flexible spaces have been largely neglected

in the literature on relations between the physical environment and sports participation. Our studies confirm that public spaces offer great potential for increasing sports participation and promoting healthy lifestyles, because these spaces are particularly popular among the growing groups of sports participants who have strong health goals, as well as among those who perceive a more vulnerable health situation. In addition, public spaces fit well with the preferences and needs of time-pressed population groups, because their low-key, informal and flexible character generally matches the personal goals and level of motivation of these groups. Furthermore, objective characteristics of the physical environment – including the availability and proximity of green spaces, blue spaces and sports facilities, travel distance to sports facilities, and liveability and urban density of the residential neighbourhood – proved to be important determinants. These physical environmental factors were associated with preferences regarding sports settings and locations, and with motivational factors and perceived constraints on participating in sports. In addition to objective factors, the perceptions and experiences of the physical environment played an important role in explaining how attractive and restorative the physical public environment was for engaging in sports activities, particularly in running.

Having said this, the physical environment only matters partly for the explanation of sports participation and the probability of dropout, since intrapersonal factors such as motivation, goals, perceived constraints and time use factors also play an important role. Furthermore, the importance of the physical environment differs for different segments of the population. For instance, the perceived characteristics of the physical environment had more impact on less experienced runners than on more experienced runners, and travel distances to the sports club mattered for young tennis players but not for young football players. In addition, motivation and goals differed greatly for organized and unorganized sports participants using different sports locations, and this moderated the associations with sports frequency. These examples highlight that the physical environment does not have the same association with sports participation for everyone; instead, intrapersonal factors such as motivation, goals, perceived constraints and experience in sport are even more important for some people.

7.3 Theoretical reflections

Following the insights and conclusions from the empirical studies presented above, this section discusses the contribution that this thesis makes to the theoretical debates and existing empirical knowledge regarding the three main gaps in the literature identified in the Introduction (chapter 1).

The need for a socioecological model specifically developed to explain sports participation

The first research gap concerns whether a socioecological model specifically developed to explain sports participation is needed. The findings of this thesis support the need for such a specific approach, instead of using a more general socioecological model. General ecological models, such as the ecological model of four domains of active living of Sallis [23], are often applied to different types of physical activity, such as recreational walking and walking or cycling for transport. A specific socioecological model for sport could be based on general models and include similar socioecological levels (such as for instance the 'Health through Sport' model of Eime et al. [24]). It should however make use of measures that take into account the complexity and great variety of types of individual and team sports and the more or less organized or flexible types of settings and locations used for sport. Such a model should also pay attention to sports-related intrapersonal characteristics, including years of experience in sport, recreational versus competitive athletes, types and levels of extrinsic or intrinsic motivation, personal goals and perceived constraints on participating in sport.

The findings of this thesis revealed differences between the determinants of sports participation and those of physical activity. This supports the need for a specific ecological model to apply to sport. Whereas sports participation and physical activity have some physical environmental determinants in common (e.g. urban density, perceived characteristics such as neighbourhood aesthetics, and the availability of and proximity to green and blue spaces [25–28]), other determinants differ. Important environmental determinants associated with sports participation include the organizational settings where sport takes place (e.g. traditional sports clubs versus more informal and flexible settings, such as

private sports initiatives, gyms or the public space) and travel distance to specific sports locations. To illustrate, travel distances to indoor sports facilities such as gyms and swimming pools negatively affected the sports frequency of adults, in contrast to outdoor sports facilities and the public space (chapter 3), and greater travel distances to tennis clubs were associated with a higher probability of dropout from tennis among youths (chapter 4). Furthermore, the users of different sports settings differed greatly in their personal characteristics, level of motivation to participate in sport and types of sport-related goals, and these characteristics affected sports frequency (chapter 5). For instance, having health-related goals significantly increased the sports frequency among users of informal settings, such as public spaces. In addition, the results from chapter 6 indicated that different types of sports participants, for instance those who vary in years of experience in a specific sport, perceived their physical sports environment differently. For instance, for a sports environment to be attractive to and restorative for novice runners, it had to include a green and lively public environment, which was not so important for more experienced runners.

The aforementioned factors are less decisive for physical activity behaviours compared to sports participation. In other words, different physical environmental and intrapersonal determinants and their interrelations impact on different types of health behaviours. In addition, physical environmental factors which are known to be important determinants of walking and physical activity [28,29] – such as the availability of roads, pavements, shops and sociocultural facilities – were not found to be associated with sports participation in this thesis. Furthermore, the determinants of sports participation and of physical activity may differ greatly depending on the goals and level of motivation people have in relation to these different behaviours. In addition, previous studies suggest that the diverse and specific personal meanings (e.g. joyful, bodily, health-improving and competitive meanings) and societal values (e.g. social, integrative and health-enhancing values) that are attributed to sport distinguishes sport from physical activity [22,30–35]. As mentioned, similarities were also found between the determinants of sports participation and those of physical activity. For instance, some perceived physical environmental determinants of running (chapter 6), such as preferences for

green and lively running routes, also accorded with previous findings for recreational walking [1,36,37]. In addition, this thesis showed the importance of intrapersonal factors such as motivation and goals, as well as perceived constraints and time use patterns, for sports participation. Previous studies on physical activity focussed on slightly different psychosocial characteristics, such as attitudes, cognitions, self-efficacy and intentions, which were found to be associated with physical activity outcomes [38,39] and to moderate the relationship between environmental factors and behaviour [40,41]. Both examples confirm that targeting both people and places is required in order to increase physical activity and sports participation [39].

In addition to the call for a socioecological approach specifically designed for application to sport, this thesis found some indications for the use of sport-specific ecological models, because the results and relative weight of specific determinants differed greatly for specific types of sports. For instance, determinants that predicted dropout from organized sports differed for youths playing tennis and football (chapter 4), and significant differences in sports frequency were found for team versus individual sports (chapters 3 and 5). Research into a specific type of sport could therefore benefit from using a sport-specific socioecological model.

To summarize, the aforementioned rationale and examples highlight the importance of distinguishing between different types of sports, organizational settings and geographical locations, and between different target groups and their perceptions when investigating and explaining sports participation. This also implies that interventions aimed at encouraging sports participation should target people differently compared to interventions aimed at increasing overall physical activity. The results of this thesis thus confirm the need for behaviour-specific socioecological models and measures that are specifically applied to sport, in order to better understand sports participation for several specific target groups [20]. The conceptual framework presented in the Introduction (chapter 1) could be used as an example of such a specific socioecological model. This model could serve as a starting point for future research into sports participation. It could also inform intervention development about which people

should be targeted, and how, in order get them involved in sports, increase their sports frequency or prevent them from dropping out. Furthermore, it is recommended to experiment with sport-specific socioecological models – or to at least distinguish between different types of sports, sports participants, and sports settings and locations – in order to draw conclusions that are more specific regarding the role of the objective and perceived physical environment in sports participation.

The interplay between the physical environment and intrapersonal characteristics and its associations with sports participation

An important contribution of this thesis is the empirical evidence we found for the importance of investigating interactions between intrapersonal factors and characteristics of the physical environment (research gap 2). This was also suggested in the literature and by socioecological models but was mostly neglected in previous studies [42,43]. This thesis showed that sports participation and the impact of its determinants differed significantly for different groups of the population. The findings of our studies imply that associations of the physical environment with sports participation are not similar for everyone but differ between people, depending on their sociodemographic characteristics, motivation, goals, perceived constraints, time use and important changes in time use. Thus, the extent to which a sports-facilitating and active environment with many sports facilities and public spaces that are suitable for sports activities is available leads to a higher sports frequency, also depends on intrapersonal factors such as a person's level of self-determined motivation and goals.

To illustrate, chapter 5 showed that people who participate in different settings and locations differ in their level of motivation and goals, and this is related to their sports frequency. Sports participants with strong health goals more frequently participated in sport when practised in informal settings such as the public space, whereas participants with high social and intrinsic goals (e.g. social affiliation and improving sporting skills) and those with extrinsic goals (e.g. image improvement and social recognition) had a higher sports frequency if they were members of traditional sports clubs. Other examples of interactions between intrapersonal and physical environmental factors were found in chapter 6 and concerned the perceived environment and running.

Perceptions of the physical environment (e.g. encounters with other road users and dogs, liveability and greenness of the environment) were associated with years of running experience, and this impacted on how attractive or restorative the physical environment was perceived by runners. Novice runners with less than one year of experience in running perceived more constraints and attached more value to the encouraging effect of green and lively environments than more experienced runners. This indicates that more experienced runners may prefer different environments for running, for instance because they are more focussed on pace and distance and are thus less sensitive to environmental stimuli.

The evidence found for the importance of investigating interactions between intrapersonal and physical environmental factors in order to explain sports participation contributes to the existing literature in two ways. First, most studies on sport-related level of motivation and goals build on motivational theories such as self-determination theory (SDT) [44,45] and achievement goal theory (AGT) [46]. These theories focus solely on determinants at the intrapersonal and interpersonal levels, and neglect contextual influences and their interactions with intrapersonal factors. However, this thesis showed the importance of also taking characteristics of the physical environment, with public spaces as informal settings and flexible locations of particular importance, into account when investigating the motivational characteristics of sports participants. Second, in line with the socioecological approach [43], the evidence of interactions between intrapersonal and physical environmental factors suggest that differentiating between population segments or target groups related to, for instance, age, years of experience, motivation and goals is important in order to gain a better insight into environmental influences on patterns of health behaviours and characteristics of the different target groups. Such insights can be used when targeting interventions at both the individual and the environmental level [42,47]. In addition, in order to get a better understanding of the role the physical environment plays in the sports participation behaviour of different target groups, it is essential to explicitly include interactions between intrapersonal factors and the physical environment in socioecological models. Socioecological models specifically designed for

application to sports, such as the conceptual framework introduced in this thesis, could provide for this.

New dimensions in socioecological research on sports participation: time use and constraints

Although time-related factors and perceived constraints are known for their discouraging impact on sports participation and other health behaviours [11,48–50], they are usually not explicitly included in socioecological models (research gap 3). However, the results from chapters 3 and 4 showed that time use factors and perceived constraints, and time constraints in particular, are important determinants of sports frequency and dropout from organized sports. In addition to the socioecological approach, this thesis also used elements from two theoretical frameworks – namely time geography (chapters 3 and 4) and hierarchical leisure constraints theory (chapter 3) – to interpret the findings related to time use and constraints.

Chapter 3 showed that time and accessibility constraints were the most important constraints associated with sports participation. In contrast to the hierarchical proposition of the hierarchical leisure constraints theory – which states that intrapersonal and interpersonal constraints (e.g. physical/psychological, skills/knowledge and partner constraints) are more influential than structural constraints, including time constraints and accessibility constraints – we found no support for this hierarchy in constraint factors. The sports participants involved in this study had apparently already overcome their intrapersonal and interpersonal constraints. It is also plausible that accessibility constraints are easier to overcome and negotiate than other constraints, particularly for participants who prioritize their sports activities, which may explain the positive association of accessibility constraints with sports frequency. This supports the evidence for the effect of applying negotiation strategies, such as time management and discipline, which have been positively associated with sports participation and motivation for sport in previous research [51–54]. Furthermore, the findings indicated that the perceived constraints on participating in sport differ for different population segments. For instance, people who already participate in sport very frequently will likely perceive different constraints than less active sports participants.

Besides this, time constraints will probably have more effect on the frequency of engaging in sports activities than on the decision to participate in sport. In addition, accessibility constraints and time constraints may be related to a higher demand for activities and therefore be more important for adults who already engage in sport.

The findings of chapter 4 showed that time use factors were more important predictors of dropout from organized sports among youths compared to physical environmental factors. Youths who spent more time on sport outside their sports club and those who spent time on social or voluntary activities at their sports club were more likely to continue being football/tennis club members. In addition, we investigated important changes in time use that often relate to important events in the lives of youths, such as moving, changing schools or starting a first job. Such life events mostly have a spatial consequence as well and they may impact on the activities and locations visited for sport. However, the only association related to life events we found was that tennis players who changed schools had a higher probability of dropping out. Interestingly, football players proved to have rather different time use patterns than tennis players. This once again shows the importance of differentiating between target groups and considering interactions between intrapersonal and physical environmental factors.

To interpret the findings related to time use and perceived constraints, we used insights from time geography [55]. This approach provides a useful framework when considering both the spatial and the temporal dimensions of health behaviours and how these are connected [56,57]. It helps to explain what behavioural choices people make, while taking into account several environmental and temporal limitations or constraints and opportunities. Whereas previous studies found indications of the importance of time use, changes in time use and time constraints [11,48–50], only limited research has examined these factors in conjunction. In the studies in this thesis, both the time and the constraint dimensions appeared to be important determinants, which were associated with sports participation both directly and in interaction with the physical environment. It is therefore recommended to also integrate

these dimensions into socioecological models that are specifically applied to sport. However, whereas the time geographical framework inspired us, much more can be gained by applying this approach more completely in future research, for instance by further integrating spatial and temporal dimensions with methods to investigate emotions, perceptions and social interactions [58]. These and other recommendations are detailed in section 7.5.

7.4 Methodological reflections

This section discusses some methodological issues related to the design and the measurements used in the different studies in this thesis.

Causality

All studies in this thesis had a cross-sectional research design, which means that the outcome variables (e.g. sports frequency), characteristics related to sport (e.g. organizational settings and geographical locations), intrapersonal factors (e.g. sociodemographic factors, motivation, goals and perceived constraints related to sports participation) and perceived neighbourhood characteristics were measured at the same moment in time. A limitation of cross-sectional studies is that they cannot prove the causality of the associations found. The results of this thesis can therefore be interpreted in two ways. On the one hand, certain characteristics of the physical environment impact on sports participation to a greater or lesser extent. On the other hand, people who often participate in sport tend to seek out a residential environment or sports environment that is conducive to their own sports activities. People may, for instance, choose to live in certain neighbourhoods due to the presence of more urban green space, natural areas or sports facilities because they prefer to live close to areas that suit their active lifestyles. This phenomenon is called residential self-selection. It is most likely, however, that a combination of the two mechanisms will reflect the actual situation.

Residential self-selection is a frequently encountered phenomenon in research on the built environment and health behaviours, and also in the field of transport geography [59,60]. This mechanism is an important threat that may affect the internal validity (i.e. whether the applied measures measured what they

were meant to measure) of cross-sectional studies. For instance, in chapter 2 it was found that adults living in neighbourhoods with more green space, blue space or sports facilities were more likely to participate in sport. However, the causality of these relationships remains unclear: do active people choose to live in sports-facilitating neighbourhoods, or do neighbourhood characteristics affect sports participation?

Since residential self-selection has only recently attracted limited attention in the literature, most studies do not control for the possible confounding effects of self-selection [61]. Studies that do control for residential self-selection found mixed results. Some studies found that the self-selection mechanism altered significant associations between environmental characteristics and behaviour, whereas in other studies it did not impact on these associations. These inconsistencies make it difficult to draw definitive conclusions on the possible importance of residential self-selection [60]. To address potential self-selection bias, studies into physical environmental influences on physical activity have included items such as reasons for moving to the current neighbourhood or preferences for certain aspects of the residential neighbourhood [28,62]. For instance, Van Dyck et al. [60] found that a higher participation in walking among residents of 'highly walkable' neighbourhoods did not result from residential self-selection rather than walkability characteristics. Beenackers and colleagues [63] conducted a 'natural experiment' and found that cycling increased after relocation to a new neighbourhood, irrespective of participants' attitudes towards cycling, or their pre-relocation intentions to increase their cycling levels. Thus, although residential self-selection could not be fully adjusted for, the researchers controlled for effects of cognitions towards cycling in order to control for changes in behaviour caused by differences in cognitions rather than neighbourhood change.

Like most other studies [61], we did not include items on reasons for choosing the residential neighbourhood in our surveys and we were thus unable to check whether potential self-selection biases had an impact on our findings. Furthermore, this thesis was not aimed at demonstrating whether a change in the built environment leads to behaviour change related to sports participation. This is another issue related to causality, but the implications of this issue are

similar to those of self-selection, namely that the associations found may not reflect behaviour change or the willingness to do so. However, we were able to adjust for an extensive number of potential intrapersonal and psychosocial confounders to control for the possibility that changes in sports participation were caused by these intrapersonal characteristics rather than characteristics of the physical environment. In addition, the rather dense sports infrastructure in the Netherlands probably also decreases the likelihood of self-selection processes among the majority of Dutch sports participants. Furthermore, residential self-selection is probably more relevant for sports participants who are highly motivated and participate in sport very frequently, such as elite athletes. Given the aforementioned arguments, it is assumed that the results of this thesis are affected by residential self-selection only to a limited extent.

Generalizability

The study designs in this thesis have some consequences for the external validity of the results, namely whether results may be generalized to populations other than the research sample. First, the results of this thesis may not be generalized to the whole Dutch population due to the underrepresentation of certain population groups in the study samples. For instance, the different samples of chapters 2, 3 and 5 underrepresented adults of non-native Dutch origin and lower-educated adults – population segments that are more frequently associated with health inequalities and that participate less in physical activities and sport [64,65]. However, the relatively high share of higher-educated and native Dutch adults in these studies did not lead to an overrepresentation of sports participants or sports minded respondents. According to the national figures for sports participation, 30% of Dutch adults do not participate in sport at all or do so less frequently than once per month [66], and this figure is similar to the percentage of non-participants in the studies in this thesis. In addition, previous research has shown that objective physical environmental characteristics contribute minimally to educational inequalities in walking and cycling in the Netherlands, suggesting that the physical environment does not always contribute to SES differences in health behaviours [67]. Since explaining SES differences was not the focus of this thesis, we only adjusted for educational levels in our multivariate analyses, and our results imply that the effects of physical environmental factors represent the general effect across education

levels in a reliable way. Nevertheless, the results should be interpreted carefully and may not be directly applied to the more vulnerable groups of the population (for future research suggestions on this topic, see section 7.5). Furthermore, the studies in this thesis consistently investigated differences for rural and urban areas, and the results can thus be generalized to residents living in urban, semi-urban and rural places in the Netherlands. An exception was made in chapter 6, because the relevant study sample did not contain individual address data, whereby we lacked data on urban density.

The results of this thesis cannot simply be generalized to other countries. The Netherlands is known for its relatively high sports participation rates: 56% of the population aged 15 years or older participates at least once a week in sports, compared to 40% in Europe as a whole [68]. Furthermore, the Netherlands is a compact and densely-populated country where people have access to a sports infrastructure that is of high density and high quality [30]. Many formal and informal sports facilities and sports providers are available within a short distance, even in low SES neighbourhoods [10,69]. In addition, and in contrast to other countries, the Netherlands has a long tradition and culture of using active transport. Due to the high density and relative short distances, good infrastructure, geographical 'flat' landscape and moderate weather climate, many people cycle to school or work and are therefore familiar with active behaviours in the public space [70]. Cycling may also provide access to sports activities for people who not own or drive a car.

Finally, in order to minimize consequences regarding causality and generalizability, it is recommended that future research should use longitudinal research designs that link environmental and individual data in both time and space in a large ethnically diverse sample that is, for instance, followed for a period of over 20 years [60,61].

Measurement issues

Several potential biases can be distinguished regarding the measures used in this thesis. In this section, I first discuss issues related to self-reported measures and then reflect upon objective environmental characteristics.

First, this thesis relied on the use of a self-reported measure of sports participation. In the surveys, participants were asked about their frequency of sports participation during the 12 months prior to the survey. A potential bias that may have occurred here is related to the social desirability of the respondents' answers. People are generally susceptible to social norms and tend to provide socially desirable responses to survey questions. People may also incorrectly estimate the amount of sports activities they have participated in, for instance when they engage in seasonal sports, such as tennis or football, which have training sessions and competitions more or less frequently during the year. However, we do not believe that this potential bias affected our conclusions, because there are no suggestions in the literature that people with certain intrapersonal or physical environmental characteristics estimate their sports participation systematically higher or lower than others.

Second, objective characteristics of the physical environment are often seen as valuable because these concrete measures usually lead to specific statements on environmental aspects that can be directly linked to policy interventions in the physical environment [71]. The objective measures used in this thesis were obtained from existing national datasets (e.g. neighbourhood measures of SES, urban density and liveability indicators) or calculated using GIS-based methods (e.g. travel distances from the home to sports locations, and availability of different land use types in buffers around the home). Both types of measures made exact calculations possible through linking the actual locations at the level of the 6-digit postal codes of respondents. However, an important aspect of investigating the role of the physical environment in sports participation is the definition of the residential area. What can be defined as the neighbourhood? And do administrative units or census tracks correspond with what people perceive as their neighbourhood? This well-known methodological problem is also known as the 'modifiable unit areal problem' (MAUP) and it has received much attention in research on physical environmental influences on health behaviours and health outcomes [72,73]. Researchers have criticized the use of administrative units or census tracts to define the neighbourhood and suggested that buffers may more accurately reflect local environmental exposures [56]. For that reason, in chapter 2, we calculated buffers to estimate

the impact of several land use characteristics on sports participation and the preference for sports locations. However, the size of the buffers is also a concern, as there is no consensus in the current literature [29,74]. We therefore assessed models with various buffers sizes and finally applied buffers of 2,000 metres around the respondents' homes, because 1) this buffer size had the best model fit, 2) sports participants using the public space usually go further than their immediate neighbourhood of, for instance, 400–800 metres around their homes [21], and 3) respondents generally travelled further than 3 kilometres to their sports activities. Regarding the travel distances from the home to the sports facility, we were able to distinguish between car and cycle distances. However, a limitation of the use of these actual distance calculations is that they were limited to the accuracy level of 6-digit postal codes. In addition, neither the buffer sizes nor the distance calculations allowed us to capture the entire daily activity patterns of respondents, including actual departure and arrival locations, let alone the actual sports locations or 'spatial reach' of sports participants practising sport in public spaces. This issue touches upon another potential methodological problem: the uncertain geographical context problem (UGCoP) [73], namely how contextual units or neighbourhoods are geographically defined, and the extent to which these units differ from the true geographical context, can affect findings regarding physical environmental effects on health behaviours and health outcomes. The UGCoP arises due to spatial and temporal uncertainty in the timing and duration of individuals' experience of contextual influences; in other words, at what times and how long they stay in an area or neighbourhood. The exposure to the physical environment may go beyond the direct residential physical environment and may thus vary for individuals in the same household or neighbourhood. Using GPS- and GIS-based measures comes closer to applying a more detailed and comprehensive time geographical (or so-called spatiotemporal) approach and is therefore recommended for future research. Suggestions on how to approach the true geographical context of sports participation most closely are discussed in the next section.

7.5 Recommendations for future research

This section presents some recommendations for future research to address the aforementioned methodological issues and limitations and other important issues. The recommendations relate to the following four topics: 1) finding further support for the need for a socioecological model specifically applied to sport, 2) more thorough assessments of the public space for sport, 3) further understanding of the needs and preferences of people in more vulnerable situations, including their health, and 4) integrating both objective and perceived measures of the physical environment.

First, as reasoned in section 7.3, the results of this thesis generally confirm the need for a socioecological model specifically designed to be applied to sport. The conceptual framework introduced in the Introduction of this thesis – including the defined intrapersonal factors, the objective and perceived physical environmental factors, and the associations and interrelations between these factors – can be used as an example of such a behaviour-specific socioecological model. However, to find further support for such a model, which may probably even be sport-specific, further research on the differences between different health behaviours is needed. For instance, little is known about conscious versus unconscious processes determining sports behaviour and the extent to which this differs from other types of physical activity. It is likely that sustained sports participation as a typical goal-directed behaviour [75] happens less frequently automatically than is the case with physical activities, such as walking for transport. Continuing sports participation may, for instance, succeed only when one repeatedly decides to engage in sports activities. This also implies that sports participation may be influenced by environmental stimuli in different ways than is the case of physical activity. In line with dual-process models [76], more research on the influence of these conscious and unconscious processes on sports participation is recommended, as it would contribute to more knowledge about how the physical environment can affect and encourage sports participation. Furthermore, in order to get more insight into sport-specific differences, attention could be paid to specific time windows within which a specific type of sports can be practised (e.g. practising indoor and organized type of sports such as swimming and volleyball largely depend

on the availability and opening hours of sports facilities), exact locations (e.g. in case sports participants use multiple sports locations and settings), and the specific social atmosphere of sports settings and required skills that may deter people from participating or encourage them to do so.

Second, given the growing importance of public spaces as settings and locations for sports participation, a more specific and in-depth investigation of the use of and preferences regarding these public spaces is recommended. In contrast to previous research, the studies in this thesis included a wide range of both organizational settings (e.g. ranging from organized sports clubs to unorganized settings with greater flexibility for individuals, friends or sports teams) and geographical locations (e.g. ranging from traditional sports facilities to more informal and flexible locations, such as commercial gyms and public spaces). This distinction allowed us to simultaneously make a comparison between these different settings and locations. However, more insight is needed into what specific types and features of public spaces and natural environments are attractive to which target groups, and under what social and physical environmental conditions people prefer to use them for what type of sports activities. Here, applying a socioecological approach in research on sports participation that is sport-specific may be useful and effective. Sport-specific models and analyses may better reflect the differences between types of sports (see e.g. Karusisi et al. [77]), as well as the different levels of motivation, goals, constraints and needs of sports participants that may affect their sports participation and preferred choices for specific public spaces. It would be of great interest to conduct more in-depth research into the importance of natural green and blue spaces, for instance regarding objective characteristics such as numbers, sizes and types, but also related to preferences and evaluations of specific environmental features. For instance, it would be of value to investigate how specific types of sports participants (e.g. 'CrossFitters', runners and race cyclists), as well as people who do not participate in sports on a regular basis, use and evaluate specific environmental features and public green or grey spaces or routes, and why they prefer them. Such investigations may help policymakers and urban planners to design and develop active and sport-friendly environments, and to decide, for instance, which environmental interventions are needed to further encourage sports participation.

Third, specific population groups that are in a more vulnerable position are underrepresented in this thesis. These include people with a lower SES, illiterate people, those with a migration background and people with disabilities. Specific attention and more in-depth analyses are needed to gain more insight into their level of motivation, goals and perceived constraints on participating in sport or having a more active lifestyle. These groups often have lower sports participation rates and higher sedentary levels and higher physical and mental health risks [64,65], which makes them particularly relevant target groups with respect to the aims and objectives in the social and public health policy domains. Such health inequalities may become even greater due to processes of gentrification, in which lower educated households are forced to relocate to the outskirts of cities [67]. Despite much policy attention to these disadvantaged neighbourhoods in the past decade in the Netherlands, and the evidence found in recent literature on positive contributions to the lives of people living in disadvantaged neighbourhoods [78], these processes of gentrification are generally accompanied by segregation and its negative consequences. According to a recent study, poorer people end up living in neighbourhoods with lower liveability and quality of life situations, and this reinforces a downward spiral towards even more social and health problems [79,80].

Since socially vulnerable people are usually more difficult to reach, they are often excluded from cross-sectional research. Therefore, it is recommended to complement survey-based research designs with qualitative and ethnographic methods. Such methods will allow more in-depth conversations with both sports participants and non-participants about their motivations, goals and perceived constraints, their preferred use of specific locations, and preferences and/or missing items regarding specific physical environmental features that make the neighbourhood more encouraging and familiar to them for active use. Such methods require special attention to the recruitment of respondents. For instance, a recent study investigated motivations and constraints related to participation in sport among certain people in socially vulnerable positions (e.g. women and girls from non-Western migration backgrounds, elderly people and people with physical or mental disabilities) in three disadvantaged neighbourhoods in the city of Utrecht, the Netherlands [81]. Snowball sampling

was used to get into contact with people belonging to the target groups. On the one hand, professionals working with these target groups were approached (e.g. professionals working in the social welfare, public health, and sport and physical activity domains, such as social workers, community sports coaches, health information officers and physiotherapists), and on the other hand people were addressed at sites in the neighbourhoods that were frequently visited (e.g. playgrounds, schools, community centres and nursing homes). The findings showed that besides important structural and physical environmental barriers, such as financial constraints and a lack of appropriate sports activities and locations that people feel familiar with, the social environment also played an important role. For instance, existing social norms and practices related to sport, physical activity and healthy lifestyles played an important and, for some people, constraining role in sports participation. These social norms and practices often took place via underlying sociocultural processes, including traditional gender role patterns. Besides the recommendation for qualitative or mixed-method approaches to investigate these topics, it is recommend to include the social and cultural environment in future research into the physical environment and sports participation and in its guiding socioecological models.

Fourth, it is recommended to combine both objective and perceived measures of similar physical environment aspects within the same study [82,83]. According to a recent review study, current objective and perceived measures are related but different constructs that account for unique parts of the variance in physical activity behaviours [82]. Investigating both the objective and the perceived environment could provide a more complete picture of the associations between the physical environment and sports participation. For instance, it may provide a more valid interpretation of why sports participation lags behind in some neighbourhoods despite the sports infrastructure (e.g. sports facilities and public green spaces) being 'visibly' good, widely available, varied and well maintained. When these objective observations are combined with the perceptions of the infrastructure's actual and potential users, issues such as feeling unsafe due to the absence of street lighting at certain places in parks, or feeling 'watched' by others, may for example explain why certain people prefer indoor sports locations over the public space.

Several innovative and novel approaches may help to integrate such objective and perceived data in relation to health behaviours. Future research could, for instance, use the data gathered by sports and lifestyle tracking apps, such as Strava, which are increasingly popular among all types of informal sports participants, including runners, race cyclists and triathletes. These objective big data sources potentially provide access to all kinds of spatial and temporal features (e.g. exact training locations, routes, training times, patterns of training times and locations during the day and week), which are linked to real-time sports participation (e.g. duration, speed and power), intrapersonal characteristics (e.g. socio-demographics and body measures) and interpersonal characteristics (e.g. whether a person was accompanied by someone else, was part of a training group or was alone). Adding to these objective data perceived measures about the experience of the physical environment – such as an evaluation of the constraining and encouraging items of a specific space or route, crowdedness and safety – would enhance the understanding of the spaces and routes that are frequently used. Sport scientists already frequently apply personalized real-time feedback methods in studies on optimizing performances [84] and to keep people motivated in sport [85]. Such approaches would also have the potential to provide a better insight into recreational sports participation [86,87], as well as into the relative importance of and differences and similarities between objective versus perceived measures of the physical environment. Another example is a research project on the implementation of a smart environmental intervention or technology application in the built environment, namely the 'Run!' project in the city of Eindhoven, the Netherlands [88]. In this project, lights alongside a running track light up as a runner passes them and estimates the running speed, which motivates people to maintain their pace or speed up. Such projects could be combined with qualitative methods such as observations, in-depth interviews and 'run alongs' [22,89] to gain more insight into the level of motivation, goals, the perceived constraints and the perceptions of the current physical environment used for sport compared to other environments. Furthermore, in line with time geography, geographers and health scientists have been working on the development of wearables and smartphone applications to investigate the minute-to-minute daily activity patterns of individuals [90–92]. These technologies enable the

accurate tracking of both spatial and temporal aspects of the daily lives of people and the investigation of individuals' space–time paths (i.e. what people are doing at what locations and at what points in time) [92]. In order to gain a more complete understanding of the impact of the physical environment on health behaviours and behavioural choices, and to capture all socio-spatial processes that are going on, future research could combine objective and perceived elements by integrating accurate GPS-based measures of behaviour with the characteristics and experiences of relevant real-time contexts, and with social interactions [73]. GPS–GIS methodologies could, for instance, be integrated with ecological momentary assessments (EMA) to capture the real-time contexts, and with social network analysis (SMA). GPS-based measures have been increasingly applied in physical activity research (see e.g. Jansen et al. [93]) and can be used to investigate individual activity spaces and therefore provide good representations of true geographical contexts [73]. EMAs have been used in a wide range of studies in the public health domain. They involve using wireless devices such as smartphones to prompt participants to provide real-time data about their moods, perceptions and behaviours and the features of the physical environment [94]. Data on peoples' social networks can give a better understanding of how one's interactions with others such as peers and friends in particular spaces and at particular times could affect their sports participation [73].

As far as I know, the combination of such detailed objective and perceived measures of the impact of both spatial and temporal features on accurately measured sports participation behaviour, integrated with investigations of emotions and social interactions, has not yet been applied to research on recreational sports participation. Such a research design could possibly reveal blind spots regarding the design of the physical environment in relation to the stimulation of active and healthy behaviours. Blind spots could be, for instance, neighbourhoods that are less well provided with specific sports infrastructure and green spaces that are attractive to certain subgroups of actual and potential sports participants, or neighbourhoods and infrastructures that are not fully tuned to the desires of certain sports participants who prefer to participate in sport during certain time frames. Although these innovative methods are

believed to be promising for research into recreational sports participation [86], researchers still have to be critical regarding the quality of the data and the causality of the associations found. Furthermore, when applying such technologies in research on the physical environment and health behaviours, including sports participation, it is crucial that ethical and societal aspects, including privacy and potential personal burdens, are properly addressed [90]. An alternative approach to gaining a better insight into the user perceptions of planned public spaces for sport is the 'mutual gains approach' (MGA). The MGA is frequently used in the urban planning field [95]. It is an action-centred participatory approach and negotiation technique that in previous research has been applied to mutual development processes regarding building or relocating sports facilities and the planning process of designing active and sport-friendly spaces [96]. In this approach, policymakers collaborate with existing and new inhabitants, sports clubs, and other public and private stakeholders. This bottom-up method can be used to gain more insight into the level of motivation, goals and perceived constraints of existing and new users and residents. In addition, it helps to gain support for top-down policy implications, specifically when different agents with different interests are involved. Such participatory approaches make the negotiating of interests, ideas and objections possible, right from the beginning of the planning process. This contributes to a better connection or integration of the preferences and needs of actual and potential users with the desires of policymakers and the designers of public spaces for active use.

7.6 Policy recommendations

This section provides some recommendations and implications for policymakers and professionals working in the sport, urban planning, social and public health domains.

First, this thesis found evidence for the importance of the physical environment for sports participation, in particular besides and in interaction with intrapersonal factors. Policymakers are therefore recommended to continue to pay attention to the accessibility and quality of the sports infrastructure, including both sports facilities and public spaces, and the provision of sports

activities that are well tailored to the needs of actual and potential sports participants. Both aspects are important in order to reduce the probability of perceived constraints that may deter people, and especially non-participants, from participating. Neighbourhood-specific interventions may particularly be useful to lower perceived constraints and to prevent dropout in the longer term. Such interventions may be aimed at infrastructural improvements or modifications of the public space if inhabitants face constraints regarding access to or the affordability, quality or variety of the sports activities provided. If inhabitants do not know where they can participate in sport, or lack the skills required to do so, solutions may be found in the social environment. Here, local professionals such as community sports coaches can be of great importance. A key characteristic of neighbourhood-specific interventions is that they are based on the characteristics of the neighbourhoods involved. Such approaches require a thorough investigation of the intrapersonal characteristics, including the level of motivation and perceived constraints, of different target groups. These target groups include both sports participants and people who do not yet participate in sport on a regular basis but who can be persuaded to do so, with special attention paid to people in socially more vulnerable positions. It is important to include in such interventions factors at the intrapersonal level (e.g. changing motivation, goals, needs, preferences and constraints) and the social level (e.g. social interactions, norms and values). For policymakers, this implies the need for policies and interventions at the 'hardware' level (i.e. sports infrastructure), the 'orgware' level (i.e. organizational structure) and the 'software' level (i.e. the sports activities provided) – all of which should be tailored at the local level to the changing needs of the population [97]. In addition, our findings showed that the social environment plays an important role in preventing young people from dropping out of organized sports. Sports professionals, including sports coaches and the managers of sports clubs, are recommended to stimulate participation in social activities and voluntary work at sports clubs.

Second, this thesis confirms the growing importance of informal and flexible settings and locations for sports. This growing popularity reflects the need for sports activities that are flexible in time and space, which is especially relevant

for time-pressed groups and youths. Regarding youths, it is recommended that sports clubs offer more flexibility in training hours or training schedules and innovate their training methods. In addition, sports coaches and professionals are recommended to encourage and create possibilities for youths to practice and play sports outside regular training hours, for instance on sports clubs' own grounds or elsewhere, such as playgrounds, community courts or public parks in the neighbourhood or at schoolyards that are opened to the public during non-school hours. In addition, informal and flexible sports settings and locations attract different types of sports participants regarding their level of motivation and goals compared to organized sports settings such as sports clubs. These flexible spaces are particularly popular among sports participants who have health-related goals. Therefore, and in order to maintain or increase the number of members and to not lose ground to informal sports settings, it is recommended that sports clubs provide sports activities in a low-key, flexible and open atmosphere, which probably better suits the needs and preferences of less experienced or less competitive participants. Community sports coaches could collaborate with other sports professionals operating in less organized and less commercial settings, and specifically target people in socially more vulnerable positions and those with poorer health statuses in order to provide them with or guide them to similar low-key and affordable sports activities. For all people for whom practising sport is less self-evident but who are willing to participate or can be persuaded to do so, offering flexibility and as few obligations as possible is important because the social atmosphere and social pressure around competing with and being recognized by others, as often experienced in sports clubs, may well scare some of them off. Moreover, creating a healthy, welcoming and inclusive environment may also allow those with a more vulnerable health status to feel more at ease in more organized sports settings such as sports clubs [98]. However, there will always be people who do not wish to participate in sport, not because they are excluded but because they do not like it and prefer other leisure activities [99,100].

Third, this thesis found several indications of the importance of designing attractive public spaces that encourage people to become active and participate in sports activities. For instance, the built environment appeared to be particularly

important to promote running among less experienced runners. In order to stimulate novice runners to remain involved and motivated, policymakers should prioritize the designing of active public spaces, as these spaces have the greatest potential to further stimulate healthy lifestyles. For instance, attractive, green and lively spaces, with for instance separate lanes for runners and other road users or other sports participants, could be implemented on a larger scale. Running routes could connect parks and natural areas by means of green or bark running tracks. Because of their soft surface, such tracks are believed, at least by runners, to contribute to injury prevention [101]. Providing good access to this green infrastructure at the neighbourhood level is key.

Fourth, in the Introduction (chapter 1) I referred to the recent trend in sport policy to increasingly emphasize the contribution of sport to broader health and social policy goals, and to promote collaborations with other policy sectors [30,102,103], instead of merely focusing on increasing sports participation rates. More and more policy documents refer to 'sport as a means', rather than 'sport as a goal'. However, and this is also referred to by Hoekman [30], despite the strong belief in the potential of the sports sector to achieve these social and health goals, little effort has been made to critically reflect upon and systematically analyse the extent to which sport policy indeed contributes to these broader societal goals. Little is known about the efficacy of policy on sport: to what extent do investments in the physical environment, including municipal sports facilities and the public space, really contribute to the goals policymakers want to achieve? More and continuous policy monitoring and evaluation research in the field of sport could provide further insights both into what issues should be prioritized and into the societal value of sport. In addition, this thesis also shows the urgency of an integral and multidisciplinary approach if local sports infrastructures, including public spaces, are to be used to achieve broader policy goals. While changes in the physical environment may contribute to really break inactive behaviour patterns, structural policies on this topic are, however, currently non-existent. This is a political process that requires multilevel interventions and multilevel responsibilities [43]. In this regard, future policies – including the new Dutch spatial 'Omgevingswet' (Environment Act), which will be officially introduced in 2021 – are promising.

Together with recent decentralization processes in the social welfare policy context, the Omgevingswet is expected to offer opportunities for a joint approach wherein the sport, spatial, social and public health domains collaborate and work together on creating an active and attractive living environment that encourages people to be more physically active and to participate in sport, including informal types of sports [104]. Policymakers and sports professionals in the Netherlands are recommended to make use of these recent and upcoming developments in the social and spatial policy context. For instance, recent decentralization processes in the social welfare policy context can stimulate an increase in benefits when the societal value of sport and physical activity is more embedded and is being used in the preventive and curative health context (e.g. social welfare, youth work and youth care), and when sports participation and physical activity, for instance, are included as standard topics in conversations with professionals in the neighbourhood. In the spatial and planning context, current examples include opening sports facilities during certain quiet hours (i.e. outside clubs' regular training hours) to a broader public, and allowing less formal suppliers to offer sports and physical activities in the context of after-school care and other social or healthcare services. This contributes to a more cost- and time-efficient use of municipal sports facilities, and to achieving broader societal health and social goals with sport [105,106]. Further promoting and implementing such developments and initiatives calls for multidisciplinary teams that include policymakers and professionals in the urban planning, sport and physical activity, social and public health domains, and that collaborate in the planning and designing of active and sport-friendly spaces and neighbourhoods from a very early stage onwards. An important condition for success is timely mapping, connecting and coordinating the supply side (i.e. organized and informal sports suppliers) and the demand side (i.e. preferences and needs of actual and potential users), and aligning the interests of all stakeholders. Actively working on such integral approaches reflects a step towards a more inclusive realization of liveable and healthy urban environments.

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NEDERLANDSE SAMENVATTING

Achtergrond

Van sporten en bewegen krijg je energie, het bevordert zelfvertrouwen, zorgt voor plezier, zingeving en doelen in het leven, en het levert sociale contacten op. Het leert je omgaan met frustraties en je grenzen te verleggen. Sporten en bewegen kunnen daarnaast positief bijdragen aan gezondheidsproblemen als obesitas, diabetes, hart- en vaatziekten en psychische aandoeningen en aan het verkleinen van sociaaleconomische gezondheidsverschillen. Om deze redenen stimuleert de Nederlandse overheid al decennialang deelname aan sport en bewegen. Niet iedereen doet echter aan sport en mensen die wel sporten doen dit niet allemaal evenveel of structureel. Onder een aantal groepen blijft de sport- en beweegdeelname achter. Denk bijvoorbeeld aan kwetsbare groepen als ouderen, mensen met een chronische ziekte en/of beperking, mensen met een migratieachtergrond en mensen in een lagere sociaaleconomische positie. Ook mensen met een druk werk- en/of gezinsleven sporten minder. Nederlanders brengen daarnaast (te)veel tijd zittend door. Nederlandse jongeren zijn zelfs benoemd tot kampioen stilzitten, terwijl ze vergeleken met andere Europese jeugd relatief veel sporten. Sportverenigingen zien hun ledenaantallen onder jongeren echter sterk teruglopen omdat veel jongeren stoppen met sporten in de pubertijd.

Onderzoek heeft aangetoond dat de ruimtelijke omgeving een belangrijke rol speelt als verklarende factor voor sport- en beweeggedrag. Beleid probeert hier invloed op uit te oefenen, al is dit niet eenvoudig en het effect vaak lastig te meten. De invloed van de ruimtelijke omgeving op sportgedrag is voor iedereen anders. Ook is niet elke omgeving even stimulerend en zet in gelijke mate aan tot sporten en bewegen. Omgevingsfactoren als de geografische locatie (van voetbalvelden tot openbare ruimte), het organisatorische verband waarin mensen sporten (van lidmaatschap bij een sportvereniging tot individueel hardlopen in het park), het oppervlakte (asfalt versus bospaden) en kenmerken

van de woonwijk (van objectieve maten als stedelijkheidsgraad tot subjectieve beleving van de openbare ruimte), hebben bijvoorbeeld invloed op hoe sporters hun sportomgeving beleven, hoe vaak ze sporten en indirect op de mate waarin sporters voordelen en effecten op sociaal- en gezondheidsvlak ervaren.

Hoewel de meeste Nederlanders op relatief korte afstand keuze hebben uit een divers en kwalitatief goed aanbod aan sportvoorzieningen, zijn er nog steeds verschillen in sportdeelname. Het gebruik van de ruimtelijke omgeving voor sport is daarnaast sterk veranderd door de opkomst van flexibele en informele of ongebonden vormen van sport zoals hardlopen, wielrennen, CrossFit en bootcamp in de openbare ruimte. Dit wijst erop dat naast de ruimtelijke omgeving, ook persoonlijke factoren, voorkeuren en ervaringen een rol spelen. Uit eerdere onderzoeken naar sportdeelname is gebleken dat persoonlijke motivatie, doelen en belemmeringen die mensen ervaren om te sporten voor een belangrijk deel verklaren of en hoe vaak mensen aan sport doen. De relatie tussen de ruimtelijke omgeving en het sportgedrag (of de invloed daarop) moet daarom altijd in samenhang met deze persoonlijke factoren onderzocht worden. Dit samenspel tussen persoonlijke factoren en omgevingsfactoren wordt benadrukt in de theorie en literatuur, bijvoorbeeld in sociaalecologische modellen die gezondheidsgedrag verklaren. Sociaalecologische modellen stellen dat gezondheidsgedrag, zoals sportdeelname, beïnvloedt wordt door factoren op persoonlijk-, interpersoonlijk-, organisatie-, ruimtelijk- en beleidsniveau. Er is echter nog maar weinig bekend over hoe persoonlijke en ruimtelijke factoren precies samenhangen en de mate waarin dit samenspel van factoren beïnvloedt of (specifieke groepen) mensen wel of niet sporten, hoe vaak ze sporten en of ze stoppen of doorgaan met sporten.

Doel

Het doel van dit proefschrift is om meer inzicht te geven in hoe (objectieve en subjectieve kenmerken van) de ruimtelijke omgeving en persoonlijke factoren op elkaar inwerken en sportdeelname verklaren. Drie doelgroepen staan centraal: 1) volwassen sporters en niet-sporters, 2) jongeren (13-21 jaar) die lid zijn of waren bij een voetbal- of tennisvereniging, en 3) hardlopers. Dit proefschrift geeft meer inzicht in het belang van diverse sportlocaties en sportverbanden en

het inrichten van een aantrekkelijke en beweeg- en sportvriendelijke omgeving. Dit draagt bij aan een doelgerichtere en effectievere sportstimulering onder verschillende doelgroepen (potentiële) sporters.

Belangrijkste resultaten

Dit proefschrift bestaat uit vijf verschillende deelstudies met bijbehorende onderzoekvragen die elk in een apart hoofdstuk besproken worden. Hieronder volgen de belangrijkste resultaten.

1. *Hoe zijn objectieve kenmerken van de ruimtelijke omgeving gerelateerd aan sportdeelname en voorkeuren voor bepaalde sportlocaties en sportverbanden?*

Hoofdstuk 2 onderzoekt de mate waarin de buurt stimulerend of bevorderlijk is voor de sportdeelname van zowel sporters als niet-sporters. Het hoofdstuk inventariseert of het aanbod aan sportvoorzieningen, het aantal sportverenigingen, de mate van groene (parken, bos en natuurgebieden) en de blauwe (waterrijke) inrichting van de openbare ruimte gerelateerd is aan wel of niet sporten, en of er een verband is met de voorkeur die mensen geven aan een bepaalde sportlocatie of sportverband. Is er een relatie tussen de ruimtelijke inrichting en de voorkeur van sporters om te sporten in een park of een officiële sportvoorziening zoals een atletiekbaan of zwembad? En doen zij dit als lid van een sportvereniging, liever individueel of met vrienden in een informelere en/of flexibelere setting als een sportschool of de openbare ruimte?

De resultaten van hoofdstuk 2 laten zien dat hoe meer sportvoorzieningen, groene en blauwe ruimten in de buurt aanwezig zijn, hoe groter de kans dat iemand sport bij een sportvereniging, een informele/flexibelere sportvoorziening of de openbare ruimte. Een beweeg- of sportvriendelijke buurt vergroot dus de kans dat bewoners aan sport doen, maar heeft geen invloed op hun voorkeur of keuze voor een bepaald type sportlocatie of sportverband. Verder blijkt dat groene maar vooral ook blauwe omgevingen een sterk positief effect hebben op de sportdeelname, ongeacht waar dit plaatsvindt. Dat natuurlijke omgevingen in de buurt een positief effect hebben op de sportdeelname komt overeen met bevindingen uit eerder onderzoek. Waarschijnlijk heeft dit te maken

met de aantrekkelijkheid van deze ruimten voor verschillende, relatief vaak ongeorganiseerde typen sporten, zoals hardlopen en wielrennen. Kenmerken van de ruimtelijke omgeving blijken geen verband te hebben met de voorkeuren die mensen hebben voor een bepaalde sportlocatie of sportverband. Dit komt mogelijk doordat in een sportvriendelijke buurt meer mensen buiten aan het hardlopen, fietsen of wandelen zijn. Het zien van deze actieve mensen, of het gevoel dat 'actief zijn' de norm is, zou andere buurtbewoners er ook toe kunnen aanzetten om te gaan sporten, ongeacht waar dit plaatsvindt. Uit eerder onderzoek blijkt tot slot dat er verschillen zijn in sportdeelname in de stad en op het platteland. In dit onderzoek komt naar voren dat hoe sterker de buurt verstedelijkt is, hoe groter de kans dat mensen niet aan sport doen. In nauwelijks tot gematigd verstedelijkte gebieden sporten mensen minder vaak in de openbare ruimte en in informelere of flexibelere sportvoorzieningen.

2. *Hoe is de objectieve ruimtelijke omgeving gerelateerd aan het ervaren van belemmeringen om te sporten en hoe belangrijk zijn deze belemmeringen, omgevingskenmerken en persoonlijke factoren voor het verklaren van de sportfrequentie?*

Uit hoofdstuk 3 blijkt dat zowel de reisafstand naar sportvoorzieningen als de leefbaarheid van de buurt (o.a. sociale samenstelling, veiligheid, en type woningbouw) gerelateerd zijn aan belemmeringen die sporters ervaren om te sporten. Mensen die langer moeten reizen naar hun sport ervaren meer belemmeringen op het gebied van bereikbaarheid. Dit gaat vooral op voor sporters die in binnensportvoorzieningen en zwembaden sporten en geldt veel minder voor sporters die in de openbare ruimte sporten. Sporters die dichter bij natuurgebieden wonen, ervaren minder belemmeringen op het gebied van bereikbaarheid en de aanwezigheid en kwaliteit van het aanbod aan sportactiviteiten. Mensen die in buurten wonen die objectief zeer veilig zijn (dit blijken relatief vaak buurten in landelijke omgevingen te zijn), ervaren juist in grotere mate belemmeringen op het gebied van bereikbaarheid. Zij ervaren wel weer significant minder belemmeringen op het gebied van benodigde sportieve vaardigheden om de sport te kunnen uitoefenen, kennis over waar ze kunnen sporten en het vinden van een sportmaatje. Dit wijst er mogelijk op een grotere

rol van de sociale omgeving bij sporters die in veiligere buurten wonen. Hierdoor hebben zij vermoedelijk minder moeite met het vinden van een gelijkgestemd sportmaatje en zijn ze beter op de hoogte of meer bewust van de mogelijkheden die er zijn om te sporten.

Tijdbelemmeringen hebben zoals verwacht een negatief effect op de sportfrequentie. Vooral volwassenen met thuiswonende kinderen en fulltime werkende mensen, ervaren tijdgebrek als een belemmering om te sporten. Een langere reisafstand naar specifieke sportvoorzieningen (binnensportvoorzieningen en zwembaden) is ook significant gerelateerd aan een lagere sportfrequentie. Het ervaren van belemmeringen die te maken hebben met bereikbaarheid (o.a. afstand, vervoer en kosten) heeft een onverwacht positieve associatie met sportfrequentie: sporters die bereikbaarheidsbelemmeringen ervaren zouden dus vaker sporten. De mate waarin sporters belemmeringen ervaren op het gebied van bereikbaarheid verschilt echter sterk. Vooral sporters die ver moeten reizen naar hun sport en zij die 'slechts' eens per week sporten, ervaren belemmeringen op het gebied van bereikbaarheid. Voor een deel van deze sporters zal dit waarschijnlijk negatief doorwerken in hun sportfrequentie. Er is echter ook een groep sporters die drie of meer keren per week sport en voor wie de reistijd die ze kwijt zijn aan sporten mogelijk een gevolg is van hun hogere sportfrequentie. Andere bepalende persoonlijke factoren die een positief effect hebben op de sportfrequentie zijn het ervaren van een goede gezondheid, individueel en ongeorganiseerd sporten en competitief of prestatiegericht ingesteld zijn als sporter.

3. *In welke mate verklaren tijdbesteding, veranderingen in tijdbesteding en de ruimtelijke omgeving dat jongeren stoppen met voetballen en tennissen bij een sportvereniging?*

Hoofdstuk 4 laat zien dat jongeren die meer tijd besteden aan sporten buiten de sportvereniging om (met flexibele tijden en op flexibele locaties) en aan sociale activiteiten en vrijwilligerswerk op de club, een kleinere kans hebben om te stoppen met voetbal of tennis. Deze activiteiten dragen mogelijk bij aan een verhoogde motivatie om te (blijven) sporten bij de sportvereniging. Daarnaast

hebben tennissers die veranderen van schoolsituatie, zoals de overgang van de basisschool naar de middelbare school, een grotere kans om te stoppen met tennis. Dit geldt ook voor jongeren die naast tennis nog een andere sport beoefenen. Echter, een langere reisafstand naar de tennisclub verkleint de kans op stoppen met tennis. Dit zou gerelateerd kunnen zijn aan een hogere mate van motivatie, bijvoorbeeld onder jongeren die op een hoger niveau spelen en hierdoor verder moeten reizen naar specifieke trainingen en regionale of nationale competities. Andere kenmerken van de ruimtelijke omgeving, zoals de stedelijkheidsgraad en de sociaaleconomische status van de buurt, hebben geen significante invloed op de kans dat jongeren stoppen met sporten. Dit komt wellicht door de hoge dichtheid, spreiding en goede kwaliteit van de sportinfrastructuur in Nederland en het feit dat reisafstanden in Nederland over het algemeen slechts een geringe barrière vormen voor sportdeelname.

Een interessante bevinding is dat de invloed van tijdbestedingsfactoren en omgevingskenmerken sterk verschilt voor voetballers en tennissers. Dit heeft vermoedelijk te maken met de verschillen in activiteiten en interesses waaraan zij hun tijd besteden. Zo besteden tennissers meer tijd aan school en huiswerk dan voetballers, terwijl voetballers meer tijd besteden aan fulltime werk of een bijbaan. Het onderwijsniveau van tennissers is ook relatief hoger.

Persoonlijke factoren, zoals sociaal-demografische factoren en motivatie om te sporten, blijken erg bepalend te zijn voor het verklaren waarom jongeren stoppen met sporten bij een sportvereniging. De kans dat meisjes en jongeren met een lager onderwijsniveau stoppen met voetbal is bijvoorbeeld groter dan de kans dat jongens en hoger opgeleide jongeren stoppen. Jongeren die in een selectieteam spelen, of hier ooit deel van uit maakten, hebben een kleinere kans om te stoppen met voetbal of tennis. De motivatie van sporters kan gericht zijn op het uitvoeren van de ‘taak’: sporten om te willen leren en jezelf te willen verbeteren, of meer op het ‘ego’: een sterke focus op competitie en willen winnen. Zowel voor voetballers en tennissers met een hoge score op ‘taak’ motivatie als voor sporters met een hoge ‘ego’ motivatie, blijkt de kans op stoppen met georganiseerd sporten minder groot te zijn dan voor jongeren met een lagere motivatie, ongeacht welk type motivatie. Een hoge mate van

zowel taak- als ego-georiënteerde motivatie draagt mogelijk bij aan een grotere betrokkenheid bij het team en/of de club en daarmee het blijven sporten in verenigingsverband.

In hoofdstuk 4 komt naar voren dat de tijd die jongeren besteden aan bepaalde activiteiten en belangrijke veranderingen die gerelateerd zijn aan school en werk (vaak met ruimtelijke gevolgen), kunnen verklaren waarom jongeren stoppen met sporten. In tegenstelling tot tijdbestedingsfactoren blijken kenmerken van de ruimtelijke omgeving nauwelijks invloed te hebben op het stoppen met voetbal of tennis. Verder blijkt dat factoren die het stoppen met sporten kunnen verklaren verschillen tussen type sporten. Verschillende sporten trekken vermoedelijk jeugd aan met verschillende interesses, behoeften en voorkeuren voor activiteiten in tijd en ruimte. Dit leidt tot verschillende tijdbestedingspatronen.

4. *Hoe verschillen de persoonlijke kenmerken van sporters die in verschillende sportverbanden sporten, en in welke mate verschillen de relaties tussen motivatie, doelen en sportfrequentie voor deze verschillende type sporters?*

De resultaten uit hoofdstuk 5 laten zien dat persoonlijke kenmerken en motivatie en doelen om te sporten verschillen tussen sporters. Verder blijkt dat verschillende sportverbanden verschillende type sporters aantrekken. Informele en anders georganiseerde sportverbanden zijn vooral populair onder niet-competitieve, beginnende en ervaren recreatieve sporters die aan individuele en flexibele, ongebonden vormen van sport doen. Dat zijn bijvoorbeeld hardlopers, wielrenners en bootcampers in de openbare ruimte of fitnessers en vechtsporters in (commerciële) sportscholen. Leden van sportverenigingen zijn juist vaker ervaren en competitief ingestelde sporters die relatief vaak aan teamsporten doen.

Persoonlijke doelen om te sporten blijken in sterke mate verbonden te zijn met de voorkeur voor een bepaald sportverband, en dit heeft impact op hoe vaak mensen aan sport doen. Leden van sportverenigingen hebben relatief vaak zowel intrinsieke doelen (zoals bijvoorbeeld sociale verbondenheid met anderen

en het ontwikkelen van sportieve vaardigheden om hun sport beter te kunnen uitoefenen) als extrinsieke doelen om te sporten (bijvoorbeeld het verbeteren van het uiterlijk en sociale erkenning door anderen). Gezondheidsdoelen als conditieverbetering, je fit voelen en afvallen worden onder alle sporters het meest genoemd, maar komen significant vaker voor onder sporters die informeel en ongebonden sporten in bijvoorbeeld de openbare ruimte. Ook minder ervaren en minder competitieve sporters en sporters die hun gezondheid als minder goed ervaren, maken vaker gebruik van de openbare ruimte. Dit is interessant omdat het de indruk wekt dat traditionele sportverenigingen in mindere mate gezien worden als sportomgevingen waar je aan je gezondheid werkt. Informelere en flexibelere sportverbanden en locaties passen mogelijk beter bij de voorkeuren en behoeften sporters die vooral bezig zijn met gezondheidsdoelen en van mensen die hun gezondheid als kwetsbaar ervaren.

Hoofdstuk 5 toont aan dat, zoals verwacht, de relaties tussen motivatie en sportdeelname afhangen van het sportverband waarbinnen mensen aan sport doen. De resultaten suggereren dat de sportfrequentie hoger is wanneer sporters deelnemen in verbanden die beter passen bij hun motieven en doelen. Het maakt hierbij niet uit of de motivatie en doelen intrinsiek of extrinsiek van aard zijn.

5. *Hoe zijn persoonlijke kenmerken en percepties van de ruimtelijke omgeving gerelateerd aan hoe aantrekkelijk en rustgevend de openbare ruimte ervaren wordt door hardlopers? En hoe hangt dit samen met het aantal jaren hardloopervaring?*

Hoofdstuk 6 richt zich op een specifieke groep sporters: hardlopers die hebben deelgenomen aan een halve marathon tijdens een groot hardloopevenement, de Eindhoven Marathon in 2015. Over het algemeen zijn hardlopers in dit onderzoek positief over de aantrekkelijkheid en 'rustgevendheid' van hun hardloop- of trainingsomgeving. De percepties die hardlopers hebben over de ruimtelijke omgeving, en dan met name hun voorkeuren voor groene en levendige hardlooproutes en voor een comfortabele hardloopondergrond, blijken een positieve invloed te hebben op hoe aantrekkelijk en rustgevend zij hun trainingsomgeving ervaren. De beleving van de ruimtelijke omgeving blijkt

zowel van belang voor beginnende als voor gevorderde hardlopers. Dit heeft een veel grotere invloed op hoe aantrekkelijk en rustgevend hardlopers hun omgeving ervaren dan persoonlijke factoren zoals motieven om hard te lopen.

Vanuit het perspectief van gezondheids- en sportstimulering zijn beginnende hardlopers (in dit onderzoek zijn dit hardlopers die minder dan een jaar aan hardlopen doen) een interessante doelgroep. Om te voorkomen dat zij afhaken is het belangrijk om te weten welke factoren hier mogelijk op van invloed zijn. Uit dit hoofdstuk blijkt dat beginnende hardlopers minder gemotiveerd zijn en zich minder identificeren met hardlopen dan meer ervaren hardlopers. Ook ervaren zij hun hardloopomgeving anders. Groene en levendige aspecten in de openbare ruimte blijken vooral voor beginnende hardlopers een stimulerend effect te hebben. Het ervaren van hinder door auto's heeft voor beginnende hardlopers een negatief effect op hoe aantrekkelijk en rustgevend zij de hardloopomgeving ervaren. Opvallend is dat minder ervaren hardlopers die aangaven wel eens hinder te ondervinden van voetgangers en loslopende honden, positiever waren over de aantrekkelijkheid en het rustgevende karakter van hun hardloopomgeving dan meer ervaren hardlopers. Deze bevindingen wijzen erop dat minder ervaren hardlopers hun trainingsomgeving significant anders beleven dan ervaren hardlopers. Het lijkt dat meer ervaren hardlopers de voorkeur geven aan andere plekken in de openbare ruimte om hard te lopen dan minder ervaren hardlopers. Ervaren hardlopers geven wellicht vaker de voorkeur aan hardlopen op de openbare weg omdat deze ondergrond sneller is. Ook leggen meer ervaren hardlopers vaker grotere afstanden af waardoor de kans dat ze buiten de drukke, stedelijke bebouwde omgeving lopen groter is. Beginnende hardlopers geven mogelijk juist de voorkeur aan hardlopen in het park, bos of in natuurgebieden. Dit zijn openbare ruimten die ook andere recreatieve gebruikers aantrekken, zoals wandelaars en mensen die hun hond uitlaten.

De resultaten van hoofdstuk 6 laten zien dat de ruimtelijke omgeving, en vooral hoe zij beleefd wordt door hardlopers, kan bijdragen aan het stimuleren van hardlopen. Dit geldt vooral voor minder ervaren hardlopers die hardlopen in de openbare ruimte.

Algemene conclusie

Dit proefschrift toont aan dat de ruimtelijke omgeving ertoe doet wanneer je sportdeelname wilt verklaren. Vooral informele, flexibele en ongebonden vormen van sport en bijbehorende locaties spelen hierin een steeds belangrijkere rol en hebben veel potentie voor het stimuleren van sporten, bewegen en een gezonde leefstijl. Dit zijn bijvoorbeeld de openbare ruimte met haar stadsparken en natuurgebieden, maar ook meer informele en flexibele sportvoorzieningen als fitness-, vechtsport-, en yogascholen. Deze ruimten zijn vooral interessant omdat ze populair zijn onder de grootste groep sporters: sporters die voornamelijk sporten vanwege gezondheidsdoelen (fit worden of blijven, conditieverbetering of gewichtsverlies), maar ook onder mensen die aangeven hun gezondheid als minder goed te ervaren. Omdat sporten in de openbare ruimte of de sportschool laagdrempelig en flexibel is in te passen qua tijd en locatie, sluit dit daarnaast goed aan op de motieven, doelen, voorkeuren en behoeften van groepen 'drukke' mensen die vaak tijdgebrek ervaren. Naast de sportlocatie en het sportverband zijn objectief gemeten kenmerken van de woonomgeving van invloed op sportgedrag. Het gaat dan bijvoorbeeld om de beschikbaarheid en nabijheid van groene (parken, bos en natuurgebieden) en blauwe (waterrijke) natuurlijke ruimten en sportvoorzieningen, de reisafstand naar sportvoorzieningen en om de leefbaarheid en stedelijke dichtheid van de wijk. Deze kenmerken van de ruimtelijke omgeving zijn gerelateerd aan de voorkeuren die sporters hebben voor bepaalde locaties en (organisatie) verbanden om te sporten. Daarnaast is er sprake van een samenspel tussen de ruimtelijke omgeving en persoonlijke factoren als motivatie en doelen en ervaren belemmeringen om te sporten. Het samenspel van deze factoren beïnvloedt de sportdeelname. Naast objectieve ruimtelijke factoren spelen ook subjectieve kenmerken, zoals hoe de ruimtelijke omgeving ervaren of beleefd wordt door sporters, een belangrijke rol. De beleving van de openbare ruimte verklaard voor een groot deel hoe aantrekkelijk ('sportvriendelijk') of rustgevend hardlopers de omgeving waarin zij sporten ervaren.

De ruimtelijke omgeving speelt echter slechts voor een deel een rol in het verklaren van sportdeelname en de kans op stoppen met sporten. Andere factoren, waaronder persoonlijke factoren als motivatie en doelen om te sporten,

ervaren belemmeringen en tijdbestedingsfactoren, zijn ook van invloed. Daarnaast blijkt dat het belang van de ruimtelijke omgeving verschilt voor diverse groepen mensen. Hoe aspecten van de ruimtelijke omgeving ervaren worden, heeft bijvoorbeeld meer impact op minder ervaren hardlopers dan op ervaren hardlopers, en reisafstanden naar de sportvereniging spelen alleen een rol voor jonge tennissers en niet voor voetballers. Verder blijkt dat motieven en doelen voor een groot deel verschillen voor georganiseerde en ongeorganiseerde sporters die op verschillende locaties sporten. Dit samenspel tussen factoren op verschillende sociaalecologische niveaus, zoals motivatie en doelen, en sportlocatie en sportverband, heeft significant invloed op hoe vaak mensen aan sport doen. Deze voorbeelden laten zien dat de ruimtelijke omgeving niet voor iedereen op dezelfde wijze gerelateerd is aan sportdeelname. In tegendeel; voor sommige mensen spelen persoonlijke factoren zoals motivatie, doelen, het ervaren van belemmeringen en hoe lang men al aan (een bepaalde) sport doet een veel belangrijkere rol.

Wetenschappelijke bijdragen en kansen voor verder onderzoek

Dit proefschrift draagt op een drietal punten bij aan het wetenschappelijke debat en de bestaande kennis als het gaat om het verklaren van sportdeelname. Het toont bewijs voor: 1) de behoefte aan een sociaalecologisch model dat specifiek toegepast is op sportdeelname, 2) het samenspel tussen de ruimtelijke omgeving en persoonlijke factoren en relaties hiervan met sportdeelname, 3) de toegevoegde waarde van concepten als tijdbesteding en belemmeringen in sociaalecologisch onderzoek naar sportdeelname.

Ten eerste toont dit proefschrift het belang van een sociaalecologisch model specifiek toegepast op sportdeelname. Dit proefschrift bestudeert sportgedrag vanuit multidisciplinair perspectief. Het gaat uit van een sociaalecologische benadering, een theorie die veel gebruikt wordt om gezondheidsgedrag en factoren die hierop van invloed zijn te verklaren. Daarnaast past het proefschrift verschillende theorieën en inzichten toe uit de sportpsychologie (motivatie en doelen om te sporten), sociale en gezondheidsgeografie (tijdgeografie en objectieve en subjectieve omgevingsfactoren), en vrijetijdsstudies

(belemmeringen om te sporten). In de Inleiding (hoofdstuk 1) van dit proefschrift is een sociaalecologisch model geïntroduceerd dat al deze elementen bevat. Niet alleen zijn sporten en bewegen verschillende typen van 'gezond gedrag', maar ook spelen hier deels verschillende omgevingsfactoren een rol. Om nog meer bewijs aan te dragen voor een dergelijk specifiek verklaringsmodel zou toekomstig onderzoek zich kunnen focussen op onbewuste en bewuste factoren die van invloed zijn op sportgedrag, en op de verschillen in verklarende factoren tussen sport- en beweeggedrag. Dit proefschrift vindt daarnaast aanwijzingen om het geïntroduceerde verklaringsmodel toe te passen in onderzoeken naar specifieke takken van sport. Dit is van belang omdat sporten van elkaar verschillen. Bijvoorbeeld wat betreft locaties en voorzieningen, organisatievormen, maar ook de sociale context, kosten en benodigde vaardigheden die mensen ervan kunnen weerhouden of juist stimuleren om bepaalde typen sporten te (gaan) beoefenen.

Ten tweede bevestigt dit proefschrift dat het belangrijk is het samenspel tussen de ruimtelijke omgeving en persoonlijke factoren te onderzoeken, onder andere omdat de combinatie van deze factoren verklaard hoe frequent mensen sporten en of ze stoppen met sporten. Zowel het gebruik van de ruimtelijke omgeving om te sporten als hoe mensen de openbare ruimte ervaren en beleven om te sporten, blijken samen te hangen met hun motivatie, doelen en belemmeringen om te sporten, en met het aantal jaren dat mensen al aan sport doen. In hoeverre de ruimtelijke omgeving de sportdeelname beïnvloedt hangt dus sterk af van de persoonlijke factoren van sporters en potentiële sporters. Het is belangrijk om in onderzoek naar de beweeg- en sportvriendelijke omgeving aandacht te hebben voor deze persoonlijke factoren. En wanneer de psychologische kant van sport wordt onderzocht is het zinvol ook de ruimtelijke context hierbij te betrekken. Dit is iets wat nog niet vaak wordt gedaan.

Ten derde blijkt uit dit proefschrift dat factoren als tijdbesteding aan sport en andere activiteiten en ervaren belemmeringen om te sporten belangrijke factoren zijn die sportdeelname verklaren. Deze dimensies zouden daarom onderdeel uit zouden moeten maken van (sociaalecologisch) onderzoek naar sport.

Bovenstaande bijdragen van dit proefschrift leiden tot een aantal aanbevelingen voor verder onderzoek. Vanwege de grote potentie van de openbare ruimte als ruimte om te sporten en bewegen, is meer specifiek en diepgaander onderzoek nodig naar bijvoorbeeld het gebruik en de voorkeuren die mensen hebben voor bepaalde plekken in de openbare ruimte en de betekenis die zij daaraan hechten. Welke typen en kenmerken van de stedelijke openbare ruimte en natuurgebieden zijn aantrekkelijk voor welke doelgroep? Onder welke sociale en ruimtelijke voorwaarden gebruiken mensen bij voorkeur deze ruimten, en voor welk type sporten? Om de sportdeelname verder te stimuleren is het van belang meer inzicht te krijgen in de behoeften en voorkeuren van groepen mensen in een kwetsbare (gezondheids en/of sociaaleconomische) positie. Hierbij is het extra belangrijk om ook de sociale omgeving te betrekken en veel aandacht te besteden aan het bereiken en winnen van vertrouwen van deze kwetsbare groepen. Kwalitatieve onderzoeksmethoden kunnen hierin van (aanvullende) betekenis zijn. Tot slot is het van belang dat toekomstig onderzoek zowel de objectief gemeten als subjectieve ruimtelijke omgeving betrekt (percepties en ervaringen van sporters en potentiële sporters), en deze methoden combineert. Door innovatieve technologie zoals veelgebruikte trackingapps met GPS en beweegsensoren en realtime feedback methoden te koppelen aan meer kwalitatieve methoden als ‘run alongs’ en het uitvragen van belevingen, ervaringen, emoties en de rol van het sociale netwerk, ontstaat rijke (big) data. Dit kan bruikbare inzichten opleveren over zowel de motieven, doelen, belemmeringen en ervaringen van de gebruikte ruimtelijke omgeving voor sport ten opzichte van andere, niet of minder gebruikte, ruimten.

Interessante bevindingen en betekenissen voor beleid en praktijk

Ondanks dat de resultaten van dit proefschrift niet direct concrete oplossingen aandragen voor bijvoorbeeld ingrepen in de lokale ruimtelijke omgeving, leveren de resultaten een aantal interessante inzichten op voor beleidsmakers en professionals die bij kunnen dragen aan de verdere stimulering van sport (en bewegen).

1. Beleidsprofessionals wordt aangeraden om aandacht te blijven besteden aan de bereikbaarheid en de kwaliteit van de sportinfrastructuur: zowel van sportvoorzieningen als de sportieve openbare ruimte. Lokale, wijk- of buurtgerichte interventies kunnen hierin een belangrijke rol spelen. Deze interventies moeten zowel betrekking hebben op de 'hardware' (sportinfrastructuur/sportieve ruimte), de 'orgware' (organisatiestructuur), als de 'software' (aanbod aan sportactiviteiten) kant van sport- en beweegstimulering, en zij moeten zoveel mogelijk toegespitst zijn op de veranderende voorkeuren en behoeften van de lokale gebruikers. Kwetsbare groepen voor wie sporten en bewegen minder vanzelfsprekend is verdienen extra aandacht of zelfs speciale focus binnen deze interventies. Lokale sport- en beweegprofessionals zoals buurtsportcoaches spelen hierin een cruciale rol.

2. Sporters vinden flexibele tijden en locaties om te sporten steeds belangrijker. Voor de jeugd en jongeren betekent dit dat zij gestimuleerd kunnen worden om buiten te sporten (en te spelen), bijvoorbeeld na schooltijd op het schoolplein. Sportverenigingen kunnen ook een rol vervullen in het aanmoedigen van sporten buiten de reguliere trainingen en wedstrijden om. Clubs die te maken hebben met afnemende ledenaantallen onder jongeren, wordt aangeraden om te investeren in ontmoeting en sociale binding. Zo kunnen jongeren naast het sporten ook een andere betekenisvolle rol krijgen binnen de sportvereniging. Dit kan bijvoorbeeld door middel van het stimuleren van deelname aan sociale activiteiten en vrijwilligerswerk op de club. Jongeren kunnen aangemoedigd worden dit zelf te organiseren en mee te denken over innovatieve en uitdagende trainingsvormen. Om volwassenen te binden en behouden aan sportverenigingen, maar ook aan het meer flexibele en commerciële sportaanbod, is het belangrijk dat sportaanbieders laagdrempelige en betaalbare sport- en beweegactiviteiten aanbieden op verschillende niveaus. Vanuit het oogpunt van sportsimulering is het belangrijk om aan te sluiten op de voorkeuren en behoeften van minder ervaren en/of minder competitieve sporters en van mensen voor wie sporten vanzelfsprekend is. En daarnaast bewust te zijn van de (sociale) drempels die niet-leden kunnen hebben om aan te sluiten of lid te worden van een sportclub of sportaanbieder. Dit kunnen

bijvoorbeeld angst voor focus op prestatie, aanwezigheidsplicht en verwachtingen rondom vrijwilligerswerk zijn. Accepteer ook dat er altijd een groep zal blijven die niet tot sporten aangezet wil of kan worden.

3. Een aantrekkelijk ingerichte openbare ruimte is essentieel om sporten en bewegen mogelijk te blijven maken en verder te stimuleren. Uit dit proefschrift blijkt dit onder andere duidelijk voor een vanuit gezondheidsoogpunt interessante groep sporters: beginnende hardlopers. Zij hechten veel waarde aan een groene en levendige hardloopomgeving. Het is aan te raden om te investeren in hardlooproutes en paden die gescheiden zijn van andere weggebruikers zoals fietsers, voetgangers en gemotoriseerd verkeer. Bij voorkeur hebben deze paden en routes een comfortabele ondergrond. Routes die goed ontsloten worden vanuit de wijk en groene ruimten zoals parken en natuurgebieden met elkaar verbinden, vormen een essentieel onderdeel van de gezonde stad van de toekomst.

4. Sport en bewegen wordt steeds vaker gezien en ingezet als middel om doelen op het gebied van bijvoorbeeld sociale participatie, eenzaamheid en gezondheid te bereiken. Het is echter goed om stil te staan bij de vraag wat het sport(beleid) nu echt bij draagt aan het bereiken van deze doelen. Wat is bekend over de effecten en impact van sport (in relatie tot ander) beleid? En wat is de rol van bijvoorbeeld de ruimtelijke omgeving hierin? Meer zicht hierop draagt bij aan een betere onderbouwing van beleidskeuzes en dus effectiever beleid. Zoals ook dit proefschrift vakgebied overstijgend is, is het voor beleidsprofessionals aan te raden om in multidisciplinaire teams aan de slag te gaan met beleidsmakers en professionals die zich bezig houden met gebiedsontwikkeling, sport en bewegen, het sociaal domein en publieke (preventieve) gezondheid. Dit is nodig om in te kunnen spelen op de huidige en toekomstige beleidsontwikkelingen. De Omgevingswet die in 2021 van kracht zal zijn, maar ook de transities en ontwikkelingen in het sociale en gezondheidsdomein bieden kansen om de grenzen tussen beleidsterreinen verder te laten vervagen en gezamenlijk de verantwoordelijkheid te voelen en op te pakken. Thema's als sporten en bewegen in de openbare ruimte en het actief of beweeg- en sportvriendelijk

inrichten van deze ruimte kunnen een mooi startpunt vormen voor gezamenlijke gebiedsontwikkeling waar vanaf de start gezamenlijk wordt ontwikkeld en ontworpen om woonwijken gezonder, socialer en veiliger te maken. Andere voorbeelden waar de sport- en beweegsector een rol in kan spelen is het openstellen van sportvoorzieningen (en verenigingen) voor andere gebruikers zoals kinderdagverblijven en bijvoorbeeld als werk- en ervaringsplaats voor mensen in een sociaal kwetsbare situatie. Een belangrijke voorwaarde is wel dat de belangen van alle stakeholders, waaronder zowel de sportaanbieders als de (potentiële) gebruikers tijdig in kaart gebracht, verbonden en gecoördineerd worden. Door proactief en gezamenlijk te werken kunnen stappen gezet worden richting een meer inclusieve, leefbare en gezonde leefomgeving.

DANKWOORD

Sport betekent veel voor mij. Het heeft mij op vele manieren gevormd en ik kan eigenlijk geen dag zonder. Ik heb nooit stil kunnen zitten, maar sporten begon voor mij pas echt tijdens mijn studietijd bij atletiekvereniging AV Phoenix in Utrecht. Op de baan en in het bos was het altijd thuiskomen. Dit kwam onder andere door de fijne trainingsmaatjes en (mede) trainers en het gevoel onderdeel uit te maken van de club. Toen ik in 2014 naar Amsterdam verhuisde zocht ik wat vaker de informelere kant van het hardlopen in de openbare ruimte op, ontdekte ik yoga, en bovenal herontdekte ik de racefiets. In 2017 sloot ik me aan bij een fietsgroepje en een jaar later werd ik lid van wielervereniging ASC Olympia. Voor ik het wist was ik om en kwam mijn fanatisme weer helemaal terug. Al dat fietsen kostte natuurlijk wel veel meer tijd dan hardlopen. Tegelijkertijd vroeg ook de afronding van dit promotieonderzoek en mijn baan als onderzoeker en adviseur bij DSP de nodige aandacht, een combinatie die sowieso al uitdagend was. Juist op die momenten hielp en helpt sporten. Het relativeert alle dingen die je jezelf oplegt en het helpt omgaan met teleurstellingen. De focus tijdens het sporten geeft rust en maakt je hoofd leeg. Sporten, en fietsen in het bijzonder, is ook grenzen opzoeken: angsten overwinnen, het beste uit jezelf halen, sterker worden en steeds sneller willen gaan. Maar even vaak is het genieten van de vrijheid, de natuur en de gezelligheid met fietsmaatjes, en dromen over volgende doelen of avonturen. Ik geef graag toe dat de adrenaline en energie ook gewoon enorm verslavend zijn.

Tijdens mijn studietijd werd ik ervan bewust dat ik met sporten niet alleen mijzelf wilde verbeteren, maar mijn ervaringen met wat sporten en een actieve leefstijl met je kan doen ook wilde delen met anderen. Juist met en voor mensen voor wie sporten en bewegen minder vanzelfsprekend is. Ik hoop dat ook dit proefschrift hier indirect een kleine bijdrage aan levert door inzichtelijk te maken dat sportgedrag door veel verschillende en met elkaar samenhangende factoren verklaard kan worden. Space for sport, de titel van dit proefschrift, verwijst daarom niet alleen naar het belang van de ruimtelijke omgeving, maar

ook naar de rol van persoonlijke factoren zoals motivatie en het creëren van ruimte en rust in je hoofd als belangrijke voorwaarde om te (blijven) sporten.

Uit ervaring weet ik dat motivatie niet alleen uit jezelf komt maar een inspirerende omgeving met positieve en gedreven mensen dit stimuleert. Als je er maar voor open staat en het ook zelf opzoekt. Zonder alle afleiding, nevenactiviteiten en -projecten, buitenlandse congressen, nieuwe uitdagingen en natuurlijk het sporten was ik met mijn ongeduldige aard nooit zover gekomen. Ondanks alle hobbels en tegenvallers ben ik ben dankbaar voor de kans die ik gekregen heb om dit promotietraject te mogen doen. Ik ben blij dat ik doorgezet heb, een weg vond die voor mij werkte en mij bracht waar ik nu ben. Een heel aantal mensen heeft hier een rol in gespeeld. Ik wil jullie allemaal hartelijk bedanken.

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Ineke Deelen, 17 maart 2019

CURRICULUM VITAE

Ineke Deelen (1987) obtained a BSc in Human Geography and Spatial Planning (2009) and a MSc in Urban Geography (2011) at Utrecht University. She combined her master thesis on sport and interethnic contact of migrant youth with an internship at the sports department of the Municipality of Utrecht (2010-2011). Ineke started her professional career as a consultant at Bureau Stedelijke Planning. After that, she has been working in several organizations and worked among others as a coordinating sports professional in Utrecht. In October 2013, she started her PhD research at the department of Human Geography and Spatial Planning at Utrecht University. Her PhD was part of a NWO funded project on sports facilities and sports participation. During her PhD, Ineke collaborated with several municipalities, sports federations and other researchers, presented her interdisciplinary research at several international and national conferences and published in international and national journals. Besides this, Ineke participated in a qualitative research project on the meaning of sports activities for refugee youth at a reception centre, which resulted in a scientific publication. Since 2014, Ineke has been a member of the editorial team of AGORA magazine, of which she also was part of the editorial board in 2015. Because of her affinity with sport policy and practice, she was affiliated with the sports department of the Municipality of Amsterdam (2016-2017). Since 2017 until March 2019, Ineke combined her PhD with a position as a researcher and consultant at DSP-groep in Amsterdam. Here, she has been working on many sports related policy research and consultancy projects for sports organizations, national and local governments. Ineke is currently employed as a consultant, project manager and researcher at USBO Advies at the Utrecht University School of Governance. She also has a coordinating role within the focus area and network Sport & Society (UU) and the research and education program Vitality Academy (UU, UMCU, TU Eindhoven). Her research interests are related to the meaning and public values of sport, and include among others the inclusion of vulnerable groups in society, community sports and sports events. In order to contribute to public issues, she likes to connect sport with other policy areas and its professional organizations in the social, health, youth and spatial domain.

Sports such as running, cycling and fitness in unorganized or flexible sports settings such as the public space and gyms have become increasingly popular compared to organized sports in traditional club settings and sports facilities. Little is known however which characteristics of the physical environment trigger people to participate in sport, and how this interacts with intrapersonal factors and preferences for spaces for sport. In her dissertation, Ineke Deelen investigated the importance of the physical environment in explaining sports participation, and the interplay with intrapersonal factors such as motivation and goals, perceived constraints and time use. This thesis contributes to a better understanding on how to design attractive and sport-friendly public spaces that invite different population segments (adults, youths and runners) to participate in sport.