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Promoting physical activity: The role of neighbourhood safety and renewal of deprived areas

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CHAPTER

3

Social neighborhood environment and sports participation among Dutch adults: does sports location matter?

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ABSTRACT

Studies on the relation between the social neighbourhood environment and sports participation have produced inconsistent results. Use of generic sports outcomes may have obscured associations only apparent for sports at certain locations. This study aims to assess the association between the social neighbourhood environment and three location-specific sports outcomes. Repeated cross-sectional data on sports participation (any type of sports, sports at indoor sports clubs, sports at outdoor sports clubs, sports on streets) were obtained from 20,600 adults using the Dutch national health survey (POLS) 2006-2009. Data on neighbourhood social safety and social capital were obtained using the Dutch Housing Research (WoON) 2006. Over 40% of Dutch adults participated in any type of sports. Indoor sports clubs were most popular. Multilevel logistic regression analyses revealed that neighbourhood social safety was positively associated with sports at indoor sports clubs (OR=1.25, 95%CI=1.06-1.48), but not with the other sports outcomes. Contrary, neighbourhood social capital was positively associated with sports on streets only (OR=1.69, 95%CI=1.17-2.44). The results suggest that a positive social neighbourhood environment enhances sports participation, but that this impact depends on the location of the sports activity. This study highlights the importance of using location-specific sports outcomes when assessing environmental determinants.

INTRODUCTION

There is ample evidence of the association between a person's immediate social environment and sports participation. Adults with much social support from friends, family or spouses have consistently been found to have higher odds of participating in sports than their counterparts [1-3]. According to the ecological approach, the broader social neighbourhood environment may also be an important determinant of sports participation [4]. However, few studies have explored the association between the social neighbourhood environment and sports participation [5]. Neighbourhood social safety and social capital are the two most commonly explored social environmental determinants of sports participation [5]. So far, the evidence is inconsistent.

Social capital has been defined as those 'features of social life – networks, norms, and trust – that enable participants to act together more effectively to pursue shared objectives' [6]. According to McNeill et al. [7], communities with much social capital may be better able to reinforce positive social norms for health behaviours like physical activity. Social capital may also increase the likelihood that people observe and copy the behaviour of fellow (active) neighbours, called the contagion effect [8]. A study in the Dutch city Eindhoven found adults to be more likely to participate in sports in case they had an extensive social network in their neighbourhood, experienced much social cohesion among neighbours, and felt at home in their neighbourhood [9]. However, other studies found no significant association between social capital and sports participation [3,10].

A safe neighbourhood may alleviate residents' fear of being out on the streets, which may stimulate sports participation [11]. In Eindhoven, residents of neighbourhoods with little social nuisance and crime have been found to be more likely to participate in sports activities than those residing in a less safe neighbourhood [9,12]. However, studies from other countries found no support for an association between neighbourhood social safety and sports participation [10,13].

Inconsistencies in the evidence on social environmental determinants of sports participation may have been due to the use of generic sports outcomes. Some have advocated the use of location-specific activity outcomes, as individuals may only be influenced by the social neighbourhood environment when they are actually exposed to it during exercise [13-16]. So far, location-specific sports outcomes have been applied in research only once [12]. In Eindhoven, Beenackers et al. [12] found neighbourhood safety to be more strongly associated with neighbourhood oriented sports than with organized sports.

This study aims to re-assess the association between the social neighbourhood environment and sports participation among Dutch adults by using three location-specific sports outcomes. We will extend the work of Beenackers et al. [12] by analysing data on adults across the Netherlands, instead of one single city. Furthermore, we explore the association with neighbourhood social safety, as well as neighbourhood social capital. We assess their association both with overall sports participation and three location-specific sports outcomes: sports at indoor sports clubs, sports at outdoor sports clubs, and sports on streets. Given the results of Beenackers et al. [12], we hypothesize the association between the social neighbourhood environment and sports participation to only exist for sports on streets, and not for overall sports and sports at sports clubs.

METHODS

Study population

Repeated cross-sectional data on individual characteristics and sports participation were obtained using the Dutch national health survey of 2006 to 2009. This survey is part of the yearly administered national Integrated Survey on Living Conditions (POLS). Each year, a random nationwide sample of about 14,000 individuals was drawn from the national population registry, resulting in a pooled sample of 57,281 individuals. Selected individuals were interviewed and, if 12 years and older, asked to complete an additional paper and pencil survey on specific health topics, including sports participation. Due to the age restriction, 16% of the pooled sample was not eligible to fill in the survey. Non-response was 36% for the interview and 16% for the paper and pencil survey. In the pooled dataset, a total remained of 25,206 persons over 12 years old.

Cross-sectional data on individual perceptions of neighbourhood social safety and social capital were obtained using the three-yearly conducted Dutch Housing Research (WoON) of 2006. A total of 64,005 adults from 3,495 neighbourhoods completed the survey. To assess the social situation in the neighbourhood at large, we constructed neighbourhood-level scores of social safety and social capital by averaging all individual-level scores within each 4-digit zipcode. These neighbourhood-level scores from the WoON survey were then linked to individual POLS data using the 4-digit zipcode.

We excluded respondents younger than 18 (N=2,242) and residents of neighbourhoods with five or less valid individual-level social safety/social capital scores in WoON (N=2,364). Sensitivity analyses have found our results to be robust

against a further exclusion of neighbourhoods with ten or less valid scores in WoON. A total of 20,600 adults residing in 2,129 neighbourhoods were analyzed.

Measures

Sports participation

Self-reported sports participation was measured using the Dutch Short QUestionnaire to ASsess Health-enhancing physical activity (SQUASH). This instrument has shown to be fairly reliable and valid, especially for large samples [17,18]. The questionnaire assessed the extent to which respondents participated in sports and physical activity in other domains (transportation, work, household, recreational walking/cycling/gardening). For sports participation, respondents were asked to report up to four sports they had performed in an average week over the past few months. For each sports, they had to provide the frequency (days per week) and duration (hours and minutes per day).

Water-related sports (diving, surfing, ice skating) were excluded because of the geographical restriction of these sports. Sports for medical purposes (e.g. physiotherapy), in-home sports, activities in domains other than sport (transportation, work, household, recreational walking and cycling), and low-intensity sports were also excluded. Classification of the intensity of the sports was based on a classification system developed by prior Dutch research [19]. Accordingly, low-intensity agility sport (e.g. bowling, darts, golf) and mental sport (e.g. chess) were classified as low intensity sports and excluded from our analysis.

Overall sports participation was calculated as minutes per week spent on any of the remaining sports. The distribution of overall sports participation was highly skewed with 57.5% not engaging in any sports at all. Therefore, the sports measure was dichotomised into 'active' (more than 0 minutes per week) versus 'inactive' (0 minutes per week).

The sports were divided into three location-specific sports measures: sports performed at indoor sports clubs (e.g. fitness, basketball), sports performed at outdoor sports clubs (e.g. hockey, tennis), and sports performed on streets (e.g. jogging, speed cycling). The location-specific sports measures were dichotomised into 'active' (more than 0 minutes per week at the location of interest) versus 'inactive' (0 minutes per week at any location). Respondents who were 'inactive' in sports at the location of interest were excluded if they were 'active' in sports at another location. This resulted in 18,351 14,144 and 13,633 respondents for the analyses of sports at indoor facilities, sports at outdoor facilities, and sports on streets, respectively.

Neighbourhood social environment

Individual perceptions of neighbourhood social safety were assessed using three items on social disorder and one item on crime-related fear (table 1). For crime-related fear, the two upper and the two lower scores were combined, so all items were rated on a scale from 1(unsafe) to 3(safe). All four items proved to be intercorrelated ($\alpha = 0.80$). To prevent overrepresentation of social disorder in the overall social safety score, we created a mean social disorder score by averaging the scores on the social disorder items. An overall neighbourhood social safety score was created by averaging the mean score on social disorder and the score on crime-related fear.

TABLE 1. Items and response categories for the constructs of neighbourhood social safety and social capital

Item	Response category
Neighbourhood social safety	
Social disorder	
Nuisance from direct neighbours	1(often) to 3(never)
Nuisance from other neighbourhood residents	1(often) to 3(never)
Nuisance from youth	1(often) to 3(never)
Crime-related fear	
I am afraid to be troubled or robbed in this neighbourhood	1(totally agree) to 5(totally disagree)
Neighbourhood social capital	
It is unpleasant to live in this neighbourhood	1(totally agree) to 5(totally disagree)
I feel attached to this neighbourhood	1(totally agree) to 5(totally disagree)
I feel at home in this neighbourhood	1(totally agree) to 5(totally disagree)
I am in touch a lot with my direct neighbours	1(totally agree) to 5(totally disagree)
I am in touch a lot with other neighbours	1(totally agree) to 5(totally disagree)
People treat each other nicely in this neighbourhood	1(totally agree) to 5(totally disagree)
I live in a social neighbourhood with high levels of solidarity	1(totally agree) to 5(totally disagree)
People in this neighbourhood hardly know each other	1(totally agree) to 5(totally disagree)
I am satisfied with the population composition of this neighbourhood	1(totally agree) to 5(totally disagree)

Individual perceptions of neighbourhood social capital were assessed using nine items that correspond to Putnam's definition of social capital (table 1) [6]. Some items were rearranged so that all items were rated on a scale from 1(low social capital) to 5(high social capital). The nine items proved to be intercorrelated ($\alpha = 0.83$). An overall neighbourhood social capital score was created by averaging the scores on all nine items.

Neighbourhood-level overall social safety and social capital scores were calculated by averaging the scores of all respondents living within the same 4-digit zipcode. This resulted in neighbourhood-level averages between 1 and 3 for social safety, and between 1 and 5 for social capital. The averages for social safety scores were

transformed to make them comparable to those for social capital, so that both scores ranged from 1(low) to 5(high).

Potential confounders

We controlled for various potential confounders that have been found to be related to sports participation and whose prevalence may strongly differ between neighbourhoods [20]. At the individual level, we controlled for age (continuous), gender (female; male), household composition (married/partner with children; married/partner without children; single without children; single with children), ethnicity (Dutch origin; non-Dutch, western origin; non-Dutch, non-western origin; non-Dutch, origin unknown), and socio-economic status (SES). Three SES indicators were included: educational level (primary; lower secondary; mid secondary; upper secondary; tertiary), disposable household income (five quintiles based on net income in Euros), and disposable household wealth (five quintiles based on the sum of assets and debts in Euros). Age, gender, household composition, and education have been assessed using POLS. Data on ethnicity were derived from the national population registry. Information on household income and wealth was obtained from the national tax registration.

At the municipal level, we controlled for population density as a composite indicator of various potential environmental confounders such as land use mix or proximity of facilities. Population density has been determined at the municipal level using data on address density, i.e. the number of addresses per square kilometer (km²) within a municipality. Municipalities were categorized as either very dense (2500 addresses or more per km²), dense (1500-2500 addresses per km²), moderately dense (1000-1500 addresses per km²), slightly dense (500-1000 addresses per km²), and not densely populated (<500 addresses per km²). Information was available from Statistics Netherlands.

Statistical analysis

To take the sampling design of the POLS survey into account, prevalence of the four sports outcomes were weighted for age, gender, marital status, household size, urbanization, province, and month of survey. The associations of neighbourhood social safety and social capital with each of the sports outcomes were assessed by means of odds ratios derived from multilevel logistic regression analysis. Multilevel modelling (level 1: individuals; level 2: neighbourhoods) was used to account for clustering of individuals in neighbourhoods. A four-stage modelling approach was used with stepwise adjustment for socio-demographic factors (stage 1: age, gender, household composition, ethnicity), SES indicators (stage 2: education, household income, household wealth), municipal factors (stage 3: population density), and

neighbourhood factors (stage 4: neighbourhood social safety/ social capital). Each potential confounder was included as a set of dummy variables. For all analyses, statistical significance was set at 0.05. Analyses were carried out using the STATA 11.0 software (StataCorp, College Station, Texas, USA).

This study was based on secondary analyses of anonymized survey data by Statistics Netherlands (the "CBS"). The Medical Ethics Committee has confirmed that the Medical Research Involving Human Subjects Act (WMO) does not apply to this study and therefore, no official approval was required.

RESULTS

Of the respondents, 42.5% participated in any sports. Sports at indoor sports clubs (31.1%) was more popular than sports at outdoor sports clubs (10.1%) and on streets (8.1%). Respondents participating in sports, spent most time on sports at outdoor sports clubs (209 minutes per week), and less on sports at indoor sports clubs (169 minutes per week) and sports on streets (155 minutes per week).

Overall, young adults, non-Dutch adults of Western origin, adults with high levels of education, income, and wealth, and adults living in very densely populated areas were more likely to participate in sports than their counterparts (table 2). Between-sport differences were observed. Females and childless people were more likely to participate in sports at indoor sports clubs, while males and married people with children were more likely to participate in sports at outdoor sports clubs and on streets.

With an increase in neighbourhood social safety and social capital, there was a slight increase in weighted prevalence of overall sports and sports at outdoor sports clubs (figure 1). Results of the multilevel logistic regression analyses mainly confirmed these patterns (table 3). After initial adjustment (model 1), neighbourhood social safety was significantly positively associated with all sports outcomes except sports on streets. Additional adjustment for individual-level SES had limited effect (model 2). Additional adjustment for population density slightly strengthened the associations (model 3). Additional adjustment for neighbourhood social capital weakened the association with sports at outdoor sports clubs to the point that the association was no longer significant. In the final model, one unit increase in social safety was associated with 16% higher odds of overall sports and 25% higher odds of sports at indoor sports clubs (model 4). There were no significant associations with sports at outdoor sports clubs and sports on streets. After initial adjustment (model 1), neighbourhood social capital was significantly positively associated with overall

sports and sports at outdoor sports clubs, but not with the other types of sports. For all sports except sports on streets, additional adjustment for SES (model 2) and social safety (model 4) weakened the associations, while additional adjustment for population density (model 3) strengthened the associations. Contrary, for sports on streets, the association with social capital strengthened with each additional adjustment. In the final model, one unit increase in social capital was significantly associated with 69% higher odds of sports on streets. There were no significant associations with the other sports outcomes.

TABLE 2. The association of individual-level covariates with sports participation

	% N ¹	Odds Ratio (95% CI) model 4 ²			
		Overall sports	Sports at indoor sports clubs	Sports at outdoor sports clubs	Sports on streets
Age (years)	48.4	0.97 (0.97–0.97)*	0.97 (0.97–0.97)*	0.96 (0.95–0.96)*	0.95 (0.94–0.95)*
Gender					
Female	52.2	Ref	Ref	Ref	Ref
Male	47.8	0.89 (0.84–0.95)*	0.69 (0.64–0.74)*	2.04 (1.84–2.27)*	1.87 (1.66–2.10)*
Household composition					
Married/partner, child	39.2	Ref	Ref	Ref	Ref
Married/partner, no child	35.8	1.08 (1.00–1.17)*	1.19 (1.10–1.29)*	0.94 (0.83–1.07)	0.72 (0.62–0.83)*
Single, no child	19.5	1.19 (1.08–1.31)*	1.34 (1.21–1.48)*	0.90 (0.76–1.07)	0.99 (0.83–1.19)
Single, child	4.6	0.80 (0.69–0.93)*	0.83 (0.70–0.97)*	0.76 (0.58–0.99)	0.69 (0.51–0.93)*
Origin					
Dutch	86.3	Ref	Ref	Ref	Ref
Non-Dutch, western	6.6	1.21 (1.07–1.37)*	1.29 (1.13–1.47)*	1.33 (1.08–1.64)*	1.05 (0.82–1.35)
Non-Dutch, non-western	4.1	0.84 (0.71–0.99)*	0.99 (0.83–1.18)	0.63 (0.45–0.88)*	0.41 (0.26–0.62)*
Non-Dutch, unknown	3.1	0.99 (0.83–1.19)	0.98 (0.81–1.19)	1.00 (0.74–1.37)	0.98 (0.70–1.37)
Educational level					
Primary	14.5	Ref	Ref	Ref	Ref
Lower secondary	14.3	1.33 (1.18–1.50)*	1.33 (1.17–1.52)*	1.51 (1.14–1.98)*	1.44 (1.00–2.07)*
Mid secondary	8.3	1.73 (1.51–1.99)*	1.60 (1.38–1.86)*	2.87 (2.17–3.81)*	1.98 (1.34–2.92)*
Upper secondary	35.6	1.84 (1.65–2.05)*	1.76 (1.57–1.98)*	2.55 (2.01–3.25)*	3.19 (2.33–4.36)*
Tertiary	27.0	2.91 (2.59–3.26)*	2.65 (2.34–2.99)*	4.34 (3.40–5.54)*	6.72 (4.90–9.21)*
Household income (€)					
<15 200	18.3	Ref	Ref	Ref	Ref
15 200 – 19 200	19.4	1.19 (1.07–1.32)*	1.21 (1.09–1.36)*	1.09 (0.89–1.33)	1.05 (0.84–1.30)
19 200 – 23 600	19.9	1.37 (1.24–1.52)*	1.41 (1.26–1.57)*	1.41 (1.17–1.71)*	1.10 (0.89–1.36)
23 600 – 29 900	20.3	1.54 (1.39–1.71)*	1.56 (1.39–1.74)*	1.75 (1.45–2.10)*	1.35 (1.10–1.66)*
>29 900	20.8	1.79 (1.60–1.99)*	1.74 (1.55–1.96)*	2.31 (1.91–2.80)*	2.05 (1.67–2.53)*
Household wealth (€)					
<3 362	12.9	Ref	Ref	Ref	Ref
3 362 – 39 047	14.0	1.10 (0.98–1.25)	1.12 (0.98–1.27)	0.94 (0.75–1.17)	1.16 (0.92–1.47)
39 047 – 148 000	14.6	1.23 (1.09–1.38)*	1.22 (1.07–1.38)*	1.15 (0.93–1.42)	1.26 (1.00–1.58)*
148 000 – 293 469	14.5	1.42 (1.26–1.61)*	1.42 (1.24–1.62)*	1.34 (1.09–1.66)*	1.39 (1.10–1.76)*
>293 469	14.3	1.40 (1.24–1.59)*	1.32 (1.15–1.51)*	1.64 (1.32–2.03)*	1.26 (0.99–1.61)
Unknown	29.6	1.27 (1.14–1.41)*	1.24 (1.10–1.39)*	1.30 (1.08–1.57)*	1.15 (0.93–1.41)
Population density					
Very dense	18.8	Ref	Ref	Ref	Ref
Dense	27.8	0.97 (0.88–1.07)	0.99 (0.89–1.10)	0.99 (0.83–1.19)	0.97 (0.81–1.16)
Moderately dense	21.5	0.95 (0.85–1.06)	0.98 (0.88–1.10)	1.02 (0.84–1.24)	0.89 (0.73–1.10)
Slightly dense	21.9	0.89 (0.79–0.99)*	0.90 (0.79–1.01)	0.95 (0.78–1.17)	0.88 (0.71–1.10)
Not dense	10.0	0.86 (0.75–0.98)*	0.87 (0.75–1.01)	0.88 (0.69–1.12)	0.86 (0.66–1.11)

*p≤0,05

¹Percentages may not add up to 100%, due to the category 'missings' which has not been shown here.²Odds of sports participation adjusted for age, gender, ethnicity, household composition, education, income, wealth, population density, neighbourhood social safety/ social capital.

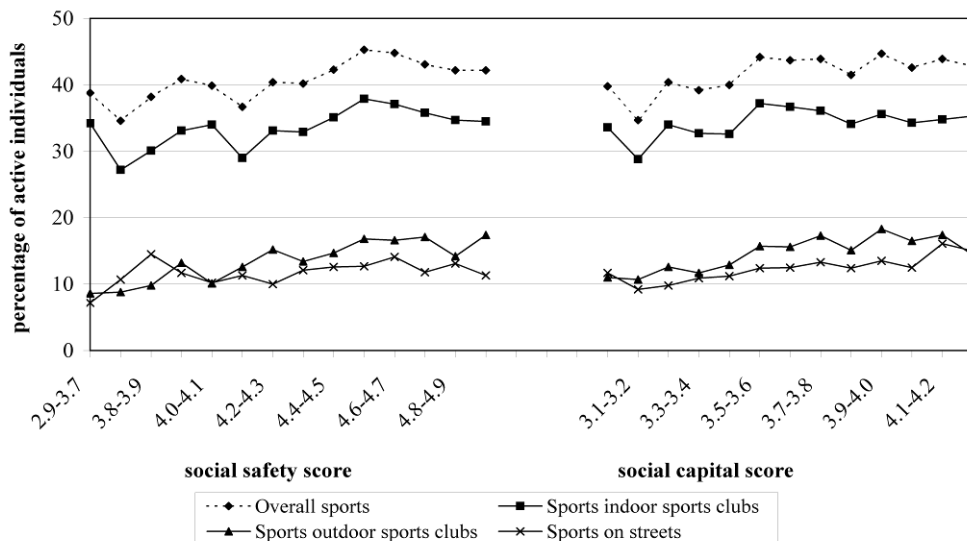


FIGURE 1. Weighted prevalence of sports participation by neighbourhood-level social safety and social capital. Neighbourhood-level social safety scores range from 1 (not safe) to 5 (very safe). Neighbourhood-level social capital scores range from 1 (low social capital) to 5 (high social capital)

TABLE 3. The association of neighbourhood-level social safety and social capital with sports participation, in four logistic regression models

	Odds Ratio (95% CI) ¹			
	Model 1 (age, gender, household comp., ethnicity)	Model 2 (+ education, income, wealth)	Model 3 (+ population density)	Model 4 (+ social capital / social safety)
Neighbourhood social safety				
Overall sports	1.15 (1.03 – 1.29)*	1.12 (1.00 – 1.26)*	1.20 (1.05 – 1.37)*	1.16 (0.99 – 1.35)
Sports at indoor sports clubs	1.16 (1.03 – 1.31)*	1.14 (1.01 – 1.28)*	1.23 (1.07 – 1.42)*	1.25 (1.06 – 1.48)*
Sports at outdoor sports clubs	1.38 (1.13 – 1.69)*	1.32 (1.07 – 1.62)*	1.35 (1.06 – 1.71)*	1.19 (0.90 – 1.58)
Sports on streets	0.96 (0.77 – 1.18)	1.01 (0.81 – 1.25)	1.05 (0.82 – 1.35)	0.84 (0.63 – 1.13)
Neighbourhood social capital				
Overall sports	1.16 (1.01 – 1.34)*	1.11 (0.97 – 1.28)	1.21 (1.02 – 1.43)*	1.09 (0.90 – 1.33)
Sports at indoor sports clubs	1.08 (0.93 – 1.26)	1.04 (0.90 – 1.21)	1.13 (0.95 – 1.35)	0.97 (0.78 – 1.19)
Sports at outdoor sports clubs	1.51 (1.18 – 1.93)*	1.42 (1.10 – 1.83)*	1.49 (1.11 – 2.00)*	1.33 (0.94 – 1.87)
Sports on streets	1.20 (0.92 – 1.56)	1.31 (0.99 – 1.71)	1.51 (1.10 – 2.06)*	1.69 (1.17 – 2.44)*

*p≤0,05

¹ Odds of sports participation = 1 (yes).

DISCUSSION

We expected the social neighbourhood environment to be associated with sports on streets, but not with sports in general or at other locations. This hypothesis was supported by the results for neighbourhood social capital. Unexpectedly, neighbourhood social safety was significantly positively associated with sports at indoor sports clubs only.

Evaluation of data limitations

Data available to this study had some potential limitations. First, information on the location of the sports activity was not available from the survey. Therefore, some sports activities may have been misclassified, such as basketball. We classified basketball as an indoor sports as we assumed basketball to have taken place at an indoor court. However, it may have also taken place at an outdoor court in the neighbourhood. Classification of these types of sports activities were based on the most common location in the Netherlands.

The cross-sectional nature of our study does not allow us to establish the causality of the observed associations. On one hand, a safe neighbourhood with much social capital may stimulate sports participation. On the other hand, a safe neighbourhood with much social capital might attract people who like to exercise. This is called self-selection [21].

Sports participation was measured in years 2006 to 2009, while the social neighbourhood environment was measured only in 2006. We added the years 2007 to 2009 to increase statistical power and to take into account possible lag times of effect. This may have biased our results if differences between neighbourhoods in environmental conditions have changed between 2006 and 2009. Prior research on traffic safety and physical activity suggests that such differences may indeed have changed [22]. Traffic safety appeared to have improved between 2006 and 2009 in some neighbourhoods but not in others. An improvement in traffic safety was related to increased odds of being physically active. Similar studies are needed on the impact of trends in social neighbourhood environment on sports participation.

The social neighbourhood environment was measured using relatively small areas of only 3.4 km² wide. Since our sports measure was not neighbourhood-specific, some of the sports activities listed by the respondents may have (partly) taken place outside the neighbourhood limits. As a consequence, we are only able to anticipate the impact of the environment in which people live, rather than where they exercise.

We used subjective measures of the social neighbourhood environment because there is evidence that objective ratings do not always coincide with residents' perceptions [23,24] and that perceptions may be more important in determining physical activity behaviour than objective ratings [23,25]. The use of subjective neighbourhood measures may result in the so called 'single source bias' if self-reported data on both determinants and outcomes are collected from the same respondent [26]. To eliminate this source of bias, we used neighbourhood-level measures of the perceived social neighbourhood environment. These measures are based on perceptions of other residents living in the same neighbourhood as the respondent, rather than on perceptions of the respondent himself.

Interpretation of key results

So far, studies on the association of neighbourhood social safety and social capital with sports participation have produced inconsistent results. Some studies found no significant association [3,10,13]. Studies that did find both aspects to be positively associated with overall sports participation have all been conducted in the Netherlands [9,12]. Therefore, associations may be restricted to the Dutch context. Like the other Dutch studies, we found both neighbourhood social safety and social capital to be associated with sports participation. However, the associations were found to differ according to the location of the sports activity.

As expected, neighbourhood social capital was positively associated with sports on streets, but not with sports at sports clubs. These results support the use location-specific sports outcomes, as suggested in prior research [13-16]. The underlying mechanisms remain unclear. It might be that residents of neighbourhoods with much social capital are more likely to adopt the (active) behaviour of their fellow residents. This is termed the contagion effect [8]. Ross [8] points out that for this contagion effect to occur, behaviours have to be visible in the streets, as is the case with sports on streets rather than at sports clubs.

Unexpectedly, we found neighbourhood social safety to be associated with sports at indoor sports clubs, but not with sports on streets. Prior research has suggested that neighbourhood social safety might not only be important during the exercise itself, but also when travelling to sports facilities [12]. Sports at sports clubs often take place at a fixed location and at set times (most often in the evenings), require membership fees, and are multiplayer. As a result, residents of unsafe neighbourhoods are less able to avoid unsafe places and hours when going to the sports club. Sports on streets on the other hand, can be practiced everywhere, anytime, without cost, and are solo. As a result, street exercisers living in unsafe areas, have the ability to go out at safer hours and into safer areas, limiting the impact of neighbourhood social safety.

There is a possibility that the positive associations between the social neighbourhood environment and sports participation have been caused by an underlying (neighbourhood) factor. While we have extensively accounted for individual-level confounders, we have not been able to control for all possible neighbourhood-level confounders, such as availability of sports clubs or outdoor facilities. Vigorous activity at sports clubs has been found to be associated with a higher density of paid facilities [27]. These facilities tend to be more present in suburban and rural areas [28,29], which generally face less safety problems compared to urban areas. Recreational activity or exercise on neighbourhood streets has been found to be associated with access to outdoor recreational facilities (park, sports facility, beach, river) [13], which in turn have been found to stimulate the development of social ties between neighbours [30]. We have adjusted our analysis for population density as an indicator of these various potential environmental determinants. Future research should aim to control for neighbourhood-level confounders in more detail.

PERSPECTIVE

The results of this study suggest that sports participation might be enhanced by means of a positive social neighbourhood environment. However, the impact of the social neighbourhood environment was found to depend on the location of the sports activity. A neighbourhood with much social safety might enhance participation in sports at indoor sports clubs, while neighbourhoods with much social capital might enhance participation in sports on streets. Even though many researchers have advocated the use of location-specific physical activity outcomes [13-16], we are one of the first to apply this to sports research. Our results highlight the need to use location-specific sports measures in research on environmental determinants of sports participation. More research is needed to explore the mechanisms underlying these associations and to take the possibility of neighbourhood-level confounding into account.

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