An Active City Approach for Urban Development

Frank Daumann, Robin Heinze, Benedikt Römmelt, and
Anne Wunderlich

ABSTRACT *With an increasing percentage of the global population living in cities and the concurrent decrease in physical activity in daily life, public health issues for urban development have arisen. This study responds to that trend by presenting an approach to measure city-wide physical activity levels. Comparing of city indices for active sports and the active transportation shows differences between subject cities and activity level of age groups in sports as well as walking and cycling. Therefore, our study lends itself to implications for urban development towards creating a healthier city.*

KEYWORDS *Sport development, Urban development, Healthy city, Active city*

INTRODUCTION

The European Union is facing a looming inactivity problem. Of persons older than 15, two thirds are not physically active at the levels recommended for health by the WHO.^{1,2} Physical (in)activity is a critical public health issue because it reflects other aspects of health and not enough people participate in regular health-enhancing physical activity. It is a basic human function and shows extremely beneficial effects on most chronic diseases of fundamental means for improving physical and mental health.^{2,3} Also, it is well established that regular moderate physical activity results in enhanced health in terms of mental, physical, and social well-being; the prevention of illness; disability; and obesity.^{1,2}

Today, a high percentage of the global population lives in urban centers.⁴ This is based on a rapid unplanned urbanization resulting in an unhealthy environment and therefore is one of the important actual trends influencing global health.⁵ The degree of urbanization describes percentage of the population (of a country) living in cities. In 2011, it was around 73 % in Europe. Germany is with 74 % on average in Europe.⁶ Especially for midsized cities, urban growth will be on a high level while it slows down in megacities.⁷

This sizeable share of population clustering in urban areas is a challenge for every city administration, particularly the challenges of the public health systems.⁴ Today, urban planning serves as a form of primary prevention and contributor to health.⁸

Variants that determine a city's health status can be grouped into four categories: population composition, social environment, physical environment, and the availability of, as well as the access to, health and social services.⁴ Population composition refers to the demographics of a city or neighborhood in terms of age and gender distribution, genetic characteristics, health beliefs, and cultural attitudes.

Daumann, Heinze, Römmelt, and Wunderlich are with the Chair of Sports Economics and Health Economics, Friedrich Schiller University Jena, Jena, Germany.

Correspondence: Robin Heinze, Chair of Sports Economics and Health Economics, Friedrich Schiller University Jena, Jena, Germany. (E-mail: robin.heinze@uni-jena.de)

Social environment means the structure and characteristics of relationships among people as indicated by social networks, social capital, and social support. The category physical environment includes access to safe drinking water, sanitation, drainage, garbage collection, air and noise pollution, and the built environment. Access to health and social services is an aggregate of health infrastructures, availability of social services, quality of living conditions, market and municipal services, and the regulatory environment.

From a perspective that combines sports science with urban development, the built environment and the governmental influences with respect to sports and active transportation will be in the focus of this paper. This perspective stems from the view that improving participation in health-enhancing physical activity is a public issue of urgent concern. Accordingly, the World Health Organization (WHO) has stated, "A healthy city is an active city."¹

Our approach is concerned with the healthy city movement that was begun by the WHO in 1986. Its fourth and final phase was completed in 2008. The WHO definition of a healthy city is not the achievement of any particular health status. Rather, "a healthy, active city is one that is continually creating and improving opportunities in the built and social environment and expanding community resources to enable all its citizens to be physically active in day-to-day life."¹ This is a holistic approach to healthy cities. Publications sharing this approach use physical activity holistically by not differentiating between forms in a systematic way thereby failing to consider the interdependence of each form. Our view requires more differentiation, as is necessary for developing cities needing a more specific analysis. Therefore, it is of concern for municipalities to ascertain the different levels of physical activity in order to initiate concrete plans for action and urban development.

We define *active city* as a subcategory of a healthy city as follows:

An active city is one that provides conditions for an active lifestyle represented by high levels of active transport (cycling and walking) and high levels of active sports participation.

From this perspective, the aim here is to provide an approach to measure active transportation and active sports participation on a city-wide level and to compare the activity level between German cities.

Therefore, we first define and distinguish between physical activity, active transportation, and sports. Then, we present an approach to measure sports and active transportation on a city level and then compare selected German cities. Finally, we show the implications and conclusions of our research.

Physical Activity as a Starting Point

Physical activity is "any bodily movement produced by skeletal muscles that result in energy expenditure above resting level."^{1-3,9} This includes many types of activities like walking or cycling, dance, traditional games and pastimes, gardening and housework, as well as sport or deliberate exercise.² Thus, physical activity is an umbrella term that can be divided into more specific types. Here, we will use the terms "health-enhancing physical activity" and "sports":

Health-enhancing physical activity is "any form of physical activity that benefits health and functional capacity without undue harm or risk."^{1-3,10} Nearly any physical activity can be a health-enhancing one under this definition. It can be

integrated into a daily routine by walking briskly, cycling, and other activities that increase the heart rate and circulation.^{1,2} In this context, we define active transportation as *any human-powered movement to get from one place to another*. This includes walking in terms of strolling and promenading but does not include walking and cycling in sporting. We will focus on active transportation meaning cycling and walking.

On the other hand, there are limitations to conducting an active lifestyle through active transportation. Therefore, it is necessary to balance an inactive lifestyle through sports participation.

Sports are a heterogeneous phenomenon. The term has multiple meanings which could not be perfectly differentiated. Sport contains performance and competition as well as aspects of health and recreation.^{4,11} Sports are shown to have positive effects on physical health, integrating, and educational advantages and positive economic impacts.¹² Therefore, sports engagement is of political, social, and economic concern.¹³

The approach presented herein is concerned with mass sports primarily, characterized by fun and skill development not elite performance and winning.¹

The potential of sports to have an effect on the entirety of society indicates their importance for cities, too. Sports are an important factor for the image, location, and economy of a city.¹⁴ But, without the commitment of cities and municipalities, active sporting is hardly possible.

A healthy, active city has to recognize the value of active living, physical activity, and sports. It has to provide opportunities for physical activity and active living as well as sports facilities for all.¹

The benefits to cities that invest in physical activity policies and programs are as follows:¹

- Saving money on health care and transport services;
- More productive citizens and workers;
- More livability and attractiveness to residents, employers, and visitors;
- Less air and noise pollution and better access to green spaces;
- Enhancing neighborhood revitalization, social cohesion, and community identity; and
- Expanding social networks.

Figure 1 shows the relationship between *physical activity*, *health-enhancing physical activity*, and *sports*. As shown, there are overlapping areas between health-enhancing physical activity and sports. This is because many forms of sports are health effective while not every sport is effective for health. If a physical activity is health-enhancing depends strongly on the kind of activity, its duration, and intensity.

“In general, health-enhancing physical activity comprises activities that are classed as of at least moderate intensity. Moderate-intensity physical activity raises the heartbeat and leaves the person feeling warm and slightly out of breath. It increases the body’s metabolism to 3–6 times the resting level (3–6 metabolic equivalents—METs). Vigorous-intensity physical activities enable people to work up a sweat and become out of breath. They usually involve sport or exercise: for example, running or fast cycling. Vigorous-intensity activities raise the metabolism to at least six times its resting level (6 METs).”²

So there is evidence for actions aimed at raising the participation level in active living and sports leading to healthier cities. The next section provides an approach to measure city-wide activity levels.

FIG. 1 Relationship between physical activity, health-enhancing physical activity, and sports.

METHODS

Measures and Analysis

Physical activity has four measurable dimensions, abbreviated as FITT:²

- Frequency of the activity;
- Intensity of the activity;
- Time, the duration of the activity; and
- Type of activity.

All four dimensions are necessary to make an accurate assessment of city-wide activity levels.

The first step to developing a “city index” is to gather a sufficiently high number of representative city dwellers. Questionnaire-based surveys therefore present the best option for assessments requiring coverage of large numbers of people.²

It was not possible to use an established questionnaire, since this kind of examination of activity levels of cities has never been undertaken. A new questionnaire was designed collecting all fundamental information in such a way that a differentiated analysis of sports and physical activity would be possible.

The two most often used international physical activity questionnaires are the International Physical Activity Questionnaire and the WHO Global Physical Activity Questionnaire. The first is used to directly compare the levels of physical activity between countries and the second aims at comparison between culturally diverse populations in developing countries.² For this paper, we used the International Physical Activity Questionnaire (IPAQ) that was developed to obtain internationally comparable population data on health-related physical activity as our basis.¹⁵ We modified it to be able to differentiate between sports and physical activity.

To measure sporting activity, we first asked for a maximum of three sports that each person did at least once a week. Then, we measured the number of days they engaged in each sport in the last 7 days and the duration in minutes of each instance. Finally, we determined the metabolic equivalent of task (MET) values for every sport on the basis of the 2011 Compendium of Physical Activities.¹⁶

The active sports level of each person then was calculated as follows:

$$\begin{aligned} \text{Active sports level} = & \left(\text{MET}_{\text{sport1}} * \text{minutes}_{\text{sport1}} * \text{days}_{\text{sport1}} \right) \\ & + \left(\text{MET}_{\text{sport2}} * \text{minutes}_{\text{sport2}} * \text{days}_{\text{sport2}} \right) \\ & + \left(\text{MET}_{\text{sport3}} * \text{minutes}_{\text{sport3}} * \text{days}_{\text{sport3}} \right) \end{aligned}$$

The *city index for active sports* is represented by the median of the active sports levels of its inhabitants.

This underlying concept of sports includes all activities that are viewed as sports by the person questioned. We do not discriminate between recreational and competitive sports. The way of questioning allows a relatively clear dissociation to physical activity as transportation. In Germany, participating in a sport (German, “Sportart betreiben”) is more than being physical active to move from one place to another. In cases of doubt, what counts is if the person sees their activity as sports. If someone is running to work and afterwards home again and defines this as doing sports, we count it as sports.

Our data is based on the information of the respondents of the telephone survey so we used the median instead of the mean because it is stable against extreme values.

To measure the level of physical activity through active transportation, we asked the number of days each person biked for a minimum of 10 min to get from one place to another. We then measured the duration in minutes of biking as transport. We did the same for the number of days each person walked for a minimum of 10 min from one place to another. Then, we measured the duration in minutes of walking as transport on such a day.

The active transportation level of each person then was calculated as follows:*

$$\begin{aligned} \text{Active transportation level} = & \left(3.7 * \text{minutes}_{\text{walking}} * \text{days}_{\text{walking}} \right) \\ & + \left(5.4 * \text{minutes}_{\text{cycling}} * \text{days}_{\text{cycling}} \right) \end{aligned}$$

The *city index for active transportation* then is represented by the median of the sum of active transportation levels of its inhabitants.

*As an update to the IPAQ, we set the MET value for *walking for transportation* to 3.7 and the MET value for *cycling for transportation* to 5.4. The 2011 Compendium of Physical Activities has updated the MET values in comparison to the scoring method of the IPAQ from 2005. Walking for transport represents the mean of *walking for pleasure* (3.5), *walking for transportation 2.8–3.2 mph, level, moderate pace, firm surface* (3.5), and *walking, to work or class* (4.0). Cycling for transport represents the mean of *bicycling, <10 mph, leisure, to work or for pleasure* (4.0) and *bicycling, to/from work, self-selected pace* (6.8).

Data Source and Study Population

We used our new questionnaire along with a computer-assisted telephone interview (CATI) in five German cities: Berlin, Düsseldorf, Erfurt, Jena, and Munich. The survey took place from 30 May 2013 to 22 June 2013.

In order to generate a representative sample for each city, a sample of telephone book entries for landlines, using the Gabler-Häder approach, was generated.¹⁷ With this approach, the last two digits of a telephone number are randomly varied by a computer to include people who cannot be found in the telephone book. Overall, 25,887 telephone numbers were generated.

During the inquiry phase, 19,686 numbers were contacted. Out of these, 11,434 numbers were invalid, so that 8252 contacts came about. Out of these, 1688 people refused to grant an interview. Another 5608 interviews could not take place because the contact could not be reached, the quote was already met, or other technical reasons prevented the interview. In total, 989 complete interviews were conducted, which corresponds to a response rate of around 37 %. The participation in the interview was voluntary. No incentives were used.

Our approach attempts to measure physical activity within a city core. Therefore, conducting the survey through landline telephones allowed, on the basis of the German telephone number system, a narrowing of the person contacted on the respective city areas, so that only the urban core without outlying neighborhoods is detected.

In addition, the respondents were quoted by age and gender, and the last-birthday method guaranteed that not the person picking up the phone was always questioned. Every household was called up to a maximum of five times until the responder was contacted, because different people have different times when they are at home.

Table 1 presents the basic statistics for the sample. The partitioning of the age groups is based on the changing motivations for sport participation so that there is a significant difference between the motivations of every age group.¹⁸

The χ^2 goodness-of-fit test for gender and age group has proven the representativeness of the study for every city: Berlin ($\chi^2=12.821$, $p=.171$), Düsseldorf ($\chi^2=15.374$, $p=.081$), Erfurt ($\chi^2=3.215$, $p=.955$), Jena ($\chi^2=11.987$, $p=.214$), and Munich ($\chi^2=7.978$, $p=.536$)

RESULTS

The five cities compared here show differences in active transportation levels and active sports levels (see Tables 2 and 3). The tables show the MET values that are reached separated for the five participating cities for the age groups, respectively. From this, we can see that the city with the highest level of sporting activity is not the city with the highest active transportation level. Erfurt and Jena are both ranked at the bottom for active sports. In contrast, Erfurt reaches the highest value for active transportation.

The differences between the cities in the active sports index are insignificant ($\chi^2=5.557$; $p=.235$). The gender comparison for active sports shows another inconsequential difference between male and female respondents. Overall, males reached significantly higher MET values than females (*Mann-Whitney U*=106,521; $p=.015$). Table 2 shows further variations between the cities. However, between Jena (*Mann-Whitney U*=5856.5; $p=.996$), Berlin (*Mann-Whitney U*=10,487; $p=.226$),

TABLE 1 Basic statistics for the sample

	Berlin		Düsseldorf		Erfurt		Jena		Munich	
	Sample	Quote	Sample	Quote	Sample	Quote	Sample	Quote	Sample	Quote
N	184		166		207		226		206	
Gender										
Male	42.9	49.0	42.8	46.6	46.9	47.8	42.9	48.5	49.5	48.7
Female	57.1	51.0	57.2	53.4	53.1	52.2	57.1	51.5	50.5	51.3
Age groups										
18–25	6.5	11.4	9.6	10.5	7.7	9.8	7.1	12.0	8.7	11.6
26–35	19.0	18.4	10.2	18.4	15.5	16.0	18.1	17.6	17.5	14.7
36–45	14.1	17.0	19.3	18.9	19.3	16.0	16.8	17.6	14.1	18.4
46–59	27.2	24.6	27.7	23.1	24.2	26.1	26.1	21.6	30.6	25.0
60+	33.2	28.6	33.1	29.1	33.3	32.1	31.9	31.1	29.1	30.4

TABLE 2 Variations between the cities

	Berlin	Düsseldorf	Erfurt	Jena	Munich	Overall
Active sports index	660	630	450	480	675	630
Male	660	1012	660	480	900	798
Female	702	519	420	482	630	540
Active transport index*	810	777	849	614	555	777
Male	777	873	925	555	497	752
Female	955	608	794	666	666	777
Cycling for transport**	402	420	327	259	301	336
Male	425	484	251	325	273	340
Female	384	372	395	211	329	332
Walking for transport***	389	497	621	444	333	444
Male	361	555	534	333	310	426
Female	497	444	666	471	389	444

*Significant difference between cities ($p=.011$)

**Significant difference between cities ($p=.020$); regarding "cycling for transport," the median was zero for nearly all cities; therefore, the mean is shown in order to be able to get some conclusion. Only in Düsseldorf the median for the males excided zero (median=52)

***Significant difference between cities ($p=.035$)

and Erfurt (*Mann-Whitney U*=10,487; $p=.226$), there are no significant differences between male and female.

Comparison of the active sports index among age groups (Table 3) shows significant ($Chi^2=25.684$; $p=.000$) variation. Older respondents report less sporting activity. This held true both for male ($Chi^2=16.528$; $p=.002$) and female ($Chi^2=12.154$; $p=.016$) respondents. The 60+ age group attained the lowest scores for sporting activity.

The findings in active transportation show something else. Overall, there are significant ($Chi^2=13.124$; $p=.011$) differences between the cities but not between

TABLE 3 Levels of active transportation

	18–25	26–35	36–45	46–59	60+	Overall
Active sports index*	915	900	720	660	336	630
Male	1320	1236	900	675	420	798
Female	732	840	621	639	330	540
Active transport index**	649	828	888	729	500	777
Male	482	777	866	666	637	752
Female	777	991	973	777	444	777
Cycling for transport***	353	421	425	377	207	336
Male	346	357	433	348	255	340
Female	357	455	417	407	174	332
Walking for transport****	455	555	555	444	333	444
Male	241	497	497	389	333	426
Female	498	666	666	444	284	444

*Significant difference between the age groups ($p=.000$)

**Significant difference between the age groups ($p=.000$)

***Significant difference between the age groups ($p=.000$); regarding "cycling for transport," the median was zero for all age groups; therefore, the mean is shown in order to be able to get some conclusion

****Significant difference between the age groups ($p=.017$)

male and female. Differentiating between walking and cycling for transportation shows that there are significant differences between the cities for walking for transportation ($Chi^2=10.376$; $p=.035$) and also for cycling for transportation ($Chi^2=11.692$; $p=.020$). But there are no significant differences between male and female in walking or biking.

Across age groups, we found significant differences in active transportation ($Chi^2=23.395$; $p=.000$). Table 3 shows the highest levels of active transportation are reached between the ages of 26 and 45. After age 45, respondents used active transportation less. A comparison across the age groups shows differences between males and females. There are no significant differences for males ($Chi^2=5.538$; $p=.236$). For females, the differences are significant ($Chi^2=26.561$; $p=.000$).

Our findings show significant differences for biking ($Chi^2=38.666$; $p=.000$) and walking for transportation ($Chi^2=11.997$; $p=.017$) between age groups. But for males, there are neither significant difference for cycling for transportation ($Chi^2=7.366$; $p=.118$) nor for walking for transportation ($Chi^2=2.459$; $p=.652$) between the age groups. For females, the differences between the age groups are significant for cycling for transportation ($Chi^2=38.393$; $p=.000$) and walking for transportation ($Chi^2=14.989$; $p=.005$).

The comparisons between “cycling for transport” and “walking for transport” are problematic. The median for “cycling for transport” was zero for every city. Comparing the mean values for cycling for transport with the median values for walking for transport shows a higher value for walking in most of the cities. Differences between the cities in both categories can also be seen.

The comparison between sporting activities and active transportation shows that people reach higher MET values through active transportation. The exception is Munich. Here, the citizens reach higher MET values through sports. When comparing the age groups, people from age 18 to 35 reach higher MET values through sporting activities than respondents over age 35 years through active transportation.

DISCUSSION

Previous studies suggest that the physical environment has an influence on the physical activity of people.^{19,20} Thereby, the physical environment can operate as a barrier, a facilitation condition, or contextual influence.²⁰ Our approach attempts to demonstrate how the behavior of people with regard to physical activity can be explained by the organization of the physical environment in different cities and how these findings can be used to develop relevant policies and effective interventions on a city level.

Our data shows variation in sports and physical activity in terms of MET levels between cities and suggests a direction for urban development and planning. Having a healthy environment as their goal, our study recommends a starting point for planning city development. First, the question arises which area should be prioritized. The active sport index values are below the active transportation index of values in nearly every city, even though indications point, not directly to decline of sporting activity but to everyday activities that are responsible for problems such as cardiovascular disease and obesity.³

Moreover, the organization of sports is not a foundational urban task. Even though cities may traditionally provide necessary facilities and support clubs financially, they do not have direct influence on the physical activity of the

population through such action. However, with respect to efforts to increase physical activity by improving the infrastructure (by constructing of bicycle paths) or by supporting political policies (for example, promoting tax incentives for bicycle paths), the situation is vastly different. In these ways, urban development can have direct influence on the physical activity of its residents. Therefore, cities wanting to promote a healthy citizenry must give infrastructure policies priority over the promotion of sports.

With respect to active transportation, we showed significant differences between the cities as well as between the age groups. While respondents aged 18 to 25 compensate low levels in active transportation with high levels of sporting activity, respondents over the age of 46 reported the lowest levels of active transportation and sports. Therefore, it may be necessary to develop strategies to target this age group. The following barriers that prevent those population groups from participating in physical activity were identified:^{21,22} people over age 65 perceived their neighborhood as unsafe and are consequently less likely to be engaged in walking as a leisure time physical activity. Furthermore, lack of time, long-term illness, injury, and lack of skills were identified as important barriers for older adults. Environmental barriers for participating in physical activity are weather, extreme temperatures, presence or quality of sidewalks, and no place to sit down during a walk. Finally, a lack of understanding related to how regular, moderate physical activity can benefit health appears to be a barrier for participating in physical activity.

Narrow differentiation between modes of active transportation provides a more detailed starting point for urban development. The median of zero for cycling for transportation shows that generally only a small part of the population uses the bicycle as means of transport. With the intention of increasing physical activity by active transport, it is important to see to the extension of bicycle paths.

A study by Stronegger and colleagues shows that men and women differ in the usage of walking and biking as a means of transportation. Men will more often use a bicycle for transportation while women will go on foot.²³ Our data does not support this conclusion. There is no significant difference in cycling for transport (*Mann-Whitney* $U=114,757.5$; $p=.246$) and walking for transport (*Mann-Whitney* $U=104,867.5$; $p=.131$) between men and women. Furthermore, there are significant differences between age groups across the cities we studied. The first thing to note is that there is a need for further research into the causes for the differences between the cities. The second noteworthy point is that city development must initiate actions to increase the cycling and walking of the age groups with lower MET values. One general starting point is that the local infrastructure such as shops or leisure facilities should be engineered so as to ensure equal ease of access by walking and biking.²³ At the same time, it will be important to clearly divide bike paths from roadways or sidewalks because the presence of skateboards and cyclists on footpaths could be a negative influence on walking for transport.²²

Overall, a pedestrian friendly environment has safe and simple crosswalks, pavement continuity, a reduced flow of traffic, and the availability of shade and benches and other places to rest. Additionally, esthetic features, like greenery and clearly marked paths, are important.^{22,24} Specific to biking as transport, wide bicycle lanes or paved shoulders have a positive effect.²²

The availability and accessibility to bike paths and sidewalks can lead to a higher value of physical activity. Moreover, the evidence indicates that the accessibility to leisure facilities such as parks, shops, recreation areas, and schools is an important

environmental factor to increase physical activity.^{20,22–24} Thus, planning a diversified local infrastructure in combination with the design of footpaths and cycle ways could be a promising approach to enhance physical activity for transportation purposes.²³

One of the most important facilities is exercise facilities for sports. Even though it was given a subordinate priority, sport remains a very important factor in increasing physical activity of the population. Given the limits of an active daily routine, sports are a very good opportunity to be physically active and improve one's health. The availability and proximity of exercise facilities lead to higher levels of physical activity for certain demographic groups and leads to an overall increased frequency in physical activity participation.²⁵ The access to existing facilities can be increased by reducing structural and environmental barriers such as the affordability and location of exercising facilities in a given city.^{13,24} The sport facilities should be as close to the potential users as possible so that they should be concentrated in areas of high-density population. Then, different sport facilities are serving different size catchments so they can be arranged as a hierarchy to provide sporting ground for the whole city population.¹³

Comparing the active sports index between the age groups shows that young people reach relatively high MET values through sporting activities. Age groups over 60 years are hardly active in sports. So a city should establish or support sports programs especially targeted to this group. Research generally reports health concerns, lack of knowledge, fear of falling or injury, time constraints, and lack of transportation as barriers for the participation of older adults. But there is also research that suggests that barriers are not responsible for the nonparticipation of older adults. Smith and colleagues show that "males are more likely to be nonparticipants as a function of availability of the activity, while females are more likely to be a nonparticipant due to a lack of time. Nonparticipation is not related to a lack of motivation in males and is not related to a lack of energy in females."²⁶

Overall, the research shows a positive influence of physical activity facilities on the physical activity. To the physical activity facilities count: places to safely walk or ride a bike, publicly owned multi-purpose recreation trails, facilities, places and programs that are designed specifically for doing physical activity and sports and places that can be used for physical activity. The facility availability as part of the physical environment has an effect even independent of other factors such as education, family income, self-rated health, intention, self-efficacy, perceived barriers, or perceived health benefits. It turns out, however, that perceived facility availability has a stronger effect on people with higher education level than on those with lower education level.¹⁹ Therefore, it is not only necessary to build enough facilities for physical activity but to ensure that people know where to find these facilities to raise the level of physical activity.

All our findings show that a new perspective is needed for municipalities dedicated to promoting health and activity levels. The separation of responsibilities between traffic department, sports office, and public health department should be abolished to create effective common policies for a general improvement in the health of its citizens. It is required to have programs which include all three perspectives. Especially since it has been shown that community-based health promotion can only be successful through intersectoral collaboration and partnerships with several community organizations like schools, transport agencies, or health care organizations.²⁰ Therefore, networks should be created which promote the exchange of best practices between various professional interests.

When interpreting our results, some limitations of our study should be considered.

First, our study has a cross-sectional design and was conducted during the early summer from May until June. During this time, the physical activity of the city's population is likely to be highest because the weather provides optimal conditions. It can be assumed that, especially during the winter time, significant lower levels of physical activity can be achieved. Further research should take these differences into view to investigate the differences between the cities in terms of season. With a multipoint cross-sectional design through all seasons, city indices can be differentiated and a longitudinal study could investigate the changes that come with the seasons on an individual level.

Second, our sample with around 200 respondents in five cities was relatively small. In further research, the study should be implemented in more cities with a larger number of respondents. With a larger number of cities, a better comparison between the cities would be possible, and with a larger number of respondents, a possible response rate bias could be reduced.

In view of continuing this research, an active work index for the development of policies of cities should be taken into account, due to the effect that an active workplace can have positive consequences on the health of the population, though not as high as the effects of physical activity during leisure time or transport.^{3,27} For the actions of urban development, it is necessary to have impact analyses for specific measurements of increase in physical activity of the population. By comparing the programs for active transportation and the design of sports infrastructure between different cities, it will be possible to identify best practices to raise the level of physical activity of all urban inhabitants.

ACKNOWLEDGMENT

The authors gratefully thank Mr. Thomas Ritter from the CATI-Laboratory of the University of Jena (Germany) for his support and the whole data collection team. This study was conducted without any third-party research grants.

REFERENCES

1. Edwards P, Tsouros AD. *A healthy city is an active city: a physical activity planning guide*. Copenhagen: Denmark; WHO Regional Office for; 2008.
2. Cavill N, Kahlmeier S, Racioppi F. *Physical activity and health in Europe: evidence for action*. Copenhagen: Denmark; WHO Regional Office for; 2006.
3. Abu-Omar K, Rütten A. Sport oder körperliche Aktivität. *Bundesgesundheitsbl Gesundheitsforsch Gesundheitsschutz*. 2006; 49(11): 1162–1168.
4. Vlanhov D, Freudenberg N, Proietti F, et al. Urban as a determinant of health. *J Urban Health*. 2007; 84(1): 16–26.
5. WHO (2010). *Global recommendations on physical activity for health*. WHO; 2010. http://whqlibdoc.who.int/publications/2010/9789241599979_eng.pdf. Accessed 17 Jul 2013.
6. United Nations. *World urbanization prospects: the 2011 revision*. United Nations, Department of Economic and Social Affairs, Population Division; 2012 CD-ROM Edition.
7. Statterthwaite D. Will most people live in cities? *BJM*. 2000; 321(4): 1143–1145.
8. Duhl LJ, Sanchez AK. *Healthy cities and the city planning process: a background document on links between health and urban planning*. WHO Regional Office for Europe; 1999. <http://www.euro.who.int/document/e67843.pdf>. Accessed 31 May 2013.

9. Caspersen CJ, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Rep.* 1985; 100(2): 126–131.
10. Foster C. *Guidelines for health-enhancing physical activity promotion programmes*. HEPA Network; 2000. www.panh.ch/hepaeurope/materials/Guidelines%20HEPA%20Europe.pdf. Accessed 17 Jul 2013.
11. Mensink G. *Beiträge zur Gesundheitsberichterstattung des Bundes - Bundes-Gesundheits-survey: Körperliche Aktivität*. Robert Koch-Institut; 2003. http://www.rki.de/DE/Content/Gesundheitsmonitoring/Gesundheitsberichterstattung/GBEDownloadsB/koerperliche_aktivitaet.pdf?__blob=publicationFile. Accessed 17 July 2013.
12. Horn M, Gans P. Sport als Wirtschafts-und Standortfaktor. *Geogr Rundsch.* 2012; 16(5): 4–10.
13. Bale J. *Sports geography*. 2nd ed. London: England; Routledge; 2003.
14. Steinhardt M, Völpel H. Champions des Sports 2008 – Ein empirischer Vergleich deutscher Sportstädte. *HWWi Policy Paper 1–9*. 2008. http://www.hwwi.org/uploads/tx_wilpubdb/HWWI_Policy_Paper_1-9.pdf. Accessed 17 July 2013.
15. Sjöström M, Oja P, Hagströmer M, Smith BJ, Baumann A. Health-enhancing physical activity across European Union countries: the Europarometer study. *J Public Health.* 2006; 83(2): 291–300.
16. Ainsworth BE, et al. Compendium of physical activities: a second update of codes and MET values. *Med Sci Sports Exerc.* 2011; 43(8): 1575–1581.
17. Gabler S, Häder S. Erfahrungen beim Aufbau eines Auswahlverfahrens für Telefonstichproben in Deutschland. *ZUMA-Nachr.* 1999; 44(1): 45–61.
18. Daumann F, Heinze R, Römmelt B. *Veränderungen der Sportmotive im Lebenslauf - Grundlage eines mitgliederorientierten Managements im Sportverein*. Vortrag zur 17. Jahrestagung des Arbeitskreises Sportökonomie e.V. vom 03. - 04.05.2013 in München zum Thema “Evolution und Revolution im Sport”. Schorndorf: Germany; Arbeitskreises Sportökonomie e.V.; 2013.
19. Pan SY, Cameron C, DesMeules M, Morrison H, Craig CL, Jiang X. Individual, social, environmental, and physical environmental correlates with physical activity among Canadians: a cross-sectional study. *BMC Public Health.* 2009; 9: 21. doi:10.1186/1471-2458-9-21.
20. Humpel N, Owen N, Leslie E. Environmental factors associated with adults’ participation in physical activity. *Am J Prev Med.* 2002; 22(3): 188–199.
21. Brawley LR, Rejeski WJ, King AC. Promoting physical activity for older adults. *Am J Prev Med.* 2003; 25(3Sii): 172–183.
22. Pikora T, Giles-Corti B, Bull F, Jamrozik K, Donovan R. Developing a framework for assessment of the environmental determinants of waling and cycling. *Soc Sci Med.* 2003; 56(8): 1693–1703.
23. Stronegger WJ, Titze S, Oja P. Perceived characteristics of the neighborhood and its association with physical activity behavior and self-rated health. *Health & Place.* 2010; 16(4): 736–743.
24. Heath WG, Parra DC, Sarmiento OL, et al. Evidence-based intervention in physical activity: lessons from around the world. *Lancet.* 2012; 380(9838): 272–281.
25. Merom D, Baumann A, Vita P, Close G. An environmental intervention to promote walking and cycling—the impact of a newly constructed Rail Trail in Western Sydney. *Prev Med.* 2003; 36(2): 235–242.
26. Smith KL, Carr K, Wisemann A, Calhoun K, McNevin NH, Weir PL. Barriers are not the limiting factor to participation in physical activity in Canadian seniors. *J Aging Res.* 2012. doi:10.1155/2012/890679.
27. Hu G, Sarti C, Jousilahti P, Silventoinen K, Barengo NC, Tuomilehto J. Leisure time, occupational, and commuting physical activity and the risk of stroke. *Stroke.* 2005; 36(9): 1994–1999.