Geography and Health
– A Nordic Outlook
13. Physical Activity Behaviours and Environmental Well-being in a Spatial Context

Peter Schantz

Introduction

Every form of physical activity takes place in a certain physical environment. These settings can either be a specific delimited place, a facility or building (e.g., a school yard, a soccer field or a gymnastic hall) or they can be traces of movement in landscapes (e.g., after a walk in a forest, a kayak trip or a bicycle trip to work), and they can also be combinations of these two categories.

If they had been mapped, we would have been able to see a vibrant development of artefacts connected with physical activity in the landscapes during the 20th century in Sweden. Just think of all the sport facilities, playgrounds, parks, walking paths in the mountains and exercise trails in the neighbourhood forests that were created during that period. In line with this, there was also a state-driven planning for the protection of landscapes of national value for outdoor life and recreation (Civildepartementet 1971; Kungl. Maj: 1972). The climax in this respect occurred during the last decades of the Swedish welfare state, sometime during the 1970–80s. However, when we look at this period more closely it also becomes apparent that all forms of physical activity were not facilitated. Support for active transport by means of an infrastructure for cycling was not part of the dominant planning and investment agenda (Emanuel 2012a,b). Beginning with the 1990s, a neoliberal era followed, and with it a waning of interest in this respect by both the state and the municipalities was noted. Physical activity then became an issue that was up to the individual to solve on his/her own. Interestingly, this change in perspectives was followed by the establishment of a large number of private gyms. Consequences of the changed societal climate with respect to facilities for sport organisations are presented in a recent report from the Swedish Sport Federation (Riksidrottsförbundet 2012).

Given the potentially important effect of physical activity on public health (cf. Pedersen & Saltin 2006), the health-geographical dimension of physical activity is of clear relevance in many fields of study. In our times this dimension is also of importance for understanding, e.g. the effects of urbanisation, as well as ethnic and social segregation in urban areas (cf. Svastisalee et al. 2012). Furthermore, there is a great need to know more about circumstances in which levels of health-enhancing physical activity (cf. Haskell et al., 2007) can be encompassed within the population and at the same time contribute to a sustainable development (Schantz 2002a,b; Schantz & Lundvall 2014).

Considering all the above, it can be seen as a curious truth that scientific descriptions and analyses of physical activity and conditions for it in a spatial context are a very recent phenomenon. This is reason enough to start this chapter by placing the current interest in the physical activity–environment relationship in a historical context. Afterwards, some principal aspects of the relationship between physical activity, the environment and health will be illuminated. This
will be followed by a listing of examples of different paths taken so far, particularly in Sweden, to analyse these relationships.

Spatial analyses of physical activity in an historical context

Every scientific field has its own developmental phases. Physical activity in a context of higher education is a field with 200 years of institution-bound history in Sweden. The point of departure is 1813 when Per Henrik Ling got permission to create The Royal Gymnastic Central Institute (GCI) in Stockholm, Sweden, now known as The Swedish School of Sport and Health Studies, GIH. Ling searched for ways to place the practice of physical activity, then focusing on gymnastics, into a framing context of the laws of the human organism (Ling 1840). This was in itself an important step. A side-effect was, however, that it initiated an individually and bodily oriented focus within the field that, with few exceptions in terms of signs of interest (Åstrand 1957; 1972; 1980), remained intact and totally dominant until the beginning of the 1990s. Then the first Swedish texts were published that, from within the field of physical activity, marked the start of a continuous interest in developing research related to the role of physical environments for physical activity (Schantz 1990; Schantz 1991; Schantz et al. 1991). The lateness in this development may be seen as being a reflection of the dominant era of Ling gymnastics, which had a focus on the establishment of gymnastic halls and their interior design. However, with the wider introduction of sports and outdoor life recreation in society as well in the school curriculum at the beginning of the 1900s (cf. Lundvall & Schantz 2013), the treatment of the external environment in a broader context became relevant. But still, the total dominance of an individually oriented focus remained in this academic sphere during almost all of the 20th century.

The development in Sweden essentially mirrors that noted internationally in this field of education and science. An illustration of this came in 1990 when the pioneering and prominent American behavioural researcher James Sallis and his co-workers (Sallis et al. 1990) summarised the status of the American, as well as the international, research field in the following terms: ‘Although personal determinants of exercise behaviour have been studied extensively, few investigators have examined the influence of the physical environment on exercise habits.’ In fact, their study is probably the first example of a spatial analysis of the environment (mapped home addresses of a population sample and exercise facilities in San Diego, California) in relation to individual physical exercise habits. However, after that study not much really happened in this respect during the 1990s. But preparations to develop research strategies were undertaken, and they came into full bloom during the beginning of the new millennium. Early examples of this were the efforts by Saelens et al. (2003) and Humpel et al. (2004), who studied the relation between a rather wide set of perceived neighbourhood characteristics and levels of physical activity within population samples in the USA and Australia. That research strategy was also adopted fairly soon in Sweden; see below.

At least three important historical dimensions affected this alteration in the scientific scene. The first is that the field changed during the 1990s from one focusing on exercise and sports-oriented training at rather high intensities, to one viewing physical activity in much wider terms (cf. Kohl et al. 2006; Lundvall & Schantz 2013; Wahlgren 2009). This was true with regard to both the intensities of physical activity and the types of physical activity considered to be relevant. Most explicit were the changed perspectives on everyday-life physical activities performed with moderate intensity, such as walking and cycling, which became relevant forms of physical activity in a health perspective. This was to a great extent due to a groundbreaking document in the field published by the Surgeon General of the USA and given the all-inclusive title ‘Physical Activity and Health’ (U.S. Department of Health and Human Services 1996). The previously normal limitations of physical activity to ‘sports’ and ‘exer-
cise’ were left out in that document and, in terms of research (scientific topics, journals, organisations and conferences), education and general promotion, the field has changed dramatically since then (Kohl et al. 2006; Kohl & Hootman 2007; Lundvall & Schantz 2013).

The second historical impetus for this change was the obesity epidemics (cf. Kenney et al. 2012). This unexpected changeover during the 1990s functioned as a social driver in several ways. For example, the two countries first struck by the rapid gains in body weight in substantial portions of the population (USA and Australia) were also the first countries where strategies to understand the role of the physical environment for physical activity were developed (see above).

Finally, technological developments were also of importance for this changeover in research focus. The last two decades represent an enormous development in measuring both physical activity levels (accelerometers and pedometers) and performing spatial analyses (Geographic Information Systems, GIS, and Global Positioning Systems, GPS).

**Key perspectives on the relation between physical activity, environment and health**

Given that this is a relatively new field, I will now illuminate various general considerations when studying these matters: first, a model of factors determining the behaviour of physical activity, thereafter a choice of health perspectives, and then a discussion of some consequences thereof.

The behaviour of physical activity is in principle governed by external and internal factors (Figure 1). Geographic dimensions, such as density and variety of facilities, as well as their spatial distribution, are an example of external factors, which, however, include a number of other factors, e.g. social norms, time-wise accessibility, economic costs, sport and outdoor organisations. Internal factors include dimensions such as age, gender, physical capacity, self-efficacy, knowledge and motivation.

![Figure 1. The behaviour of physical activity is dependent on internal and external factors which, when integrated, lead to a decision to be physically active or not. Model modified from Schantz (2002b).](image)

The internal factor of motivation is often viewed as being of primary importance for the outcome of physical activity. In classical exercise and sport psychology, the focus of motivation studies has been, or been thought to be, on the motivation for the physical activity *per se*. However, motivation in relation to physical activity also needs to be understood in relation to external factors, not least physical activity environments, i.e. the physical environments where the physical activity takes place or may take place. For example, a person might be motivated to undertake the physical activity of cycling to work *per se*. But still, the behaviour does not occur. The reason for that can be that the existing route environments do not motivate to usage, e.g. due to appraisals of them as being unsafe. Thus, it is a great challenge to sort out the relevance of different factors for a behaviour, and for that purpose health geographical perspectives can be fruitful.

A central dimension of choice in this context lies in the way in which we look at health. I have chosen to make use of the official WHO definition which states that: ‘Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity’ (WHO 1948). In relation to the environment and spatial analyses, this paves the way for two
principally different perspectives, namely, the
effects of the external environment on (1) the
type and the amount (duration and frequency)
and intensity of physical activity per week over
the year, and on (2) the well-being while being
physically active. The effect of the external envi-
ronment on well-being is obviously only one of
several dimensions influencing the wholeness of
appraisal of well-being. This particular dimen-
sion of well-being is referred to here as 'environ-
mental well-being.'

An extensive knowledge base concerns the
effects of the amount and intensity of physical
activity on variables connected with physical
capacity, risks for disease, premature mortality,
overweight and obesity. It is therefore under-
standable that, up to now, efforts to understand
the relationship between the external environ-
ment and physical activity have been focused
on the outcome of physical activity behaviour.

Here I will argue for the need to view these
matters in a broader fashion. One main reason
for this is that a physical activity environment,
i.e. the environment in which physical activity
takes place, is in principle not synonymous with
a supportive environment for physical activity if we
by supportive mean that it is a stimulating envi-
ronment for physical activity. On the contrary,
a physical activity environment can be a neutral
or inhibitive environment in that respect, and
still physical activity can occur in it.

Thus, it is important to take into account the
fact that physical activity behaviours can occur
both owing to and in spite of conditions in the
external environment. This potential relational
disconnect is due to the multiplicity of motives
and conditions governing physical activity. For
example, the motivation to be physically active
per se can be strong and in itself override ad-
verse environmental conditions. Another pos-
sibility is that a physically active behaviour may
occur for other reasons than physical activity as
such. For example, all forms of active transport
have destination points that act as pull factors:
we need to, or we want to, travel to them. Thus,
there are complementary and perhaps primary
reasons and driving forces for these forms of
physical activity as compared to a possible mo-
tif of being physically active. Another scenario is
that active transport may be undertaken due to
poor, crowded or expensive public transport (cf.
Emanuel 2012a,b), or due to that it saves time
when traffic is congested. For all these reasons, a
motivation can be induced for the active trans-
port to take place in spite of, and not due to, the
existing environmental conditions.

Another type of difficulty in studying the en-
vironment–physical activity relationship is that
environmental conditions might be viewed as
perfect for physical activity in relation to a per-
son’s desires, but still, the behaviour might not
occur due to, for example, a lack of time. And
already before the wide-scale introduction of
the Internet and e-mail information technol-
ogies, the lack of time was considered to be a
major barrier to physical activity in Europe and
elsewhere (Zunft et al. 1999; Trost et al. 2002).
Thus having environmental conditions that sup-
port physical activity might be necessary, but not
enough to evoke a physically active behaviour.
This will mask the value of the environment per
se, and make studies on the effects of the external
environment on behaviour difficult. Thus, the
potential relational disconnect between the ex-
ternal environment and the behaviour of physical
activity needs to be considered when attempting
to study these matters.

To further expand on this complexity, the pos-
sibility of so-called 'substitution' is important to
consider. It relates to the fact that physical activ-
ity may occur within five different temporal do-
 mains: three during leisure and two during work:

1. During leisure, in such activities as sports and
   recreation
2. During leisure, in everyday activities, such as
daily chores
3. During leisure, as transport
4. During work, as part of the work itself
5. During work, as part of health promotion during
   paid working hours
Substitution in this context means that an expansion of physical activity within one of these temporal domains can lead to diminution, and even cessation, of the physical activity in another temporal domain. This phenomenon has been described in both qualitative (Kardell & Pehrson 1978) and in quantitative studies (Goran & Poehlman 1992). For example, getting a job that demands a lot of physical activity can lead to lowered levels of physical activity during leisure time. A side effect of this is that the relevance of the external environment for physical activity during leisure time may decrease. From a health perspective, it does not matter in which temporal context one accumulates the physical activity, but in order to understand what governs our physical activity behaviour we need to know the levels physical activity in each temporal domain, and ideally to what extent it is influenced by the external environment in each of the temporal domains.

Another dimension of substitution relates to flows of physical activity between different forms of physical activity, but within a certain temporal domain. For example, an adolescent might drop out from a certain sport, but start to be active in another form of sport, all being undertaken during leisure time. Another example is when a person shifts from cycling to walking to work for reasons of seasonality, such as darkness and slippery road conditions during the wintertime.

Thus, although studies on the relation between the environment and the behaviour of physical activity are important to undertake, there is a need for well tuned research strategies and cautious interpretation of the results.

Another equally important aim is to understand the relation between the external environment and well-being when being physically active, i.e. the environmental well-being. One aspect of well-being is the hedonic dimension (cf. Ryan and Deci 2001). To measure the effect of the environment on that form of well-being, we need a relevant terminology. For that purpose there is a need to distinguish between appraised positions along a non-pathological continuum ranging from negative ratings to indifferent or neutral ratings, and ending in positive ratings. The latter position is normally expressed as high levels of well-being. As a term for the negative end of this continuum, it is suggested that the term ‘unwell-being’ is used.

Environmental well-being has the benefit of being an outcome that can be directly understood, and is easy to communicate. Furthermore, it is reasonable that in the world of politics and societal planning, caring for the well-being of citizens is, hopefully, a likely aim. It is also worth mentioning that aspects of well-being in connection with physical activity can be evaluated in monetary terms (cf. Saelensminde 2004), and that is so irrespective of whether or not there are alterations in the levels of physical activity caused by the environment. Thus, environmental well-being is a benefit in and of itself. Finally, external environments that induce a sense of environmental well-being are, logically, external factors that facilitate and thereby support physical activity.

To summarise, the external environment in relation to physical activity can be analysed along two different lines: (1) the physical activity behaviour in quantitative terms and (2) the environmental well-being, as depicted in Figure 2.

A third line of analysis of interest in health geography is the influence of the external environment on the qualitative dimension of physical activity, i.e. which forms of physical activity are executed, how, where and why.

Before presenting some examples of approaches used to study these relations, a utilitarian perspective on the value of knowledge in this field is worth defining. The best studies on physical activity behaviours in the population point at the fact that, both in Sweden and the USA (Hagströmer 2007; Troiano et al. 2008), only a few per cent of the population meet the minimum levels of physical activity recommendations. Thus, understanding the relationship between the external environment, physical activity behaviours and environmental well-being is of clear interest.
Spatially oriented physical activity studies – some examples

Health-related geographical studies on physical activity can be on all spatial scales, from the micro to the macro level. In this section studies ranging from the very local level (pre-schoolyards) to a regional level (route environment appraisals) will be illuminated from primarily a point of view of methodology. The focus is on studies from Sweden.

Distance and the road taken

Distance is a variable of pivotal importance for positioning factors in the landscape and understanding the distance relationships between them, and the consequences thereof. For example, when evaluating the possibility of cycling to work in a city, it is necessary to know the route distance relationships between homes and workplaces within the population. Distance can be viewed as a trivial variable, but we know from environmental psychology that it is, in itself, surprisingly difficult to appraise correctly, and that it also depends on both usage and route environmental factors (see, e.g., Crompton & Brown 2006). Moreover, not only are appraisals most often systematically wrong, but the spreading in ratings is also large, which makes self-reported distances a clearly unsure variable.

With the aim of studying active commuting by walking and cycling to work in Greater Stockholm, the capital region in Sweden (see: www.gih.se/pacs), this problem was quite intriguing, and it was therefore decided to try to develop a methodological criterion for measuring commuting route distances (Schantz & Stigell 2009). For this

Figure 2. Illustration of two principally different effects of the external environment on dimensions of health. One relates to the behaviour of physical activity in terms of the amount (frequency and duration) per week over the year, and the work intensity. The other relates to appraisals of the extent to which environmental conditions induce environmental well-being when being physically active. The figure is modified from Schantz (2012).
purpose, active commuters were asked to draw their normal commuting routes on maps with two weeks in between. A reproducibility check disclosed that the map drawings often varied slightly. Individuals with completely reproducible map drawings were then asked to wear a GPS device as they cycled along the route drawn. Another cyclist followed them to check if the device traced the route taken. The finding was that, yes, the GPS displayed the actual route taken, but cyclists’ routes sometimes displayed deviations from the routes drawn. These deviations had, however, only very minor effects on the total route distance. And in combination with other checks, the conclusion arrived at was that map-drawn commuting routes, when drawn by experienced bicycle commuters and measured using valid distance measurement apparatus, produce reproducible and valid distance measurements (Schantz & Stigell 2009). Later, a similar type of study was undertaken to check the external validity of these findings in relation to children. It was concluded that the children’s drawings of routes had greater deviations from the actual routes taken, and therefore it was necessary to base distance measurements on GPS traces of their movements instead (Badland et al. 2011).

Given the results for the experienced adult commuters, it was considered to be of interest to check whether different GIS-based route distance measuring techniques, that make use of origin and destination points, and GPS functioned just as well (Stigell & Schantz 2009). Later, a similar type of study was undertaken to check the external validity of these findings in relation to children. It was concluded that the children’s drawings of routes had greater deviations from the actual routes taken, and therefore it was necessary to base distance measurements on GPS traces of their movements instead (Badland et al. 2011).

American and Australian researchers were the first to develop and implement research strategies for dealing with the relationship between neighbourhood environments and levels of physical activity. These strategies spread rather rapidly internationally, and two doctoral theses have made use of them in Sweden. Bergman (2009) based his studies on perceived ratings of environmental items in neighbourhoods throughout the country, and combined this with self-reported levels of physical activity. Eriksson (2013) made use of objective measurements based on GIS-coded information in the municipality of Stockholm and monitored the levels of physical activity using both objective, accelerometry-based measurements and self-reported levels of physical activity.

Both theses tend to indicate that living in environments with a higher density of dwellings and destination points is associated with higher levels of walking. Findings based on subjective environmental and physical activity data from 11 countries point in the same direction (Sallis et al. 2009). However, whereas subjective measurements indicate up to half an hour of difference per day, the objective measurements of physical activity indicate that the difference might be small (3 minutes/day)(Sundquist et al. 2011).

These studies are cross-sectional in nature, which limits the interpretation of them in terms of causality. But there are more reasons to be wary of the nature of the findings. One such major reason is the fact that it is not known where the respondents were physically active during the week used for the measurements. If the neighbourhoods reflect the nature of the landscapes visited during the week, then the neighbourhood characteristics may be relevant. On the other hand, if that is not the case, we have reason to

Neighbourhoods and schoolyards

The Swedish forestry researchers Kardell and Pehrson (1978) were among the pioneers in studying the relation between the neighbourhood environment and physical activity – in their case, in terms of the number of visits to green areas in Greater Stockholm. Among their findings were indications of a barrier effect of arterial roads when located between residential areas and green areas. Unfortunately, these studies were not followed up by further studies of that kind.
ask what these other characteristics mean for the respondents’ physical activity behaviours.

The need to know where people are physically active over the day in this type of research points to making use of the time-geography perspectives and principles developed by the Swedish human geographer Torsten Hägerstrand (see e.g. Hägerstrand 1985; Ellegård & Svedin 2012). Today, with the GPS available, the realisation of such descriptions of physical activity is facilitated and warranted as part of future study designs. However, not only is it necessary to know where people are active, but also in what way, as well as to determine how specific external environmental settings may affect the specific form of physical activity undertaken (cf. Giles-Corti et al. 2005).

Schoolyards are normally small spatial units, and are therefore rather easy to map in detail and to study in terms of well-controlled comparative analyses of environments and levels of physical activity. Studies have made use of preschool outdoor settings and monitored the spontaneous physical activity, as measured by pedometry, of 4- to 6-year-old children at 20 preschools in Stockholm County and the City of Malmö in Southern Sweden (Boldemann et al. 2006; Boldemann et al. 2011). These studies indicate that more steps per minute are taken when the external environment is characterised by trees, shrubbery and broken ground (21 steps/min) in contrast to delimited environments with little vegetation (18 steps/min). Furthermore, the time spent outdoors was generally longer in the greener settings. The combination of more steps per minute and longer outdoor sessions results in about 1000–2000 more steps per day, which constitutes a quite considerable amount of physical activity.

Route environments and cycling

Route environments for cycling are an example of complex spatial settings that can be studied in relation to qualitative and quantitative dimensions of the behaviour of cycling, as well as environmental well-being (Figure 3). It has been suggested that the influence of causal factors behind these outcomes can be covered in three different appraisals of route environments (Schantz 2012; Wahlgren and Schantz 2011; 2012):

- Unsafety–safety due to traffic
- Unsafety–safety due to other causes (e.g., crime, weather or infrastructure)
- Inhibition–stimulation of the route environment for cycling

The two safety dimensions relate to risks of negative effects for an individual or his/her assets. Unsafety can thereby inhibit environmental well-being and a cycling behaviour, whereas safety can be regarded as permissive in these respects. In line with that, a number of studies have pointed out that unsafety of traffic constitutes a major barrier to cycling (Heinen et al. 2010; Kingham et al. 2011; Parkin et al. 2007). However, the safety variable does not give any indication of whether route environments in other ways inhibit, are permissive or stimulate cycling. For example, let us envisage a condition in which an individual feels perfectly safe; still, the route environment can be appraised as, for instance, dull or fascinating. It therefore appears to be appropriate to try to find out how route environments interact with individuals in other ways than through unsafety–safety. The question is then how these effects can be captured semantically. As indicated above, it has been suggested to phrase them in terms of whether the route environment can be appraised as inhibiting or stimulating for cycling (Wahlgren & Schantz 2011; 2012). It is reasonable that this dimension will also affect the well-being component when cycling. To what extent the variable inhibition–stimulation affects cycling behaviours has not, to our knowledge, been systematically studied. However, anecdotal evidence speaks in favour of such a role.

But how are these outcomes related to, for example, space and other forms of geographical information? In broad terms, they can be anticipated to be an outcome of the following five different environmental domains (Schantz 2012) (Figure 3):
- The physical environment (stationary objects)
- The traffic environment (mobile objects)
- The social environment (interaction between individuals)
- Weather (wind, temperature, humidity, precipitation)
- Light conditions (natural and artificial)

Each of these environmental domains contains different environmental variables that can vary considerably. This introduces difficulties when trying to understand which are the pertinent variables for creating the outflows in terms of the appraisals and the outcomes of behaviours and environmental well-being depicted in Figure 3.

To further understand these relations, there is a need for route environmental data covering all potentially relevant aspects that may affect the appraisals, or to create perception scales that include this wholeness of items. Based on, for example, studies indicating that the aesthetic aspects of neighbourhoods can be important for levels of exercise and recreational walking (Owen et al. 2004), and that such items are difficult to grasp in other ways than through subjective ratings, a scale which deals with perceptions of route environments in a context of walking and cycling to work has been developed (Wahlgren et al. 2010). It is called the Active Commuting Route Environment Scale (ACRES). There is one version of ACRES for walking (15 items) and another for cycling (18 items). The psychometric properties of ACRES in relation to cycling, and in terms of reproducibility and validity, have been checked out extensively, and found to meet the necessary demands (Wahlgren et al. 2010; Wahlgren & Schantz 2011; Wahlgren 2011).

Based on a sample of 1379 male and female commuting cyclists, the overall ratings of different route environmental variables and overall appraisals in the inner urban area have been compared with those in the suburban area of Greater Stockholm (Wahlgren & Schantz 2011). The distinction between these geographical spaces is illustrated in Figure 4, and an example of ratings is illustrated in Figure 5. Interestingly, these settings are clearly rated differently both in terms of the overall appraisals of ‘unsafety–safety of traffic’ and ‘inhibition–stimulation’ of cycling, as well as in terms of ratings of most environmental variables (Figure 5). The suburban settings stand out as being more stimulating to cycle in, as well as being safer from the point of view of traffic. Examples of variables that were perceived as being significantly different in the two environments were exhaust fumes, noise, flow of motor vehicles, congestion: all types of vehicles, and greenery.

Figure 3. A model summarising route environmental domains and different potential effects of them on individuals in relation to appraisals of relevance for cycling behaviour and environmental well-being. The hatched lines indicate potential relationships between the three appraisals at the intermediate level of the figure. The model is modified from Schantz (2012).
SECTION IV  Everyday life – safety, risks and health promotion

Figure 4. Aerial view from 2005 over the more central parts of Greater Stockholm, Sweden. The yellow line distinguishes the inner urban and the suburban as well as rural parts of the study area. The figure is reproduced from Wahlgren & Schantz (2011). (Copyright: Lantmäteriverket, Gävle, Sweden).

Figure 5. Commuting route environment profiles for males cycling in the inner urban and suburban areas. The corresponding patterns were true concerning the female commuter cyclists. Explanation of abbreviations: Only I = those who bicycle-commuted in only an inner urban area; Both I&S = those who bicycle-commuted in both inner urban and suburban environments; Only S = those who bicycle-commuted in only a suburban environment. Unfilled symbols represent ratings of the inner urban route environment. Filled symbols represent the suburban route environments. For all items, with one exception, the scale permitted ratings from 1 to 15. The exception was the item ‘bicycle paths’, which had a minimal value of 0 and a maximal value of 10. The figure is reproduced from Wahlgren & Schantz (2011).
This spatial environmental mapping is of marked interest in and of itself. But from the point of view of making use of these findings and implementing them in a traffic planning scheme serving the cyclists, the pertinent issue to sort out is which variables are important in evoking these different appraisals. For that purpose, multiple regression analyses of ratings from the inner urban route environment in Stockholm have been undertaken (Wahlgren & Schantz 2012). The results indicate that five environmental variables are responsible for differences in the ratings of whether or not the route environments were appraised as ‘inhibiting–stimulating’ for cycling. Two variables contributed in a positive way: (1) greenery and (2) beauty, whereas three variables contributed in a negative fashion: (1) exhaust fumes, (2) congestion: all types of vehicles and (3) course of the route in terms of detours, changes in directions, side changeovers, etc. (Wahlgren & Schantz 2012). Of specific interest here was that the items aesthetics and greenery stand out as mutually independent positive factors. With these kinds of analyses, it becomes apparent that it is not easy to evaluate the relationship between the environment and physical activity using only GIS data. Beauty, for example, is in the eye of the beholder.

However, significance is one thing, impact another. To get an indication of the importance of differences in the significant environment variables, their coefficients in the equation from the multiple regression analysis (Wahlgren & Schantz 2012) were used for simulations of varying degrees of negative and positive ratings for cycling (Figure 6). As can be noted, there was a great impact of variations in values on the x-axis on the outcome on the y-axis, i.e. whether, on the whole, the route environment inhibited or stimulated cycling. For further explanations, see the legend to Figure 6.

![Figure 6](image)

**Figure 6.** A simulation of the relationship between values for route environmental variables and overall inhibition-stimulation of route environments for cycling. Maximally negative values for cycling stand for ugly route environments, without greenery, with a lot of exhaust fumes and congestion as well as non-direct courses of the routes. Maximally positive values for cycling stand for the opposite. The figure is based on data in Wahlgren & Schantz (2012), and is modified from Schantz (2012).
So far, these issues have been studied using overall ratings of the whole individual route, or the whole part of it in the inner urban area. However, the Active Commuting Route Environment Scale can also be applied in analyses of different spatially delimited and environmentally homogeneous segments of routes. This can be of value both for scientific and applied purposes. Figure 7 illustrates an example of how appraisals of route environment segments can differ along a route in a suburban area in Greater Stockholm (Schantz 2012). Indeed, if these patterns of ratings are repeated in many subjects, a basis for changes in the route environment at specific points emerges. By means of quantitative and qualitative approaches as a follow-up, it should be possible to pin-point likely causes for both the low and the high ratings of the route environment segments. This is particularly so when combining knowledge gained from applied studies with the analytical approaches presented above.

**Summary**

Understanding the relationships between the external environment and environmental well-being while being physically active, as well as quantitative and qualitative aspects of behaviours of physical activity, are important perspectives of health geography. Given the potential significance of both physical activity and the environment for public health, this constitutes a central
developmental feature. In this chapter, different facets of objectives, methodology and research strategies have been illuminated. It is likely that there will be a dynamic development in this field of knowledge, and with the needs to support public health and a changeover to a sustainable development, there are good reasons for society to follow this development.

References


of Sport and Exercise, 5th ed. Human Kinetics, Champaign, IL.


Wahlgren, L. 2009. Från träning för kondition till fysisk aktivitet för hälsa: om synen på rekommendationer för allmänheten över tid [From aerobic training to physical activity for better health: views concerning recommendations for the general public over the passage of time], Svensk Idrottsforskning 1, 45-49.


