DANISH HEALTH AUTHORITY

How the urban environment impacts physical activity

A scoping review of the associations between urban planning and physical activity

2020

Content

Introduction

Physical activity is essential for public health. It can prevent premature death and a number of diseases, e.g. cardiovascular diseases and type II diabetes. Physical activity also boosts our mental health and the sense of well-being.

The options for physical activity are not limited to indoor facilities, i.e. sports facilities, indoor pools, or fitness centres. There are also outdoor options, where our activity level to a large extent is determined by the environment, we move in. Bike lanes are an invitation to ride a bike, for example. Footpaths encourage walking rather than using the car, and safe school routes make it easier for parents to decide whether to let children walk or bike to school rather than drive them. All in all, beautiful, exciting and safe environments encourage movement, and hence, the design of the urban environment is essential for citizen's level of physical activity. A growing part of the population choose to live in the city, and thus, city planning plays an increasingly important role for general public health.

The purpose of this publication is to make it easier for municipal decision-makers and civil servants to make informed decisions about designing the urban environment to encourages everyone to be physically active, regardless of age and social background.

The publication supports the findings of the Danish Health Authority's health promotion package on physical activity, and it presents the evidence on how the urban environment impacts the level of physical activity. The focus is entirely on the urban environment as a structural framework.

The publication presents a summary of national and international research and focuses on three areas:

- Urban design and infrastructure
- Urban green areas
- School settings.

These three foci were chosen based on an assessment of these areas having the greatest impact on municipal work in the field. Furthermore, there is a special focus on the target groups: children, adolescents, and the older adults.

In Denmark, the Planning Act defines the basic rules for how to design the urban environment. The purpose of the act is to bring social interests together, contribute to the protection of the country's nature and environment, create and preserve valuable buildings and involve the public in the planning process.

Over the years, a number of books and other materials have been published focusing on how design and planning of the urban environment can support people's physical activity. In 2005, the Danish Health Authority published "Fra cykelbarometer til tarzanjungle" ("From cycle barometer to Tarzan jungle") that stimulates thinking about how the physical environment may be included as a structural framework to encourage physical activity among the public. In 2007, it was followed by "Effekt af interventioner, som inddrager omgivelserne til at fremme fysiske aktivitet" ("The effect of interventions that include the environment to encourage physical activity") describing the effect of interventions changing the environment to encourage the citizen's level of physical. Most recently, the Danish Health Authority's health promotion package about physical activity introduced a general direction for municipal work on physical activity in relation to city planning, encouraging physical activity in everyday life.

In "How the urban environment impacts physical activity" we present new knowledge in the field in order for municipalities to make decisions and create frameworks that make it even easier for the citizen to be physical active.

The Danish Health Authority, February 2020.

Niels Sandø
Director - Prevention

Definition of concepts

In the literature, there are different concepts that are relevant to understanding the content of the publication. For this publication, the most important concepts are defined as follows:

Urban environment
In the publication, the environment is limited to only focus on the urban built environment. The focus is further narrowed down to a closer look at urban design, urban green areas and school settings. Hence, this publication does not include literature about rural areas, agricultural or nature environments. The criteria for the classification of an area as an urban environment are often based on following factors: Residential density, presence of urban infrastructure, e.g. paved roads, electricity or sewers, and presence of educational or health options[8]. In Denmark, a location must have 200 inhabitants to be defined as a town, whereas in other countries there must be 5,000-10,000 inhabitants to be categorized as a town[9]. The environment and the urban built environment are used synonymously in this publication.

Physical activity
Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure. The concept includes all movement from unstructured activity, e.g. play and active transportation, to structured and regular activity, e.g. football or gymnastics practice in clubs[1].

Recreational areas and facilities
Recreational areas include e.g., parks and green areas[10-12], while recreational facilities include e.g., paths, playgrounds and training equipment[11-12]. Both areas and facilities are related to leisure time activities[13], and they provide options for, e.g. relaxation, play, and training.

Destinations
Destinations describe the places that one can visit and use in the community, e.g. schools, workplaces, shops, shopping centres, restaurants and parks[14].

Land use
Land use is when an area is used for a specific purpose, typically divided in five types of land use: residential, agricultural, recreation, transportation, and commercial[15].
We distinguish between two types of land use:

- Mixed land use: Combination of residential, commercial, transportation and recreational land use characterised with many destinations
- Divided land use: Homogeneous area with fewer destinations.

Thus, a divided land use implies longer distances between home and e.g. work, schools, shops, bus stops, parks and clubs compared to an area with mixed land use with many destinations and shorter distances.

Walkability
Walkability is a measure of how friendly an area is for walking. It describes the availability of options to be physically active in relation to walking activities in a defined area and might be quantified based on a specific index[50]. A walkability index describing a defined area can be ranked by the extent to which it supports leisure or transport-related physical activity[51]. Neighbourhoods with high walkability are areas of many different destinations, e.g. grocery stores and parks close to the home, supported by a walking-friendly infrastructure[50]. Several studies show that physical activity behaviour is closely related to the walkability of the area[15, 38, 40, 49, 52, 53]. Walkability is influenced by factors like land use mix, street connectivity, residential density as well as aesthetics and safety[20, 37, 38].

Residential density
Residential density refers to the number of homes or individuals living in a defined area[19]. Residential density is an important factor for the level of physical activity[19, 20, 38, 41].

Summary

The purpose of this publication is to share knowledge on how planning, design, management and maintenance of the urban environment can enhance physical activity.

The publication is based on 73 reviews and meta-analyses that were identified through a systematic and exploratory literature search.

The publication focuses on three areas:

- Urban design and infrastructure
- Urban green areas
- School settings.

Furthermore, the publication has special focus on two target groups: children & adolescents, and older adults.

Access to physical activity options

High accessibility to physical activity options will in general promote physical activity. Accessibility is related to:

Diversified use of areas: There should be many different destinations, e.g. homes, shops, parks, bus stops and schools, within walking and biking distance as well as access to, e.g. recreational areas and facilities. Parks and green areas should be large and accessible. However, the size should match the number of users.
There should be variation in the areas with room for different activities. The facilities in parks should be placed, so that for example playgrounds are placed along pathways. Furthermore, access to benches, tables, public barbecue facilities, toilets, tap water, paths, lighted areas, and areas with both sun and shade will encourage visits to parks.

Infrastructure: The option of walking, biking and using public transportation must be available. It is essential that there are destinations and facilities within 400-1600 meters from the residence in combination with a large number of local bus, metro and train stops. The infrastructure should be coherent, structured like a grid and not have any unnecessary intersections that cause unnecessary stops on the way. In addition to the street network there should be well maintained pavements and high-quality bike lanes. An amplified effect could be achieved if pedestrians and cyclist are separated from all other traffic, e.g. by curbs, and if there are elements like streetlights, sufficient signage, street crossings and traffic calming measures. The width of the pavements and footpaths should be designed in accordance to their function and the number of users. Pavement with asphalt is better for cyclists, while an unpaved surface is better for pedestrians. Benches, dustbins, fences, pavilions and tap water along pathways encourage walking and biking. Furthermore, it is important for biking that good bicycle parking options are available.

Safety: The perception of safety is essential for decisions to be physical active. There should be traffic safety arrangements, e.g. pedestrian crossings, intersections with traffic lights, traffic calming speed bumps, and pathways that are separated from heavy traffic. Real and perceived fear of crime is seen as a barrier to physical activity.

Aesthetics: More people would be physically active with urban spaces that are perceived as aesthetic, comfortable and attractive. Citizens will be demotivated by vandalism, litter, graffiti and uncivilised behaviour in the neighbourhood.

Children and adolescents

The following factors influence the level of physical activity among children and adolescents:

Availability and coherence: Street connections, proximity and location in relation to, e.g. school, playground, sports facilities and green areas affect the options for children and adolescents to get around on their own by foot or bicycle - particularly when they go alone. During leisure time, the accessibility of parks, playgrounds and green areas also play a role in relation to their level of physical activity.

Safety: The location of the school in the community, residential density, infrastructure as well as traffic and crime-related safety affect the active transportation of children and adolescents to school. There are indications that parents' perception of safety is a critical factor for how physically active children and adolescents are in the urban environment. The fear of traffic impacts whether parents let their children use the community. In that regard, traffic lights, pedestrian crossings, speed-regulated and less crowded streets support physical activity among children and adolescents. On the other hand, risks in the community, e.g. the number of streets to be crossed, high traffic speed and low safety for pedestrians and cyclists impact the level of physical activity negatively.

The condition and options offered by areas and facilities: Children most often visit well-maintained parks with age-appropriate facilities that challenge their physical competences and provide options for different activities. Among adolescents between the ages of 10-17, there is furthermore seen a positive correlation between physical activity and the number of sports facilities as well as streets and parking spaces which create space for social meetings. Outdoor areas and facilities in the school area impact the level of physical activity of children and adolescents during school hours. For example, painted markings in the school area, e.g. coloured play areas and hopscotch courts, contribute to increased physical activity among pupils.

Older adults

The following factors influence the level of physical activity among older adults:

Accessibility and support facilities: Reduced physical function and mobility mean that older citizens are more exposed to barriers in their neighbourhoods. To be able to manage everyday routines on their own, e.g. shopping and using public transportation, it is essential that supporting facilities exist besides short distances, e.g. benches, curb side ramps and handrails on staircases.

Safety: The perception of traffic and crime-related safety by the older adult impacts their level of activity. If older citizens are afraid of falling due to a poor pavement, their physical activity level will be lower than in neighbourhoods that are perceived as safe and secure.

Aesthetics: Studies show that green and appealing urban nature, including streetscapes with beautiful, attractive and historic buildings, promote the activity level of the older adults and thus, aesthetic communities should be prioritized.


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Background

Factors influencing physical activity

The physical activity level of the citizens is affected by complex and dynamic relationships among individual, social and environmental factors[16-17]. In particular, the daily activity level is related to our physical surroundings[4, 10, 18]. Since the end of the 19th century, people have increasingly moved away from the countryside, with fewer people and long distances between dwellings and destinations and have settled in the cities. This development continues, and the UN estimates that 2/3rds of the world population will live in cities by 2050[8].

In recent years, there has been increased focus on the role of the urban environment in relation to boosting physical activity for two reasons: more people live in cities, and there is increasing evidence that the urban design affects public well-being and health[19]. In fact, several studies show a clear relationship between the urban environment and physical activity behaviour[4, 20].

In the “Health Promotion Package - Physical activity”, the Danish Health Authority accentuates the importance of urban planning and the physical environment to enhance the level of physical activity among the citizen[7]. The prerequisites, needs and interests of the public in relation to physical activity differ, and hence, it is essential that efforts to enhance physical activity also reflect these differences[5].

The Danish Health Authority's recommendations for physical activity

The Danish Health Authority has prepared age-related recommendations for physical activity. The recommendations of the Danish Health Authority are guided by the international recommendations of the World Health Organization (WHO)1.

Recommendations for **small children (0-4 years old)**

Infants and children from 0-4 years old are physically active in spontaneous ways, and this activity bolsters their motor development. Hence, it is recommended that children are given opportunities to be physically active as much as possible in the day. Through movement they use their bodies to explore their immediate environment and establish social contact with other people.[I]

Infants under 1 year old

Maximize floor-based tummy time for infants when they are awake.
Ensure that infants are physically active in various ways during the day.
Ensure that infants can move freely as much as possible.

Children 1-4 years old

Ensure that children are physically active in various ways during the day.
Ensure that children can move freely as much as possible.
Limit the amount of screen time.

Recommendations for **Children and adolescents (5-17 years old)**

It is recommended that children and adolescents are active at least 60 minutes every day at moderate to high intensity II. This should be extended beyond the usual short-term daily activities, and last no less than 10 minutes at a time if the 60 minutes are divided.

To maintain or improve physical fitness, it is also recommended that this group is physical active at a high intensity at least three times a week for at least 30 minutes. Such activities should include elements that strengthen bones and flexibility[I].

Physical activity in addition to these recommendations will have further health benefits.

Recommendations for physical activity for **adults (18 - 64 years old)**

In addition to regular short-term daily activities, it is recommended that adults are physically active for at least 30 minutes daily at a moderate[I] to high intensity[II]. The activity should last at least 10 minutes at a time if the 30 minutes are divided. Physical activity at high intensity should be performed at least twice a week for at least 20 minutes, including activities that increase bone strength and flexibility[I].

Physical activity in addition to these recommendations will have further health benefits.

Recommendations for physical activity for **the older adults (≥65 years old)**

It is recommended that the older adults are physical active at least 30 minutes a day at a moderate intensity in addition to regular short-term daily activities. In common with the two younger age groups, the activity should last at least 10 minutes at a time if the 30 minutes are divided.

Including activities lasting at least 20 minutes that maintain or increase physical fitness as well as muscle and bone strength at least twice a week is recommended. To maintain the ability to manage everyday functions and reduce the risk of falls or other injuries, it is recommended that the older adults perform both stretch and balance exercises.

Physical activity in addition to these recommendations will have further health benefits.

[I] Moderate intensity is physical activity causing slight shortage of breath but still being able to talk to others.
[II] High intensity level is physical activity causing shortage of breath making it difficult to have a conversation.

Physical activity in Denmark

Physical activity among children 0-6 years old

It is not possible to determine exactly how many hours daily Danish children 0-6 years old are physically active[22]. However, studies show that pre-scholars are more active on weekdays compared to weekends[23-24], and that the physical environment at day care centres highly affects the activity level of the children[25-29]. The physical environment is important for children at that age as it affects their joy of physical active, providing motivation to explore themselves and their surroundings[22].

School children

Children and adolescents spend most of their waking hours in school, and hence, this setting is important in relation to enhance physical activity for this target group.

Danish schoolchildren are some of the least active in Europe when it comes to distributing activity over the entire week30. Among 11 year-olds, only 11 percent of girls and 19 percent of boys meet the recommendations of the Danish Health Authority of being active for at least 60 minutes a day at moderate to high intensity[30].

Furthermore:

- Boys are generally more active than girls[30].
- The percentage of both boys and girls that meets the recommendations decreases with age30.
- Danish children and adolescents are in the top of Europe when it comes to how often they are physical active at a high intensity during their leisure time[30].
- Among 11 year-olds, 62 percent of girls and 75 percent of boys are physically active at a high intensity for two hours or more per week during their leisure time. Similar results are found for 13-15 year-olds[30].
- The majority of Danish children and adolescents find it difficult to distribute physical activity evenly across the entire week[30].
- There is a social gradient related to physical activity in such a way that a large percentage of children and adolescents are very physically active and a large percentage are very physically inactive[31].
- School children are more active on weekdays than weekends[33-35].

Vidensråd for Forebyggelse (Council on Health and Disease prevention) concludes that children and adolescents who are very inactive present a big health problem, because physical activity has a positive impact on physical, mental and cognitive parameters[31]. This concern is amplified by the tendency that childhood patterns of physical activity is passed on for the rest of the life[32].

Physical activity among adults and older adults

Results from the National Health Profile from 2017 show that:

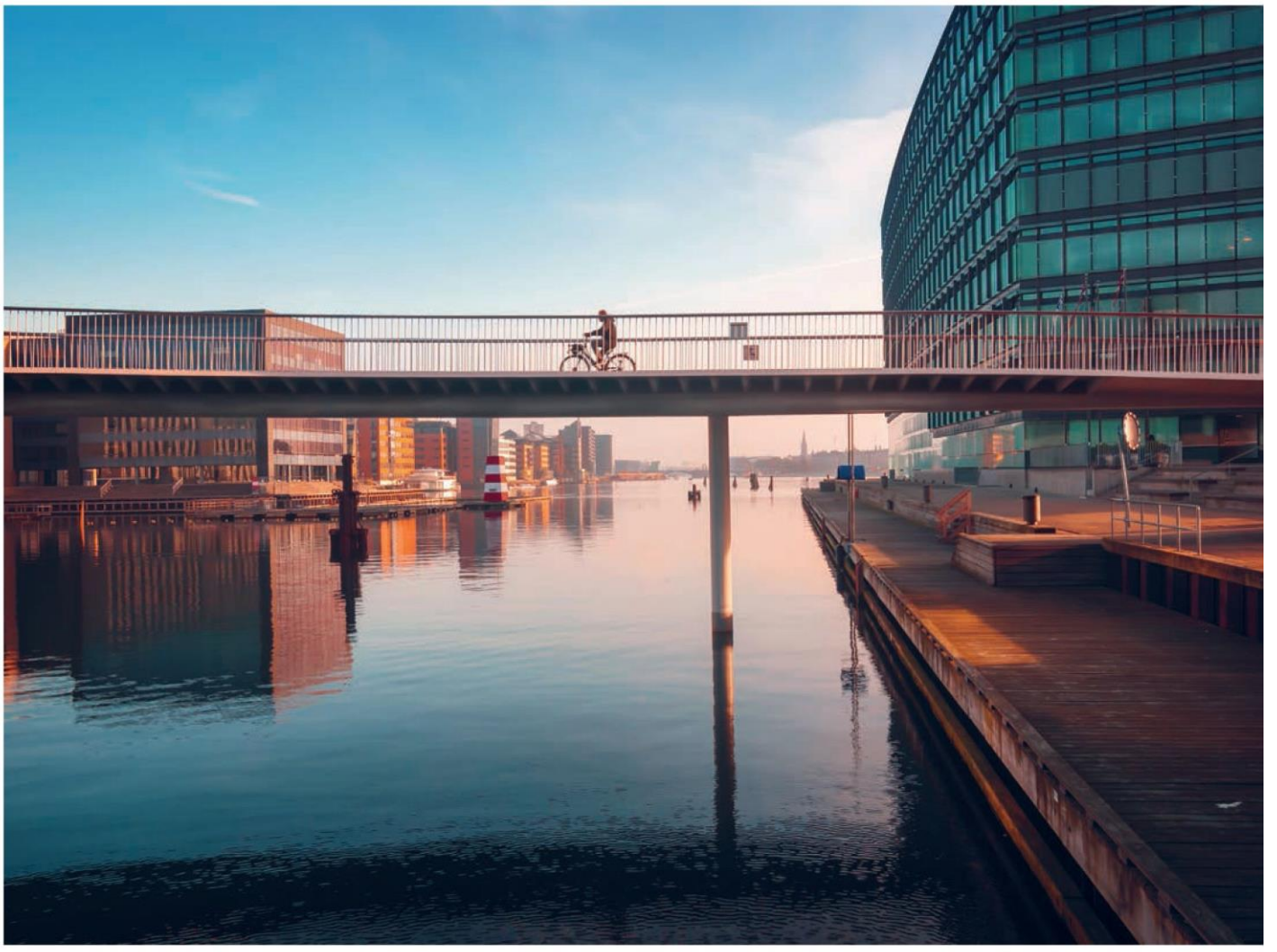
- 29 percent of the adult population (>16 years) do not meet WHO's minimum recommendations for physical activity of 150 minutes of physical activity per week.
- 16-24 year-olds (19 percent) comprise the lowest percentage of physically inactive, while the highest percentage is among the oldest (>75 years) (42 percent).
- People between 65-74 years old are more physically active compared to younger age groups, apart from 16-24 year-olds.
- More than half (56.6 percent) of the adult population has at least eight hours of sedentary time on a typical weekday in relation to transportation, work/school/education and leisure time activities.
- 71 percent of those who do not meet the recommendations for physical activity want to be more physically active[36].

Scope and purpose

The purpose of this publication is to share knowledge on how **planning, design, management and maintenance of the urban environment can enhance physical activity.**

Based on the identified knowledge, the following questions will be answered:

1. How can the urban environment support physical activity behaviour with focus on urban design and infrastructure, urban green areas and school settings?
2. How can the urban environment encourage different age groups to be physically active?



Methods

The literature review was conducted between 15th September 2018 and 1st November 2018.

Search method

The literature search was conducted as a *scoping review,* as the intent was to map key features within a specific area of research and guide to practice. This approach opens up the possibility of incorporating a wide field of methods and empirical evidence[43]. During the work on the publication, both systematic and exploratory literature search were used to uncover the field of research in the best possible way.

A systematic literature search of *peer-reviewed* scientific publications was conducted using the following databases: PubMed, Scopus and Web of Science. Based on the objectives and research questions of the publication a search matrix (Annex 2) with the following areas of focus and associated synonyms was prepared: The urban environment and physical activity. As we wanted to include literature about all age groups, we did not add a focused age span.

Literature in English published within the last 15 years (2004-2018) was included. Furthermore, the studies needed to be categorised as reviews or meta analyses. Studies were excluded if they did not investigate the associations between the urban environment and physical activity, had a different study design than reviews or meta analyses, or if they exclusively studied specific groups with specific needs, e.g. patients or persons with a handicap or chronic diseases.

To identify relevant scientific literature that was not found by using the systematic literature search in the databases, we simultaneously conducted exploratory literature search. Experts in the three areas were approached, and Danish scientific literature about the urban environment's impact on physical activity was searched using contacts to national networks. In this case, the criterion of reviews and meta analyses was also applied. A chain search was conducted using reference and citation analyses of the publications that were identified by the systematic search. By using this approach, one good reference may lead to another, to end up with the most appropriate references. However, one weakness is that references based on other approaches than the publication that was the foundation for the chain search can be lost[44]. Hence, the chain search was conducted on the basis of literature with various perspectives on the topic to minimize this inherent weakness.

Figure 1 illustrates the literature search process. At the top, the figure illustrates the number of hits from the systematic literature search in the three scientific databases, followed by the selection that resulted in 73 studies.

FIGURE 1
Flowchart illustrating the selection of studies used for the publication

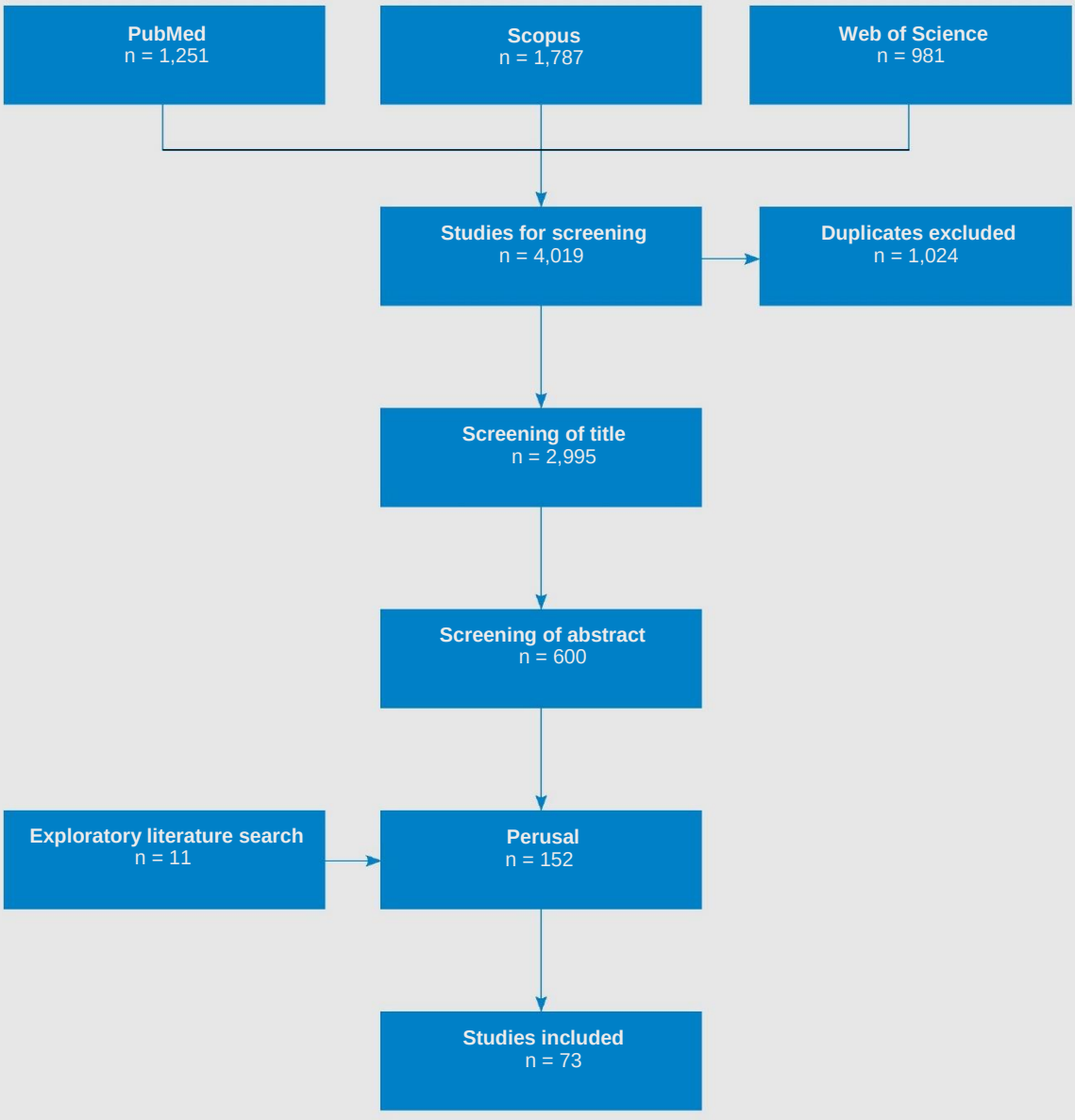
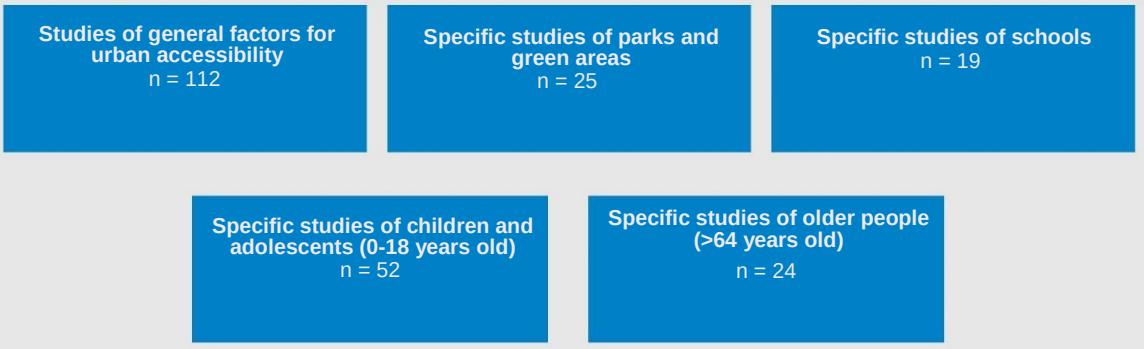


Figure 2 provides an overview of how the studies that were selected for perusal are broken down in relation to different areas of the urban environments as well as age groups.
It is important to note that studies of general factors for the accessibility of cities include many aspects and hence, may include elements in relation to parks and green areas and schools. In addition, in relation to age groups, only studies that specifically studied children and adolescents or the older adults were noted. The remaining studies generally examine the general population, e.g. adults (18-64 years) or several age groups in the same study.

FIGURE 2
Distribution of studies in relation to specific areas of the urban environment and specific age groups



For a description of the 73 studies included in the publication, see Annex 3, in which characteristics (authors, publication year, design, methods, population and area of emphasis in the urban environment) are briefly described.

Methodology critique

Scoping reviews may be criticized for a lack of thoroughness as the approach is often mistakenly compared to complete systematic reviews. On the other hand, due to a higher level of flexibility, scoping reviews enable the inclusion of a broader field of methods and empirical evidence[45]. They open the possibility of applying a broader focus on the urban environment including combined knowledge about, e.g. infrastructure, parks and green areas. This broad approach can provide an overview of a larger research area than a systematic review with a narrower, in-depth objective aim. As the purpose of the publication is to provide an overview of the existing knowledge on how the urban environment impacts physical activity, the scoping review was chosen as the method to achieve a broader perspective on the knowledge in this field.

The broad knowledge base that can be achieved by scoping reviews happens at the expense of depth. In contrast to systematic reviews, the underlying scientific quality of the studies identified in a scoping review has lower priority[45]. It may be considered a limitation that an assessment of the methodological quality of the included studies is not conducted[43, 45, 46]. However, this has been accounted for, as this publication is exclusively based on studies that are categorized as either review studies or as meta analyses of existing primary studies in the literature. This inclusion criterion ensures a high scientific level, as the studies included in the publication all have in common that they are based on previous review processes that are assessed as methodologically sound and valid in relation to the quality standards of highly esteemed journals. Hence, the publication may be classified as a scoping review of reviews in which the original, included primary studies were included based on the scrutiny of their scientific quality.

A large number or databases have been excluded by selecting only three scientific databases. However, in consultation with a scientific librarian, and given their scope and content descriptions, the three databases are believed to be comprehensive to conduct a scoping review with the purpose outlined.

The results presented originate from a large number of scientific studies which have been assessed as being of the highest scientific quality in meta-analyses of an even greater quantity of scientific studies, and have therefore been included in a compilation of the most valid knowledge within a defined field of research.
Although the systematic search has been confined to reviews and meta-analyses published in the past 15 years, the latest knowledge in the field will probably not be included, as literature searches and meta-analyses are typically completed months before published, and there may therefore be primary studies published later.

Most of the results are based on cross-sectional studies, and it is therefore not possible to say anything about the causes of the results.

Empirical factors

Results concerning the significance of the urban environment for physical activity should be transferable across countries and continents, as confirmed by several studies[4, 47, 48].

However, it is still essential to be alert to geographical, topographical and climatic factors of importance to the urban environment when transposing the results to a European or Scandinavian context. In addition, legislative, political, cultural and socioeconomic factors have a bearing on the way the urban environment is used. Thus, there will be differences in terms of land use, infrastructure, weather etc. as well as different ways of experiencing the urban environment, depending on social and cultural background. The studies included come from North America and Australia, among others, which differ from other countries in a number of respects, and this is a reservation worth making when transposing results to an own context.

Measurements of urban environments

Both subjective and objective measurement methods are used to identify characteristics of the urban environment with relevance for physical activity. Subjective measurement methods, e.g. questionnaires[50], are based on self-reported physical activity and assessments of the neighourhood. Objective measurement methods are based primarily on accelerometer data on physical activity combined with data from geographic information systems (GIS) to conduct spatial analyses. Together, the measurements make it possible to identify whether urban environments hinder or enhance physical activity.

Literature review results

Physical activity in urban settings

Walkability

Studies have shown that people living in areas with high walkability, i.e. with multiple destinations and walkable infrastructure, are more physically active than those living in areas with lower walkability[15, 38, 40, 49, 52]. One study, based on 6,882 participants from 14 cities in 10 countries spread over five continents, showed that those living in the most walkable neighbourhoods were physically active 68-89 minutes more a week than those living in the least walkable neighbourhoods[4]. The study found identical results across countries.

Furthermore, people tend to increase their overall level of physical activity when they move to areas with higher walkability[38, 53]. A review of the built environment as a determinant of physical activity showed that the higher the objectively measured walkability, the higher the overall level of physical activity[38].

Several reviews highlight how land use and infrastructure have impact on how physically active people are on a daily basis[20, 37, 38].

Land use is related to about variation in the built-up area, including the type and proximity of destinations and facilities.

The infrastructure relates to the number and quality of street and path connections that create access to destinations and facilities, as well as cover the extent to which it is practically possible to proceed easily, safely and conveniently from one place to another.

Residential density, destinations and land use

More people walk, cycle[19, 20, 41, 53] and are generally more physically active[38] in areas with a high residential density. One explanation for this positive correlation may be that in areas with many people, there are more shops, schools and other facilities because it is more worthwhile operating them there, and the short distance to destinations causes more people to be physically active[19]. This assumption tallies with results from another review[54].

Several studies emphasize that access to destinations in neighbourhoods has a special impact on levels of physical activity, and that the number, type and proximity of destinations have been found to be of significant importance[14, 20, 38, 40, 41, 49, 52, 55-57]. The proportion of active transportation increases if the number of destinations in the neighbourhood is increased[38]. Apart from the number of destinations, the variation in destinations and facilities also affects how physically active people are in their neighbourhood[20, 37 38, 41]. A number of reviews highlight the fact that the level of physical activity rises when there is a wide selection of destinations such as shops, facilities and recreational areas in the local neighbourhood[14, 41, 49, 57].

Thus, in an area with optimal land use and suitable variation in destinations and facilities within walking and cycling distance from home, it will be possible to perform the day's errands without taking a car or a bus[41]. A number of studies suggest that more people choose to walk when destinations are not far apart, while cycling is more common in lower-density environments[58].

There are various suggestions as to what, more specifically, the optimum distance to destinations is in order to promote physical activity:

- Documentation has been found in two studies showing that a distance between 400 and 1,600 metres can have a positive effect on the level of physical activity[20].
- A positive correlation has been found between a distance of 400 metres and moderate to high-intensity physical activity as well as walking and cycling activities with a lower intensity[20].
- A distance of 800 metres has proved to have a positive correlation in terms of how often people opted to walk when going shopping[20].
- A positive correlation was found with a distance of 1,600 metres and walking and cycling in the case of nice weather[20].
- A correlation is shown between transport-related and recreational walking activities and public transport stops sited at a distance between 400 and 1,500 metres from the starting point[41].

Infrastructure

A point that emerges across a number of the reviews included is the bearing the infrastructure has on how physically active people are in their neighbourhood[14, 19, 38, 41, 52, 54, 55, 57, 59-61], even though the results are not entirely clear-cut[62].

- A number of reviews emphasize that the presence of pavements, walking and cycling paths, and marked cycle paths in the local environment has a positive link to different forms of walking and cycling[11, 14, 40, 41, 55, 57, 58, 61, 63].
- One study shows that the closer the routes and the paths are to home, the more often they are used for physical activity in the form of both active transportation and recreational activities[38].
- When neighbourhoods in the urban environment have pavements and maintained streets, and when pedestrians are separated from heavy traffic, there is a tendency to walk more and generally be more physically active than people who live in neighbourhoods without such features. Even cheap, simple footpaths can promote the level of physical activity among people[41].
- One review also found a positive correlation between cycle paths and the level of cycling activity in the area[63].
- Creating new walking and cycling routes in the local environment or improving the existing ones has a positive influence on how physically active the citizens are[38, 54].

Street network

Pedestrians and cyclists prefer safe and efficient infrastructure, with the presence of components such as street lighting, adequate signage, pedestrian crossings and traffic-calming measures[38, 41, 52, 54, 58, 64, 65]. Joined-up street connectivity and network are important for the level of physical activity when it comes to walking and cycling[20, 37, 40, 41, 55, 58, 61, 66]. There are indications that grid-like street networks and short blocks are important for the walkability of an area, as it presumably affects accessibility in the area and thereby walkability positively[20, 41].

Number of enforced stops along the route, e.g. traffic lights and obstacles, has a negative correlation with the cycling activity in an area, as it influences the number of times cyclists are forced to make stops on their journey[41, 58, 63]. In addition, it suggests that superfluous intersections have a negative influence on the general level of physical activity. Superfluous intersections can result in traffic jams as well as unnecessary stops along the route, detracting from the motivation to walk and particularly to cycle on those sections[41, 58]. However, the number of intersections in the neighbourhood has been found to correlate positively with walking in particular, but also leisure-time cycling[20]. Unlike the number of stops, the length of the routes has a positive correlation with cycling activity, people being more inclined to cycle on routes, the longer they are, which may have to do with longer routes not having the same degree of superfluous intersections and thus requiring unnecessary stops[41, 58, 61].

Cul-de-sacs and dead ends

Various indications exist as to the way cul-de-sacs or dead ends affect physical activity:

- One review found that temporary road closures had a positive impact on children playing around the home[52].
- Two other reviews found that temporary road closures have a negative impact on active transportation and the general level of physical activity[38, 41].
- One review found indications of a positive correlation between cul de sacs and walking activities for women[20].

Bridges

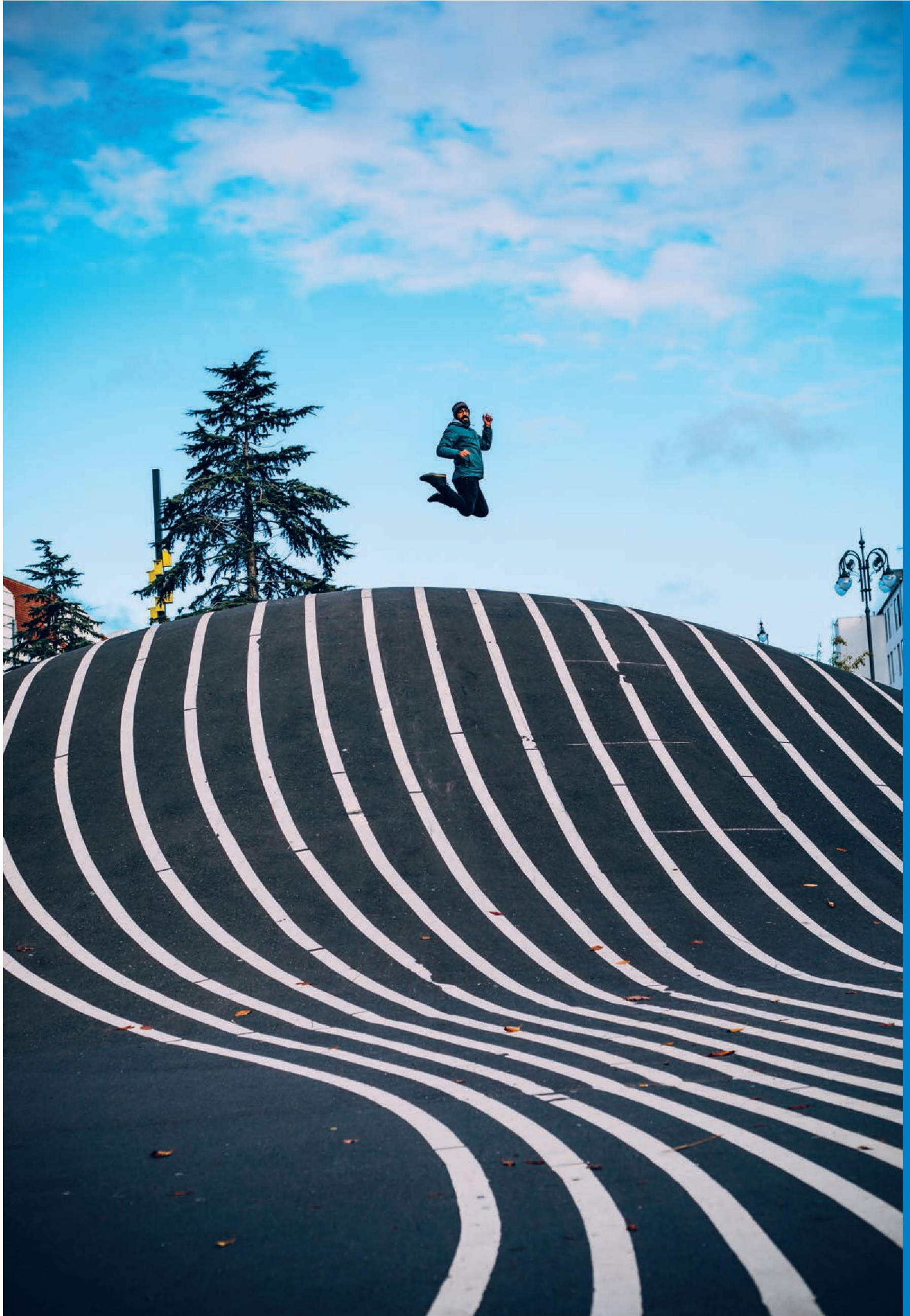
Some studies have investigated the effect of vehicle-free bridges and footbridges on physical activity, but these yield mixed results in terms of whether they influence the level of activity[52, 62, 65].

- One review describes promising indications that vehicle-free bridges and footbridges can increase active transportation and physical activity in children and adults[52].
- A later review did not find significant and negative evidence when investigating the effect of implementing vehicle-free bridges and other features on physical activity generally as well as walking and cycling[62].

Pavements, footpath and cycle lanes

The design and siting of pavements, footpath and cycle paths affects levels of activity. The results in the area are not clear-cut but tend to indicate that:

- Cycle lanes in the local environment cause more people to cycle[62].
- More people opt to walk when pedestrians are separated from other traffic[62].
- More people opt to cycle when there are markings on paths and roads, and cyclists and other road-users alike prefer designated cycle lanes on the road whenever bicycles merge with other traffic[19].
- Pavement markings (e.g. coloured cycle lanes reduce traffic behaviour that may lead to accidents[63].
- There is a difference in preferences relating to the choice of cycle paths, routes and lanes, depending on gender, cycling experience and safety requirements[58, 63]. E.g. experienced cyclists wish to take the direct route to a greater extent, whereas less experienced cyclists prefer paths and routes segregated from the rest of the traffic. In addition, there are indications that women prefer paths and routes segregated from the rest of the traffic to a greater degree than men[63].
- A correlation has been found between the width of paths and the level of activity on them. In that regard, it is essential to design the width of cycle lanes and footpaths based on the type of activities to be performed on them, and to optimize them in terms of the activity, e.g. cycling speed. However, no consensus is reached in the studies as to the recommended width of footpaths, running tracks or cycle lanes.
- There tends to be a positive correlation between physical activity and the quality of the surfacing[14,19, 41, 49], partly due to fear of injuries if the surfacing is not maintained[14, 41].
- A soil base is better for walking than for cycling, whereas asphalt surfacing is the best base for bikeways[41].
- There are indications that hills and steep terrain have an adverse effect on the level of physical activity, but the results are inconsistent[14, 41, 49, 61].



Public transportation

Good public transportation amenities, measured by the number of stops in the neighbourhood, have proved to lead to increased active transportation[19, 38, 41, 54] and general physical activity[38, 40, 54]. The distance to the stops from home or other destinations is a key factor in the use of the stops and the activity involved in transportation to get to them.

If the distance is appropriate, there are indications that the amount of sedentary time during the day is reduced[37]. A positive correlation has been identified between stations within walking distance (400-1,500 metres) and transport-related walking and recreational walking activities[41].

Recreational areas and facilities

Several reviews stress that access to recreational facilities has a bearing on the level of physical activity.

- Poor accessibility to recreational facilities results in fewer people walking and cycling[41] and to less physical activity in general[14, 49, 56].
- One barrier to physical activity in the local environment is a lack of recreational areas, as residents therefore must ride or drive longer distances for physical activity in a recreational area[41].
- Residents lose interest in facilities if they are far away from their home[41].

These results are consistent with other reviews that have identified a positive correlation between short distances to recreational destinations or facilities and levels of active transportation[14, 33, 53, 61, 66] as well as general physical activity[11, 33, 61, 66].

The increased density of recreational facilities in the neighbourhood has proved to have a significant positive effect on physical activity among adults[52].

Facilities in the urban environment

Facilities support the level of physical activity in some people. On paths, the point is to have benches (for both walkers and cyclists), wastepaper bins, hedges or fences, pavilions and drinking water taps close to running routes and cycle paths[41]. In addition, an examination of reviews shows that:

- Safe, convenient cycle parking for both long and short-term use correlates positively with cycling activities[41].
- Cycle parking at destinations, e.g. stations, tends to have a bearing on whether people choose to cycle to their destinations, although the results in this respect are not altogether clear-cut[41, 52, 63].
- Facilities for renting bicycles in towns and cities increase accessibility for cycling as a form of transportation. As a result, the transportation requirement for e.g. tourists and inhabitants without access to a bicycle can be met by cycle hire services[41].

Perceived accessibility

When it comes to determining whether features of the urban environment promote levels of physical activity, objective measured studies are not the only means of measuring (e.g. GPS-data or counting how many people pass a particular spot); another way is to enquire the citizen about their subjective perception of the neighbourhood[50, 67]. E.g. by using standardized questionnaires[50].
It is essential to emphasize not only objective factors but also perceived factors.

In terms of subjective factors, to follow are some of the indications:

- The perception of paths and pavements in good state of repair correlates positively with the amount of walking people do in their neighbourhood[38, 68].
- Better perceived access to destinations increases transport-related and leisure-related physical activity.
- The perception of a greater number of destinations in the neighbourhood causes more people to walk between destinations.
- Connections between pavements, paths and routes can influence the perception of proximity in the area as well as the feeling that there are more options and greater variation of destinations - both factors which are conducive to the level of physical activity in the neighbourhood[55].
- There is a positive correlation between the perception of cycling connections, the number of cycle paths and transport-related cycling[53].

Safety

In general, safety has a great bearing on levels of physical activity. Safety has been studied in a number of reviews, the majority finding a correlation between perceived and/or actual safety in the neighbourhood and physical activity behaviour[14, 37, 38, 41, 48, 53, 54, 68]. For instance, indications have been found that the presence of street lighting, few street intersections and smaller volumes of traffic have a positive influence on physical activity[68].

Two forms of safety play a role in physical activity in the urban environment:

- Traffic safety
- Fear of crime

Traffic safety

Lack of traffic safety is a barrier when choosing to be physically active. Fear of traffic is particularly associated with unsafe road conditions due to poor maintenance and a fear of accidents and injuries[14 68]. An examination of reviews shows the following:

- Perception of traffic safety is significant for all age groups[19, 38, 39, 49, 69].
- Fear of injury in connection with physical activity is seen particularly in children, older adults and women who have previously been physically active[41].
- If traffic safety is increased, e.g. by adding traffic-calming measures, separating cycle lanes from the roads and implementing other traffic measures, the amount of physical activity is increased.

- If perception of traffic safety is high in an area, the amount of physical activity will also be high in the same area[41, 54].
- Improvements in relation to the safety and effectiveness of local-environment infrastructure, e.g. street lighting and traffic-calming components, are linked to more physical activity and less fear of crime and accidents on the roads[54]. However, there is no evidence that less safe environments result in less active transportation[70].

Fear of crime

Fear of crime – whether founded or unfounded – has proved a barrier to choosing to be physically active. An examination of reviews shows the following:

- Perceived safety has a greater correlation with levels of physical activity than recorded crime[14, 38, 41]. This is particularly the case when it comes to recreational activities[41].
- Residents may tend to restrict their own and their children's social and physical activities in order to avoid places or situations which they perceive to be unsafe[37].
- Neighbourhoods with different, accessible destinations and transportation amenities cause more people to walk, which may be due to there being a greater perception of safety in these neighbourhoods owing to mutual social monitoring in the presence of many people. However, it is important that the other people on the streets are not perceived as threatening and dangerous[37].
- There is a positive correlation between walking and the presence of shopping centres, transportation hubs and street connections, although these factors have also been linked to specific forms of actual crime, for example burglary and vandalism[37].
- Groups who regard themselves as physically vulnerable (e.g. women and older adults) and those financially exposed to crime (e.g. low-income and minority groups)[37] are generally less active, though the results are not clear-cut. The explanation for the mixed results may be that low-income groups, who often have a greater perception of fear, have no choice but to walk[37].
- People in high-income countries who reported that they felt safe from crime were 32 percent more likely to achieve higher levels of physical activity. However, the correlation between physical activity and perceived safety from crime was not significant for people in low and middle-income countries[48].
- Residents in areas with higher police-reported crime are 28 percent less likely to be more physically active[48].
- A lack of safety from crime, both perceived and real, keeps people from being physically active[48].
- No correlation has been found between crime-related safety and physical activity in reviews about European countries, which may be due to the difference between local environments with low and high levels of crime-related safety not being as great in Europe compared with other geographical regions, and that characteristics other than feeling safe in the physical environment therefore being more closely linked with physical activity[49].

Aesthetics

- In several reviews there is a positive correlation between people's perception of aesthetically pleasing, attractive and pleasant neighbourhoods in the urban environment and physical activity[14, 38, 41, 57, 68].
  In other reviews, however, there are mixed results or no positive correlation [20, 37, 49, 53, 61, 71].
- In reviews that have identified a positive relation between the aesthetics of the neighbourhood and the level of physical activity, pleasant, entertaining and natural environments, as well as civilized behaviour, have been found to play a positive role[14, 41, 57, 68].
- The perception of aesthetically pleasing nature in the neighbourhood causes more people to work out and go for leisurely walks, but not to transport-related walking[57].
- A lack of high-quality natural and built environments may lead to a perception of unpleasantness and thus have an adverse impact on motivation for activities[57].
- There is a negative correlation between physical activity and uncivilized behaviour in the local environment, such as litter, vandalism and graffiti[57].
- No correlation has been found between aesthetics and physical activity in reviews about European countries, which may be due to the difference between local environments with low and high levels of aesthetics not being as great in Europe as compared with other geographical regions, and characteristics other than aesthetics in the physical environment therefore being more closely correlated with physical activity[49].

Factors of importance to children, adolescents and the older adults

Many of the factors of importance to physical activity for the population apply equally to specific target groups. These involve e.g. accessibility of destinations, street connections and infrastructure quality[50]. Nevertheless, it is vital to consider specific factors for specific age groups when planning and designing towns and cities[50].

Children and adolescents

As regards the relationship between the urban environment and children and adolescents' level of physical activity, an examination of reviews shows the following:

- A safe and secure neighbourhood with a low volume of traffic promotes children's level of physical activity[18, 72-75].
- Accessibility to playgrounds and other facilities has shown a correlation with younger children's overall level of physical activity[40].
- A positive correlation has been found between a moderate to high level of activity in adolescents' leisure time (average age of 14 years) and the increasing availability of sports facilities in neighbourhood[38].
- Direct routes without heavy traffic and large, major through-roads contribute positively to children and adolescents' levels of physical activity[50].
- Well-connected street networks, safe pedestrian crossings, pavements, local destinations and a low volume of traffic and low speed make children more inclined to be physically active and use active transportation[18, 72-75].
- A significant correlation has been found between walkability and active transportation to school on the part of children in Europe. Closeness to destinations, proximity and street connections impact positively on children's walking, particularly when moving around independently without the aid of older siblings or parents[72].
- There are indications that a high residential density can increase children's opportunities for outdoor activity, because there will thus be more, different facilities and destinations close by, e.g. schools and libraries, but at the same time it may also restrict them, as there will be less space in the urban environment to play in[69].
- In a review from 2006, no correlation was found between residential density and the levels of physical activity of children and adolescents. Later reviews, however, have found a correlation between residential density and active transportation on the part of children and adolescents[19, 73, 75] as well as general physical activity among adolescents[73].
- A correlation has been found between street patterns and children's walking, where grid-like patterns support walking as transportation in contrast with cul-de-sacs and dead-ends, where there are fewer options for getting from one place to another[50]. By contrast, however, studies have also shown that cul-de-sacs and dead-ends correlate positively with the social and active play of children[50, 64].
- Play opportunities, e.g. dead-ends, green areas and playgrounds, as well as scope for being able to use active transportation between the streets, correlate positively with how physically active children are[50].

- Two studies have found a significant positive correlation between street connections and physical activity, while two other studies found no correlation. One explanation may be that positive effects are only observed when objective goals are used for street connections, because it is difficult for residents to remember and accurately report the level of street connections in their neighbourhood. Another possibility is that active transportation for children is affected more by safety considerations than by street connections[76].
- There is a positive correlation between access to destinations, e.g. parks, playgrounds and green areas, and how physically active children and adolescents are[40 69 73 76] as well as their overall amount of walking[19].
- There are indications that access to outdoor toys and play objects, facilities and equipment are positively associated with younger children's (2-6 years) overall physical activity[40].
- The extent to which children experience a wealth of opportunities for exciting, challenging and risky play in playgrounds has a bearing on how much they use them[18].
- There is a positive correlation between their feeling that the opportunities offered by the playground are tailored to their needs and their level of physical activity[18]. Studies show it is important to offer facilities in the neighbourhood which are age-appropriate and thus pose the optimum challenge to the bodily skills of children[13].
- There is also a correlation between children and adolescents' physical activity and the accessibility of infrastructure that supports their ability to be physically active on e.g. pavements and paths in the neighbourhood[18, 69 76].
- There is a tendency for adolescents to perform activity in areas not considered to be important play areas, e.g. streets, car parks and shopping malls[74].
- It is important for adolescents to have an opportunity to hang out with others of the same age group[74].

Active transportation to school

Active transportation to school is essential for children's and adolescents' level of activity. As regards the relationship between the urban environment and children's and adolescents' active transportation habits, an examination of reviews shows the following:

- Direct routes to school without heavy traffic and large major through-going roads are conducive to their physical activity behaviour[50].
- There is a significant negative correlation between long distances to school and children's level of physical activity[75, 76].
- Short distances are positively associated with active transportation to school[61, 77]. Parents report that a distance of about 1,600 metres to school is acceptable for 10 to 12-year-olds to be able to use active transportation[18]. Indications of positive correlations between distances of more than 800 metres to school and active transportation have also been found, whereas there was a negative correlation with this distance to school and moderate to high-intensity physical activity[40].
- A lack of pedestrian crossings and street lighting, busy roads and routes on a slope appear to have negative correlations with children's and adolescents' active transportation to school[40, 75].

Read more about factors of significance to children's and adolescents' active transportation to school in the section *The importance of school settings for children and adolescents' physical activity* (p. 47).

Safety

An examination of reviews of the associations between safety and children and adolescents' level of physical activity, shows the following:

- Perceived safety is a crucial factor in how physically active children are in the urban environment[18, 38, 50, 69, 77, 79].
- Their mobility and physical activity depend on their own and their parents' perceptions of the neighbourhood[18, 38, 50, 69, 77, 79].

- There is no correlation exclusively between the number of destinations (e.g. shops and playgrounds) in the neighbourhood and children's physical activity. I.e. children do not necessarily visit or use the destinations, which may have to do with their own and their parents' perception of safety in the neighbourhood[18].
- The opportunities children have for being physically active and mobile are largely connected with their parents' perception of the neighbourhood and thereby fear of traffic, crime[18, 19, 37, 50, 69, 74, 77-79] and injury[27].
- A correlation has been found between parents' fear of traffic and a decline in children walking to school and activities outside of their home[50].
- Children's fear of strangers and perception of safety in the neighbourhood appears to correlate significantly with where they go without their parents or older siblings[77].
- As regards adolescents, a negative correlation has been found between physical activity and their own perceptions of the risk of injury in connection with falling[41].
- Traffic safety, e.g. speed-regulated roads, less trafficked streets, pedestrian crossings and signal-controlled junctions have a positive impact on children's and adolescents' physical activity[73, 76] and walking[79].
- Children and adolescents' physical activity is supported when they themselves or their parents perceive that pedestrian safety structures in the neighbourhood such as traffic lights and pedestrian crossings are safe[73, 79].
- Risks in the neighbourhood, e.g. the number of roads to be crossed, obstacles along the walking route, high traffic speed, low-level safety for pedestrians and cyclists, and unsafe terrain have an adverse effect on their level of physical activity[76].
- Local environments safe from traffic are important for active transportation to school[72]. Similar results have been found in terms of where children play outdoors[73, 78] and active transportation in general[61, 73].
- The proportion of outdoor and unaccompanied play among younger children (0-7 years) outside their house or in the street was smaller in line with a higher volume of traffic. However, no significant correlation was found in the bulk of the studies of this age group included[69].
- Crime in the urban environment affects children's level of physical activity negatively[76,] and indications have also been found of a negative correlation between the actual crime rate and adolescents' physical activity[80]. In a later review, however, only limited support was found for a correlation between crime and safety and adolescents' physical activity[73].

The aesthetics of the neighbourhood

An examination of reviews of the relationship between the aesthetics of the neighbourhood and children's and adolescents' level of physical activity shows:

- The state of streets, including how well-maintained they are, and the aesthetics of the neighbourhood affect the perceived and actual opportunities for how they move around the streets[18, 50].
- Attractive and well-maintained parks and high-quality play equipment appear to be used more often by children and adolescents[18, 69].
- In one study a positive correlation was found between the number of trees within five metres of the kerb and active transportation to school for 11 to 13-year-olds[75]. However, another study failed to find this correlation between aesthetics and active transportation[72].

Older adults

Local environments are important for older adults' physical health, because they are more exposed to challenges and barriers in the neighbourhood owing to their impaired physical ability to function and their mobility[18]. At the same time, older adults spend more time in their residential areas18, and local environments with higher walkability can therefore contribute to those with impaired physical functionality being more physically active. The perceived and actual quality of the physical environment plays a key role when older adults choose to walk in the local environment.

Support facilities, e.g. benches, allow older citizens to continue being active and enable them to manage their daily chores, like shopping and using public transportation, to a greater extent[81].

Walkability and street connections

As for the general population, walkability, street connections, residential density, and closeness of and access to public transportation, recreational areas, facilities and shops have a bearing on whether older adult walk in the neighbourhood[50, 59, 68, 81-83].

- Both objective and perceived access to destinations and facilities, e.g. grocery shops, GP and public transportation, are important for older adults' level of physical activity, as these factors are vital to their everyday routines[18, 54, 60, 82, 83].
- Proximity to destinations has proved to be particularly important for the older citizens when they no longer can or want to have a driving licence[84].
- Access to public transportation is important as many older adults cannot drive or no longer feel safe doing so owing to impaired functionality, reflexes and eyesight[81].
- There is very strong evidence of a positive correlation between their physical activity and the neighbourhood's walkability, access to destinations, services and recreational facilities[59].
- There is strong evidence of a positive correlation between physical activity and access to both parks and public open spaces, shops and commercial destinations, walkable infrastructure, and evidence that access to public transportation also has a positive correlation with their physical activity[59].
- There are positive correlations between a neighbourhood's walkability, access to shops and commercial destinations (e.g. doctors and convenient stores), access to and scope for public transportation in the area, access to parks and public open spaces, the density of built-up area in residential areas and walkable infrastructure[59].
- Walkable infrastructure is essential for older adults' activity behaviour[59, 82].
- Older adults walk more if there are high-quality pavements (even, non-slip surfaces)[18 50, 81], which are maintained (without cracks and temporary obstacles) and level, and have modified kerbside ramps[18, 50].
- Older adults prefer pavements and paths that are wide enough for pedestrians to be separated from other users, e.g. cyclists[18].
- Fear of falling over e.g. pavement cracks, stairs and slopes is a barrier to their behaviour for physical activity[84].
- Access to small pavement ramps with steps aids how they walk, and they appreciate facilities like handrails and access to ramps[84, 60].

Older adults and active transportation

The following have proved to have a positive correlation between older adults and active transportation

- Benches and other seating facilities[18, 41, 50, 60, 81, 82, 84].
- Good street lights[18, 59, 60].
- Suitable distance between street lights[18, 50].
- Scope for shade from sun and shelter from bad weather[18, 50, 60, 84].
- Public toilets[18, 60, 84].
- Public drinking water taps[84].

Safety

Older adults' physical activity behaviour is particularly affected by their perception of an area's safety[81]. As regards the relationship between safety and their level of physical activity, an examination of reviews shows the following:

- Fear of falling is a particular barrier to the older citizens when it comes to being physical activity in the neighbourhood[41, 50, 81, 84].

- Walkable streets are important to perception of safety[84].
- The perception of hazards in traffic tends to deter older adults in relation to walking and cycling as active transportation[84].
- Genuine traffic safety in the form of improving road conditions, e.g. with traffic-calming components, increases the level of physical activity among the older citizens[41, 82].
- Older adults usually mention traffic safety measures, e.g. signal-controlled junctions, when asked what factors in the urban environment are most important in terms of being physically active[81].
- Older adults express the view that high-speed traffic, substandard pedestrian crossings (e.g. unclear or ones with overly long distances across multiple lanes) and insufficiently long crossing times at lights, are barriers to active transportation[60, 84].
- A positive correlation has been found with the timing of traffic lights, so that the older adults can cross before the lights turn red, and their active transportation behaviour[50, 81].
- It is important for older adults to have a limited proportion of high-speed traffic in the neighbourhood, and they prefer routes to shops and recreational destinations where they do not have to cross busy streets[81].
- Elderly-friendly neighbourhoods should be designed to encourage slow traffic using traffic-calming features like narrow and twisting roads, on-street parking and low speed limits[81].
- Indications have been found that cyclists and motorized vehicles, are a barrier to older pedestrians. Separating pedestrians from cyclists can address traffic-related safety concerns, which can potentially increase older adults' physical activity[60, 84].
- Safety from crime affects older adults' level of physical activity positively[18, 59, 81].
- There is a positive correlation between crime-related personal safety, physical activity, walking, and the presence of street lighting and walking activity[59].
- Lack of street lighting, run-down areas, abandoned houses, overgrown spaces, vandalism, deserted streets and the presence of police and certain threatening groups of individuals on the street are all factors that have a negative impact on older adults' perception of crime-related safety in the local environment[60].

Aesthetics of the neighbourhood

For older adults, the aesthetics of the neighbourhood plays a role. The examination of reviews shows the following:

- Neighbourhoods that are aesthetically pleasing were rated more walkable for the older adults[50].
- There is strong evidence of a positive correlation between green and aesthetically attractive nature and older adults' walking and physical activity[59].
- The aesthetics of buildings and the general condition of a street (e.g. maintenance of the area and the buildings), historical buildings and attractive streets (e.g. characteristic buildings and architectural variations between houses) as well as nature, including the presence of trees and water, affect their physical activity in the neighbourhood positively[60].
- There is evidence of positive correlations between older adult' walking and the absence of litter, vandalism and worn-out facilities[82].
- The perception of calm surroundings and fresh air in the neighbourhood has a bearing on how physically active older citizens are[60].
- Indications have been found that older adults' perception of walkable streets corelates with whether they perceive the streets clean and free of pollution[50].

The importance of urban green areas for physical activity

The parks and urban green areas in cities provide an opportunity for physical activity and enjoyment of nature, just as they act as social spaces and meeting places for the public[41, 85].

The examination of reviews about the associations between urban green areas and physical activity behaviour shows the following:

- A correlation has been found between both urban green areas and leisure and transport-related physical activity[86].
- There is evidence showing the perceived and objectively measured accessibility of parks and urban green areas in the neighbourhood is positively associated with walking and cycling[41, 86] as well as general physical activity[14, 56, 87, 88]. That applies to accessibility, distance to parks and the number of parks in the local area.
- There is a significant correlation between park usage and the perceived distance to parks[89] as well as a general positive correlation between park usage and the number of parks within walking distance of the home[13].
- People are deterred from using parks if it is necessary to drive to get to them[13].
- Indications have been found that the presence of green areas increases walkability in the neighbourhood, because people enjoy walking and cycling in green surroundings[41].
- The quality and appeal of urban green areas can affect the level of physical activity[41].

Size and variation

- There are indications that park size has a positive correlation with the use of parks, large parks (> 5 ha) being used more often than smaller ones (< 1 ha)[85].
- Larger areas are often associated with greater accessibility of various facilities, and they provide a greater degree of motivation to walk and cycle than purely aesthetic places[41].
- It is important to adapt parks and green areas to the number of users in order to make the areas vibrant and attractive[41].
- Both empty and overcrowded areas limit people's desire to use urban green areas. However, more knowledge is needed about the correlation between park size and physical activity in order to specify the associations[41].
- It is essential that green areas include large variation in facilities and provide space for a variety of activities[85].
- The type of spaces or facilities in a park affects leisure-related physical activity more than whatever else the local environment otherwise offers in the way of facilities for leisure-related physical activity[41].
- There will be different needs and wishes concerning the options for variation offered by the parks[85].

Path network

- The design of urban green areas is linked to the proportion of active transportation[90].
- There is a tendency for attractive routes in green areas to increase the likelihood of people walking or cycling to their destination rather than using other means of transportation. This is despite the fact that the distance to the destination, the presence of supportive infrastructure, e.g. pavements and cycle lanes, and safety being rated as relatively important factors[90].
- Paths are of great importance and have great potential for enhancing active outdoor life85.
- As regards motives for using parks and green areas, particular mention is made of the possibility of taking a breather from everyday life and enjoying nature but working out and social activities have also been found to be important motivators[85].
- Path systems and network have often been studied, and the bulk of such studies show a positive correlation between physical activity and paths in recreational areas and parks[87].
- Paths are used for various activities and by different groups, who have different preferences in terms of path design and facilities along the paths[85].
- It is important for a path to create close contact with a natural environment with regard to the length of the path and its progression amid nature-like areas[85].
- Whether constructed or natural, paths are important to the use of parks by adults and young girls[13].

Facilities

Facilities in urban parks and urban green areas are important for leisure activities. As regards the relationship between facilities and levels of physical activity, an examination of reviews shows the following:

- Paths connected to recreational facilities such as playgrounds are important for the activity in these areas[13].
- The siting of facilities in parks and green areas has a bearing on their use. Playgrounds in parks sited on frequently used routes (e.g. on the way to school) are used more often than playgrounds along a less used routes[13].
- Park facilities such as benches and tables[13, 85, 89], barbecuing facilities[13, 89] toilets[13, 85, 89], water taps[13, 85, 89], footpaths[89] and lights[89] affect the use of parks positively[85].
- Shaded areas in parks and green areas correlate positively with the amount of walking on the paths and an increased perception of the neighbourhood's walkability[41].
- There is evidence that shaded areas can increase levels of physical activity[41] as well as use of the park for children and their carers, e.g. parents and educators[13].
- There are indications of a positive correlation with the level of physical activity and access to local work-out facilities in green areas[87]. E.g. areas with sports grounds within a distance of 300 metres from the participants' home showed a significant correlation with transportation and leisure-related cycling[87].However, other studies show mixed results in terms of general physical activity[87].
- A significant positive correlation has been found between the accessibility of golf courses in the local environment and physical activity[87].
- Improvements of parks and playgrounds have proved to be associated with more physical activity and greater use of such areas[38].
- In one study, a correlation was found between removing seats at a park playground and an increase in the level of physical activity. After the intervention, the probability of adults standing or being engaged in physical activity of moderate to high intensity was nine and four times greater, respectively, in relation to sitting down[38].
- A significant positive correlation was found between adding park or playground equipment and physical activity, including active transportation[64].
- There is evidence that new urban green areas, the addition of fitness and playground equipment, different park renovations (at least two of the following: new equipment, footpaths, fences and hedges, landscaping, improving surfaces and lighting), removal of seating at playgrounds and conversion of existing land areas to smaller parks have a positive correlation with physical activity and active transportation on the part of the public[64].
- Intervention strategies on several levels, e.g. both administrative initiatives and changes to the built environment, have significantly greater influence on physical activity in green urban areas than interventions focusing solely on changes to the built environment[91].

Aesthetics and urban environment

The aesthetics of parks and green areas, e.g. the appeal and quality of nature, have not been afforded much attention in the reviews included, and there are mixed results within the field of research[90]. As regards the relationship between aesthetics and levels of physical activity, an examination of reviews shows the following:

- One study found that access to large, attractive open areas was associated with more walking, while another of the studies included did not identify any correlation between access to large, urban green areas of high landscaping quality and recreational physical activity, including leisure-related walking[90].
- A strong correlation was found between the perceived quality of park facilities and use of the parks[89, 13, 88].

- Maintenance is important for the use of parks. E.g. surfaces and cleanliness in parks are important for their use by children and adults. Uneven surfaces, poor playground surfaces, a lack of grass and poor-quality pavements have a negative correlation with park usage and activity. Furthermore, litter, overflowing wastepaper baskets and generally poor maintenance have a negative effect on perceptions of park cleanliness and hence their use[13].
- The aesthetic appearance of parks and green areas is important to children, adolescents and adults alike. The presence of factors such as graffiti, vandalism and litter correlates negatively with park use, while positive features are trees, bushes, gardens, grass, flowers, natural surroundings and water features such as fountains[13].
- Air quality, including car fumes and the way the area smells, have a bearing on the use of a park. Good air quality and pleasing fragrances (e.g. those of flowers and grass) correlate positively with their use, while the presence of smog or an unpleasant smell has negative connotations[13].
- A correlation has been found between sounds in parks and their use, with some people feeling that natural sounds and silence make parks more attractive[13].

Safety

- Users of parks and green areas tend to prefer a calm and safe atmosphere[85].
- In using natural materials to design and construct facilities, it is important to ensure that the perception of safety is high in relation to the design[90].
- There are indications that a low crime rate and greater perception of safety in parks brought about by e.g. street lighting, home entries facing towards the park and good maintenance of the neighbourhood, correlate positively with physical activity[41].
- In terms of personal safety, users are usually concerned about the presence of specific groups, e.g. drug addicts and homeless people, in the parks[13].
- A positive impact on the perception of crime-related safety is achieved when legislation is enforced, there is lighting, and the number of isolated paths and park areas is low[13].
- It is essential for perceived safety that there is no broken glass, needles, heavy traffic and visibility of many other users, e.g. cyclists, on park paths[13].

Dog walking

Dog walking can have both a positive and a negative impact on the use of parks and green areas:

- Dog walking can induce dog owners to be more active, but at the same time it can cause others to experience a greater degree of insecurity[41].
- One study recommended creating dog zones in parks or special enclosures, where dog owners can exercise their dogs on or off the leash[41].
- Segregation of dogs and other park users by fencing and signs is essential to the level of physical activity and is particularly applicable to dog owners[13].

The importance of urban green areas for children, adolescents and older adults' physical activity

Children and adolescents

Both a positive and no correlation have been identified between urban green areas and children's physical activity behaviour, which may have to do with the fact that their parents' perception of the safety of the neighbourhood is an important factor for their level of physical activity[90]. The examination of reviews shows the following:

Park facilities

- No specific association has been identified between the size of the area and children and adolescents' level of physical activity.
- Studies of children and adolescents indicate that access to a varied range of facilities in parks that supports structured and unstructured activities is important for these target group's activity behaviour[13].
- The presence of water facilities, shade, picnic areas and swings are associated with the use of parks by children and their parents[89].
- There are indications that the provision of shade in the neighbourhood correlates positively with adolescents' physical activity[11].
- No significant correlation has been found between physical activity and the number of trees or green areas in the neighbourhood in two studies, while a third, which investigated shade from trees in playgrounds, showed a positive correlation[11].
- Indications have been found that park lighting has a positive correlation with the park use by adolescents[11].
- Positive perceptions of parks and play and recreational facilities in the neighbourhood have been reported to affect the physical activity of adolescents positively. Only one out of nine studies found no correlation[11].
- A positive correlation has been found between the physical activity of adolescents and access to sports and play equipment in then neighbourhood[11].
- It is essential for children to have facilities like playgrounds and trees in the neighbourhood to support their play[13].
- Quality and age-appropriate facilities are important. Children and their carers express the view that facilities which are not age-appropriate, are poorly equipped, outdated and not mentally or physically stimulating, have a negative effect on their use of parks[13].
- Seven intervention studies have investigated the correlation between children's and adolescents' health behaviour and park improvements, e.g. the addition of playgrounds and work-out equipment, renovation of existing playgrounds and park renovations. Five of the studies reported changes in levels of park use, two showing a significant increase, while three showed a drop in the number of users in the target group following the intervention.
- A single study identified no change[92]. However, a later review from 2017 found that renewal and improvement of a number of components in parks, e.g. play equipment, seating and safety surfaces, had a significantly positive correlation with children's physical activity. This applied to the youngest children only, however[64].

Safety

The opportunities for children to be physically active and mobile are largely associated with their parents' perception of the neighbourhood's safety, including traffic safety and fear of crime[18, 19, 37, 50, 69, 74, 77-79]. As regards to the relationship between safety and children's and adolescents' level of physical activity, an examination of reviews shows the following:

- In the event of specific groups being present (e.g. drug addicts and homeless people), older children and teenagers will make less use of parks and green areas[13].
- There are indications that perceived insecurity is a general barrier to the physical activity of adolescents in parks and green areas[11].
- In ten out of fifteen studies, a positive link was reported between perceived safety and physical activity[11].
- There are indications of a negative connection between the level of physical activity of adolescents and traffic in the local environment, but a positive connection with the presence of lighting[11].

Parks and green areas as social meeting places for children and adolescents

- It is essential for adolescents' use of parks and green areas to have an opportunity to meet others and pursue common interests in a safe environment[13].
- For girls in particular there is a positive correlation between leisure activities and the possibility of being able to meet friends in the local parks[13].
- It is important that adolescents can be together without having adult's present[13].
- In addition, it is important to keep open spaces tidy and well planted in order to allow adolescents to develop a feeling of communality in the park[13].

Older adults

As regards to the relationship between parks and green areas and older adults' level of physical activity, an examination of reviews shows the following:

- The presence of open spaces and parks correlates positively with older adults' health, which can help support their desire to carry on living in their respective local community[93].
- Open spaces in the neighbourhood that are in or near parks have an impact on their well-being and quality of life[93].
- Even the most fragile older citizens enjoy physical health benefits from open spaces and parks in the neighbourhood, especially if such areas enhance their feeling of well-being, safety and give a perception of beauty[93].
- Older adults prefer accessibility, safety, social contact and aesthetically pleasing landscapes when it comes to parks and green areas. However, older citizens also have different attitudes towards landscape features, some even being opposed to them[94].

Path systems

- There is evidence of a positive correlation between access to destinations, services and recreational facilities as well as access to parks and open spaces and the overall physical activity of older adults[59].
- With regard to their walking activity specifically, a positive correlation has been found with access to parks and open spaces[59].
- The density of parks in the neighbourhood has been found to be the only objective environmental characteristic associated with their self-reported health status[93].
- There are positive correlations between proximity and the number of parks in the local environment and physical activity for the older citizens[93].

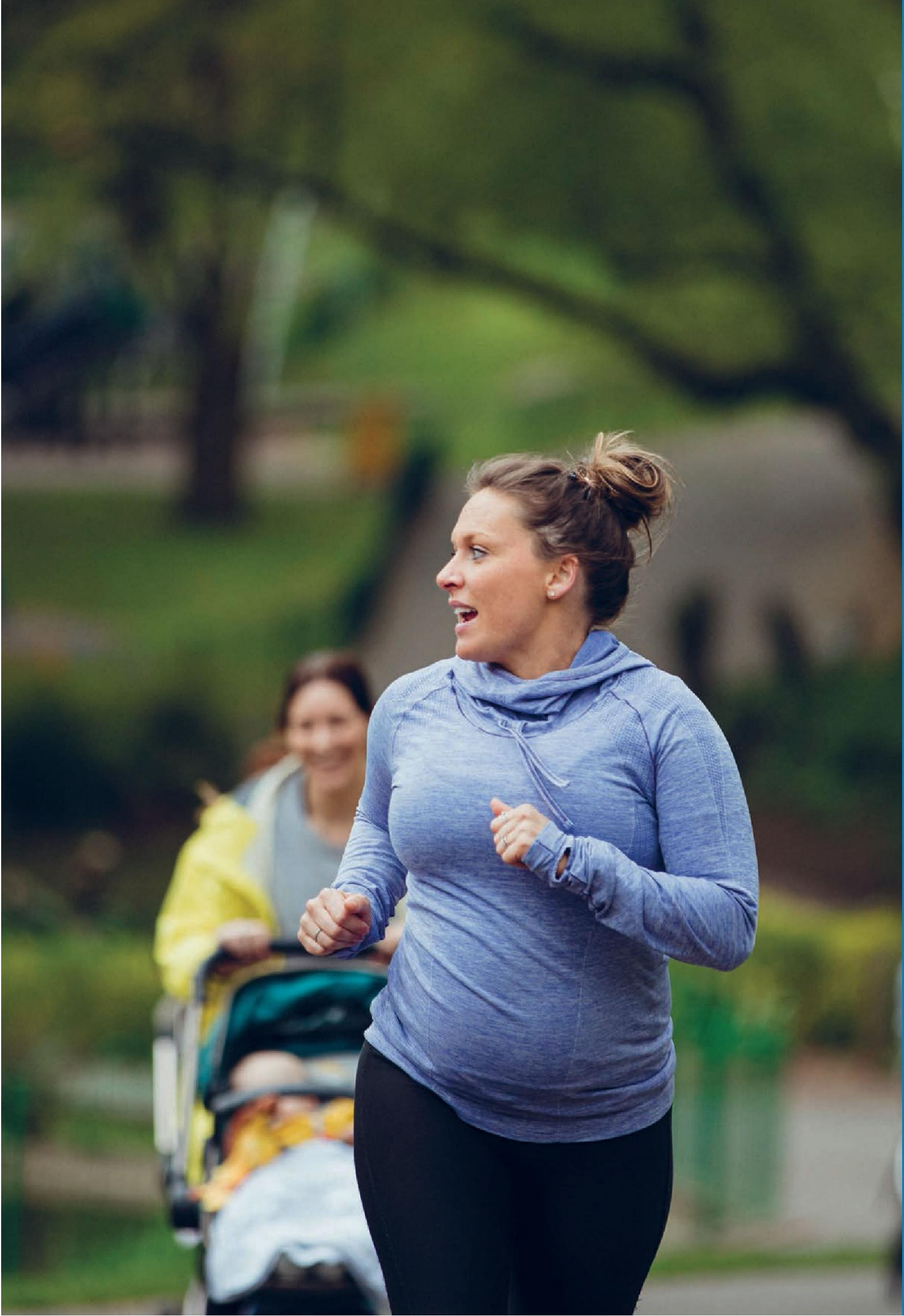
- They report that their need for good accessibility and places to rest are important factors for their use of parks[93].
- The presence of paths in parks or open spaces affects older adults' level of physical activity positively[93].
- Green areas compete with other destinations in terms of where the older adults spend their leisure time. Various indications have been found that both varied and uniform area use promote the use of parks and green areas in urban environments[94].

Facilities, aesthetics and landscape architecture

- One of the reviews included suggests that there are not enough recreational facilities for the older citizens[60].
- When they come to use pre-existing facilities, they perceive it to be a barrier if such facilities are too far away from home, there is a lack of transportation facilities, or it is expensive to use them.
- As regards to green areas, the older adults prefer areas where they do not have to use remote paths with dense vegetation and poor visibility[60].
- Older adults living on their own prefer smaller local parks to larger parks further away[93].
- Park design must be adapted to physical limitations of older adults, e.g. reduced muscular strength, increased fatigue and impaired coordination, balance, hearing and sight. There are indications that the following factors affect the use of and activities in parks by the older adults:
  - Contrasting colours on ground surfaces and benches
  - Graphics on signs
  - Shorter path layouts
  - Optimized accessibility of benches (e.g. via wheelchair)
  - Social interaction
  - Option of choosing between shade and sun
  - Lit areas[93].
- There is a positive correlation between older adults' physical activity and parks where there are seating facilities along the route to the park[60, 93].
- Having clean toilets, trees, plants, good maintenance, things to look at, limited traffic and adapted lighting[60, 93] is conducive to the use of parks, together with well-maintained benches[60].
- There are indications of a positive correlation between green areas and walking when areas are considered attractive, e.g. with plants and an absence of litter[93].

Safety

- Both a positive correlation and a lack of correlation have been found between urban green areas and the level of physical activity of older adults[90].
- The perception of safety is an essential factor for older adults' choice of activity in parks and green areas, and this factor plays a role in terms of their use of parks and green areas[93, 94].
- There is a positive correlation between perceived safety in the neighbourhood's open spaces and life satisfaction on the part of the older citizens[93].
- There are indications that older adults are more alert to environmental barriers and hazards, as they are particularly concerned about accessibility, mobility and safety[94].
- When older citizens have an overall sense of safety in open spaces and the neighbourhood as a whole, it can prompt them to do more walking, whereas a high level of traffic in the neighbourhood has been found to correlate negatively with walking among older adults[93].



- There is conflicting evidence as to whether the older adults prefer parks specifically intended for them or parks that include multiple target groups[93, 94]. Some studies show that older citizens are scared of vandalism and other criminal behaviour committed by younger people and therefore opt to visit parks specifically intended for them. Conversely, other studies have found that older adults prefer to visit inclusive parks or open spaces in the local environment, where, among other things, they can watch children at play[94].
- The older adults may find parks with safe paths and toilets appealing. In many instances older adults feel vulnerable in open public spots where there are fewer people around them. Populated, and hence socially monitored, areas can be more of a support for older adults' physical activity behaviour[81].
- Indications have been found of a positive correlation between recreational facilities and leisure-related walking on the part of the older adults[81].

Parks and green areas as social meeting places for the older citizens

There is evidence that the opportunity to be together with others in open spaces is important for older adults and even a sign that they can be more important than the physical facilities for some groups[93].

Many older citizens think of urban open spaces as meeting spaces where they can congregate and socialize. If social support is available, there are indications that it has a positive influence on the degree of physical activity, particularly when the older adults perceive that the physical environment supports them in being physically active. However, related studies have not found a correlation between social support and recreational walking[93].

The importance of school settings for children and adolescents' physical activity

Children and adolescents spend a large part of their waking hours in school. Therefore, it is essential that they can be physically active in connection with school attendance. Studies have shown that a school's areas include many options for physical activity, and the position of the school and its surrounding infrastructure also have a bearing on how physically active the pupils are. The examination of the associations between school settings and children and adolescents' physical activity, shows the following:

Location

- Children can be physically active as part of their everyday routine, e.g. by means of their transportation to school. In this respect, school location in the urban environment plays an essential role for children's level of physical activity[95].
- Residential density and street connectivity are linked to walking, and especially day-to-day mobility where children operate independently of their parents and other adults[50].
- Children living in walkable areas with well-connected streets, pavements and local destinations, e.g. schools, where there is a positive perception of traffic and crime-related safety, are generally more inclined to be physically active and use active transportation than children living in less walkable areas[18, 55, 71-74, 96].
- A significant correlation has been found between walkability and active transportation to school[72, 97].
- A school's local environment can have a bearing on the children's active transportation to school, where a negative correlation is seen between active transportation and a lack of well-connected street networks, and the presence of large main roads and hills[97].
- In addition, indications have been found that children attending schools with good opportunities for walking and cycling in the local environment, e.g. with the presence of cycle lanes as well as traffic-calming components, spent more time in moderate to high-intensity physical activity in transit to and from school as compared with children attending schools with few opportunities for walking and cycling to and from school[97].
- Several studies have shown that children's and adolescents' active transportation to school is essential for their general level of activity[40, 42, 97].
- Short distances to school have a positive correlation with active transportation to school[40, 70, 90, 98]
- Regardless of their age, children prefer short walking and cycling distances, and distance is often the factor that has the greatest impact on transportation to school[98].
- Children living closer to school are more inclined to use active transportation to school than children living further away[76].
- A negative correlation has been found between long distances to school and the children's overall physical activity[76].
- Two studies, one of which focused exclusively on girls, found a significant negative correlation between the distance to school and children's and adolescents' objectively measured moderate and high-intensity physical activity, large distances being associated with a low degree of overall physical activity[76].
- In one study, shorter walking and cycling times to school were associated with

- One study identified that most walks to school are undertaken by children who live 1-1.6 km from their school. Furthermore, it was found that children cycling to school tended to cover longer distances than those who walk[98].
- Similarly, the ability to use the school grounds and attendant facilities outside of school hours was also found to be positive for children's level of physical activity[95].
- Children's activity in urban green areas, e.g. school grounds, parks, grass areas and wooded areas accounted for 20 percent of their total daily amount of moderate to high-intensity physical activity outside of school hours[74].

Perception of safety

- Children's opportunities for being physically active are largely correlated with their parents' perception of the neighbourhood and fear of traffic and crime[18, 19, 37, 50, 69, 74, 77-79, 96, 98].
- The positive perception of accessibility and street connectivity by children and their parents can increase the proportion of active transportation to school, whatever the actual conditions prevalent on the route to school[98].
- There is a negative correlation between parents' fear of traffic and children walking to school[50].
- Improvements to traffic safety along the route increase the proportion of children who walk to school55.
- It is conducive to children's and adolescents' active transportation to school if routes are direct[50] and they do not encounter hilly roads[40, 42, 75] and large major through-roads[50, 97] or heavy traffic and busy roads[40, 42, 50].
- Intersections and street lighting also play a role in terms of children's active school transportation, a lack of these components correlating negatively with the amount of active transportation[40].
- Adolescents' concerns about safety, harassment by bullies and strangers, and perceived crime risks act as barriers to their active transportation[42].
- There is a negative correlation between perceptions of the risk of injury as a result of falling and physical activity[41].
- Children's fear of strangers and perception of safety in the neighbourhood are significantly linked to the destinations to which a child goes without being accompanied by its parents[77].
- Parents' and children's perceptions have to do with the fact that there are other children in the neighbourhood. In that context, it is positive if many children use active transportation to school, and girls in particular prefer active transportation to school to take place together with others[98].

Outside areas and facilities

- The school recesses contribute to children's physical activity throughout the school day40.
- Areas not designed for specific activities lend themselves best to sporadic activity patterns[42].
- One study found that playtime in school contributes up to 40 percent of the recommended daily amount of moderate to high-intensity physical activity for boys and up to 31 percent for girls[42]. Thus, school playtime can make an essential contribution to meeting the recommendations for physical activity.
- No correlation has been found between school size and active transportation76, but on the other hand, there are indications of a positive correlation between a school's outdoor area per pupil and physical activity in breaks and recesses[97].
- A positive correlation has been found between the building area per pupil, and the amount and intensity of children's and adolescents' physical activity[97].
- Indications have been found that spatial environments with room for activities promote physical activity, and a lack of space in school can restrict activity[99], while other studies have found no correlation between the accessibility of outdoor space in school grounds and physical activity[100] or merely indications that the correlation between size of play areas and physical activity during breaks is important for children to be physically active[101, 102].
- Allocation of sizable play areas is probably more important than extra playground equipment in promoting physical activity among pupils103, and interest in equipment may depend on the age group and motivation for such playground equipment, which can decline with time[103].

Facilities and equipment

Results are mixed as regards the correlations between physical activity and accessibility of permanent facilities and loose play and activity equipment.

- A lack of these components in the school grounds is a barrier to physical activity in school[42, 97], and equipment and materials accessible to pupils in their breaks have been identified as factors that increase their physical activity[103-105].
- Positive correlations have been found with physical activity in seven intervention studies, where equipment and materials were accessible to the pupils, but it is stressed that the equipment must be geared to their varying age and developmental levels before they will take advantage of it[103].
- One review identified no evidence of a correlation between accessible facilities in the school grounds and pupils' physical activity[101].
- It is not necessarily the number of or access to facilities that are important for adolescents' physical activity. Rather, what is important is the accessibility of specific, good-quality facilities which pupils consider suitable for activities[99].
- The only environmental factor that had a positive correlation with physical activity found in one study was the context of activity, e.g. type and siting of specific facilities, such as basketball courts and gymnasia[99].
- A positive association has been found between access to gym premises with pulse-training and weight-lifting equipment in school and physical activity in the break and after school hours[40].
- However, there are also studies that do not demonstrate a correlation between the accessibility of separate facilities in outdoor areas for physical activity (e.g. ball courts, sports tracks and green areas) and adolescents' physical activity[100].
- A positive correlation was found between the overall facilities offered on the school grounds, e.g. the sum total of accessible facilities, and physical activity in children and adolescents[100], which is supported by another review[40].
- Intervention studies have found that access to facilities in school has a positive correlation with physical activity in breaks and recesses[101].
- The results from one Danish study indicate that an increase in the number of playgrounds and facilities in Danish schools can increase the level of children's physical activity[106]. This study found no signs that the playground area affects the level of activity irrespective of the number of permanent playgrounds and facilities. But using objective measurements, it found positive correlation between the number of play facilities in the school grounds and the children's physical activity. At start of school (6 to 7-year-olds) every tenth extra play facility to which the children had access led to an increase of 14 percent in the amount of physical activity in their school hours and 6.9 percent viewed across the whole day. For children in third grade (9 to 10-year-olds) every tenth extra play facility led to an increase of 26 percent in the level of activity during school hours and 9.4 percent across the whole day[106].
- A review of both quantitative and qualitative studies of children and adolescents aged 11-18 on the importance of the school environment for adolescents' physical activity behaviour found indications in the qualitative studies that a lack of playgrounds limits children and adolescents' inner motivation to play and be active[99]. Young people feel they are too old for playgrounds, and safe play areas are boring to use[99]. This tallies well with another review, which, depending on the pupils' gender and age, shows a variation in correlations between the school's play and activity facilities and the pupils' physical activity[97].
- There are indications that surfaces with green vegetation like trees, bushes, grass and kitchen gardens support physical activity of low to moderate intensity, despite some cross-sectional studies not having found the same association[97].

- Qualitative studies have suggested that most children prefer grass surfaces to hard surfaces when it comes to being physically active. However, asphalt with courts and pitches, line markings and permanent equipment has also been identified as being well suited to active play. Hard-surfaced areas designed for activity, e.g. with markings geared to sport or casual and general play, have proved to be linked to increased moderate to high-intensity physical activity in breaks and recesses[97].
- In several reviews the presence of playground markings (e.g. painting of installations like mazes, hopscotch courts, activity areas) was found to increase children's levels of physical activity in school[42, 76, 97, 103-105, 107], although the evidence is not clear-cut[100, 101, 105, 102].
- Studies focusing on playground improvements, including playground markings, showed the most promising results in terms of promoting physical activity in children[105].
- Playground markings must be tailored to the various age groups and to pupils' developmental levels in order to influence their level of physical activity[103].
- Intervention studies have shown that designing school areas with activity zones with specific types of activity in mind can have an impact on pupils' physical activity[97, 103].
- A review of 5 to 18-year-old children and adolescents showed that remodelling playgrounds and adding variously coloured zones designed for sports, activities and play resulted in the pupils taking part in significantly more moderate and high-intensity physical activity than pupils in the control schools, which had not had their playgrounds remodelled. The effect of this type of intervention was found to be greatest among the younger children and in schools with longer breaks and recesses. Six months after the intervention, the effect of high-intensity physical activity was found to be greater than it was just six weeks after[97].
- A lack of equipment was found to be a barrier to physical activity in school[99]. Despite the inconsistent evidence, studies would indicate that not having access to activity and sports equipment is of greatest significance for boys[99].
- In qualitative studies, the respondents often highlight the negative influence on physical activity of equipment being poor and not maintained[99].
- There are various indications as to whether moveable gear (e.g. balls, skipping ropes and frisbees) or fixed equipment (e.g. basketball baskets) has a bearing on physical activity in school, and several reviews have found inadequate or varying results[76, 101, 102]. One review found no correlation between fixed equipment and physical activity, though indications were found that a positive correlation exists between movable gear and physical activity in children[100]. Another found that the addition of movable play gear in school for various games increased girls' moderate and high-intensity physical activity but at the same time reduced moderate and high-intensity physical activity in boys of normal weight[107].
- As well as play and activity equipment, indications were also found that poor changing facilities and a lack of facilities for storing bicycles at schools have an adverse impact on physical activity[99].

Conclusion

The aim of this publication is – based on reviews and meta-analyses – to share knowledge on how the urban environment impacts physical activity. The raison d'être is the fact that more and more people are going to live in cities, while the prevalence of physical inactivity globally is increasing. Research shows that there is a correlation between how active people are and the design of the urban environment.
The publication convey knowledge on how urban planning, organisation, management and maintenance of the urban environment can create opportunities and support people to become and sustain physically active.

The knowledge identified is used to study:

1. How can the urban environment support physical activity behaviour with focus on urban design and infrastructure, urban green areas and school settings?
2. How can the urban environment encourage different age groups to be physically active?

Systematic and probing search of the literature has been performed to identify relevant studies. The search led to the inclusion of 73 scientific review articles.

Based on the knowledge identified, it can be concluded that:

- To a large extent, the urban environments impacts physical activity behaviour.
- Walkability correlates positively with physical activity. A number of factors influence the walkability of the urban environment: Residential density, land use mix (e.g. mix of housing, shops, services and recreational areas), proximity to public transportation stops, street connectivity.
- It is essential for walking and cycling-friendly environments to have short distances to destinations as well as an interconnected and traffic-safe infrastructure in which people can commute and move around easily and feel safe.
- Street connectivity, including interconnected street networks, pedestrian crossings and traffic-calming components, are supportive of walking and cycling.
- Grid-like street networks are positive correlated with walkability, but superfluous intersections have an adverse effect on the general level of physical activity.
- A limited number of junctions in the neighbourhood enhances walking and cycling.
- There are differing indications about the correlation of dead-end roads and cul de sacs with physical activity. In general, dead-end roads and cul de sacs correlate negatively with physical activity, but at the same time there are indications that women living in a neighbourhoods with few dead-end roads walk less compared with women living in neighbourhoods without dead-end roads.
- The presence of pavements, paths and cycle lanes correlates positively with walking and cycling.
- More people use pavements and paths when they are nearby, and when they have a suitable width and are well-maintained.
- There are indications that separating pavements, paths and cycle lanes from other traffic enhances activity.
- Facilities along paths, e.g. benches, wastepaper bins, fences, pavilions and access to tap water, support the use of such paths.
- There are indications that people tend to cycle more to destinations that offer bicycle parking.
- Urban green areas can contribute to people being more physically active. That applies to both active transportation and other recreational activities in such areas.

- Although access to large parks and green areas is associated with more people using the parks, there are indications that adapting the size to the number of users has a bearing on perception of how vibrant and attractive such areas are found.
- People have various needs and wishes as regards the use of parks.
  Therefore, it is important to have variation in the areas and space for a variety of activities.
- Playgrounds and work-out facilities are important for outdoor leisure activities, and their siting and visibility in such areas has a bearing on the activity in them.
- Facilities such as benches, tables, barbecuing facilities, toilets, water taps, footpaths, lighting and shaded areas have a positive effect on the use of parks and thereby the level of physical activity.
- Perceived safety, aesthetics and quality also affect activity behaviour.
  Several reviews have found a positive correlation between perceived and/or actual safety in the neighbourhood and the amount of physical activity people undertake.
- Safety is related to traffic and crime Traffic safety is linked to road conditions, maintenance, lighting and the fear of accidents and injuries. The presence of street lighting, few intersections, a low volume of traffic, traffic-calming components and separate paths has a positive impact on physical activity. Fear of crime affects the level of physical activity negatively, e.g. the presence of undesirable groups, such as drug addicts, which is perceived as a barrier to physical activity.
- It is not possible to demonstrate a clear-cut correlation between the aesthetics of neighbourhoods and physical activity. There are indications that pleasant, green environments, good maintenance and the absence of litter, rubbish and vandalism have a positive effect.

Children and adolescents

It is essential to consider specific factors regarding children and adolescents' physical activity in urban environments. The examination of reviews shows that:

- Children's physical activity is largely affected by the street connections in the neighbourhood, and it is essential to consider both play amenities and transportation amenities in the street design.
- Cul de sacs and dead-ends correlate positively with children's play outdoors, but at the same time lessen the conditions for active transportation.
- The accessibility of parks and age-appropriate playgrounds with a varied range of facilities affects how physically active children and adolescents are in their leisure time.
- Children and adolescents usually visit attractive and well-maintained parks, prioritizing high-quality play equipment.
- There is a positive correlation between physical activity behaviour of adolescents and the number of sports facilities, streets and car parks that allow the creation of social meeting places.
- Active transportation to schools is an obvious opportunity for children and adolescents to be physically active in their everyday lives. The location of the school, urban densification, infrastructure, and traffic and crime-related safety influence the extent to which children and adolescents use active transportation.
- A school's outside areas and facilities have a bearing on the level of physical activity of children and adolescents. The accessibility of good-quality play facilities, equipment and materials geared to different age groups and developmental levels contributes positively to pupils' level of physical activity during school hours.
- Different kinds of surfacing and painted markings in the playground, e.g. play zones and hopscotch courts, promote physical activity among pupils.
- Children's (and particularly their parents') perception of safety in the urban environment is a crucial factor in how physically active children are in urban areas. Fear of traffic and crime influences whether parents allow their children to move independently in the neighbourhood.
- Traffic lights, pedestrian crossings, speed-regulated and less trafficked roads support children and adolescents' opportunities to be physically active. By contrast, the number of roads to be crossed, high traffic speed and low safety for pedestrians and cyclists are all factors that have an adverse impact on children's level of physical activity.
- High crime rates affect the level of physical activity of children and adolescents negatively.

Older adults

It is essential to consider specific factors regarding older adults' physical activity. Such considerations are particularly rooted in their impaired ability to function and their mobility. The examination of reviews shows that:

- It is essential for older adults to have short distances to everyday destinations, e.g. convenient stores and public stops, as well as support facilities, e.g. benches, ramps at kerbs and railings on stairs in their neighbourhood.
- There are indications that social aspects in open spaces are important for older adult, many of whom think of urban open spaces as gathering spaces where they can meet one another.
- More older adults will use and be active in parks if there are things to look at and access to attractive environments, e.g. with trees and plants, good maintenance and an absence of litter.
- Both traffic and crime-related safety have been found to be vital to the level of physical activity of older adults.
- In urban environments, where there is a fear of being assaulted or falling, e.g. owing to poor surfaces, there will be a lower level of activity than in urban environments, which are perceived to have a high level of security and safety.

Future perspective

As is clearly documented by the literature review: Structural changes to the urban environment is one of the ways of getting more people – of all age groups – to be more physically active in their everyday lives. Thus, there is great potential for improving public health by laying out the surroundings to support physically activity.

And there are great challenges to be tackled. For example, objective measurements of the level of physical activity of Danish 11 to 15-year-olds show that only 26 percent meet WHO's minimum recommendation for physical activity108. For Danish adults (aged 25-74) this is roughly one person in three, while for the older adults (> 75) it is roughly one in two[36].

Urban spaces are for everyone, and anyone – regardless of age or social background – should be able to e.g. use active transportation. Thus, an urban environment that promotes active transportation and play can be instrumental in reducing social inequality in public health, provided that everyone is given an equal opportunity to be physically active.

In the Danish health promotion packages for physical activity and mental health, the Danish Health Authority recommends that, in their urban planning, local governments focus on:

- Infrastructure that promotes active transportation[7].
- Easy access to outside areas that invite people to participate in physical activity[7].
- The use of natural amenities as an arena for promoting mental health[109].

This publication contains proposals for specific factors that usefully could be focused on in relation to the general public and specifically in relation to the target groups of children, adolescents and older persons. The proposals have a solid research basis. There are many factors involved in the people's desire to be physically active: Aesthetics, safety and proximity affect motivation, and an integrated approach should therefore be used in the planning of the urban environment.

Cross-disciplinary cooperation

The possibility for people to be active daily is to a large extent determined by a number of factors shared by various authorities. These include city planning, traffic, schools, culture and leisure, environment and technology and, above all, health. Each authority has its core tasks and goals, but it is worth underlining that focus on promoting physical activities for the public in city planning benefits many areas. When children are physically active, e.g. by walking or cycling to school, it has a positive impact on their ability to learn[1]. If more people cycled, the city would be safer, the air cleaner and there would be less noise[5]. When more people exercise, the number of sick leave days in the workplace[110] declines, and the right framework can help strengthen voluntary activities and associations[29].

If the goals and tasks of the various administrative areas were combined, it would be possible to create environments that supported physical activity, while solving other tasks. For example, the establishment of green areas due to rainwater protection could also lead to an improved network of paths that could be used by the public for walking and running. Cooperation between sectors would be required for this type of solution to be achieved, but it would be worth it - on many levels.

Important Sustainable Development Goals

Several Danish municipalities have decided to put the UN's Sustainable Development Goals into effect, and the design of the urban environment may also contribute in this context. The goals focus precisely on how physical activity can contribute to:

- Good Health & Well-being = active transportation (Goal 3)
- Sustainable Cities & Communities = less transportation by cars and bus (Goal 11)
- Climate Action = less CO2 from motorised vehicles (Goal 13).

Each of these three goals is broken down into a number of specific targets under which arguments can be presented as to whether physical activity plays a crucial role - partly because the goals promote the possibility of being physically active, but also because physical activity is an important tool for achieving the goals:

- Target 3.4: By 2030, reduce by one-third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being. Sedentary behaviour is a risk factor for non-communicable diseases, including type 2 diabetes. Physical activity may not only prevent and be included in the treatment of non-communicable diseases, but also prevent premature mortality and promote mental health and well-being1. This sub-goal can be achieved by designing the urban environment to support the public in being physically active.

- Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transportation systems for all, improving road safety, notably by expanding public transportation, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.
  The improvement of road safety for pedestrians and cyclists can help to promote active transportation - both as an independent means of transportation or as transportation to reach public transportation. A safe and secure urban environment supports everyone in being physically active. Safety and improved access to public transportation also create more room for the older adults to be physically active in.

- Target 13.2: Integrate climate change measures into national policies, strategies and planning.
  The reduction of transportation by car and increased active transportation can contribute to the reduced use of fossil fuels, thereby contributing to the mitigation of climate change. In addition, the planning and construction of parks with trees and grassland will collect excessive rainfall when torrential rain storms occur. These parks may also be designed to include, e.g. paths, playgrounds and playing fields, which would support daily physical activity.

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List of Annexes

Annex 1 Case studies

Accessibility of cities to physical activity

In 2016, Sallis and colleagues[1] published a study, which aimed at documenting how objectively measured characteristics of the urban environment are related to objectively measured physical activity in adults (aged 18-66). The analyses in the study were based on the internationally coordinated cross-sectional study *International Physical activity and Environment Network (IPEN) adult study.* The IPEN study is based on data from a total of 14,222 adults, of which both accelerometer data and GIS data were collected from 6,882 of the participants.

The 6,882 participants come from 14 cities in 10 countries spanning five continents, of which Denmark is represented by Aarhus.

The results showed a significant, positive and linear correlations between four environmental characteristics and physical activity. These environmental characteristics were residential density, density of public transportation stops, density of intersections and number of parks, respectively. What makes the conducted study unique in an international context is that it is based on objective measurements of both physical activity and the physical characteristics of urban areas. This took place in 14 very different cities in relation to size, number of inhabitants, land use, topography, geography and climate. This means that the results of the study offer a high degree of accuracy, reliability and validity, which to a certain extent make the results universal and worth building upon.

Firstly, the study shows that the built environment across geography, culture and the socio-economic status of inhabitants has an impact on physical activity behaviour among adults. This highlights the fact that urban infrastructure and the land use have a significant role to play in international public health. A role that will steadily increase with continued urbanisation, where projections suggest that 70 percent of the world's population will live in cities by 2050.

Secondly, the study shows that simply living in an activity-friendly urban area can contribute between 32-59 percent of the WHO recommendation for being physically active for 150 minutes per week. Therefore, the design of the community “facilitates” exercise that residents in areas more hostile to activity must reach out to obtain. This has particular implications for low-income population groups who find it more difficult to opt for an active lifestyle if the barriers encountered are considered as major. Urban design can therefore help in offsetting social health inequalities.

Thirdly, the study shows that any improvement of the urban environment will have a beneficial effect on physical activity behaviour, regardless of the starting point. The linear correspondence, which was applicable to the four significant factors means that, e.g. the establishment of more public transportation stops or more parks and recreational areas will have a positive impact on the activity level of the inhabitants, regardless of their level of education and social class.

The importance of parks and green spaces for physical activity - Facilities

In 2015, Lindberg and Schipperijn[2] published a study that dealt with active use of urban park facilities. Using the System for *Observing Play and Recreation in Communities (SOPARC)* methodology, they investigated four different urban green spaces and use of 36 facilities in these. SOPARC is an objective observation tool which makes it possible to collect data about park users and their characteristics, e.g. number of park users, sex, age, type of activity and level of physical activity. The observations were carried out in April and May 2013, with each area observed four times per day for 15 minutes on two weekdays and two weekend days. The four spaces that were investigated were ‘Fælledparken’ (58 ha in area), ‘Superkilen’ (3 ha), ‘Sifs plads’ (0.24 ha) and ‘Krakas plads’ (0.21 ha), which are all located within the inner city of Copenhagen and separated by distances of up to two kilometres.

All four spaces have been renovated since 2009, to be made more user-friendly, with extra facilities added to encourage physical activity and improvements made to the overall urban design. In addition to use of the parks and facilities, the authors of the study also investigated the difference between the target groups that the architects expected to use the facilities and the users who were observed using them. Short telephone interviews and semi-structured qualitative interviews were also conducted with three architects with responsibility for the chosen facilities.

The results in general indicate a difference in the number of users for each urban green space and a larger proportion of male users. Most users and the highest levels of activity were observed in Fælledparken, which by far is the largest park, although the actual area under observation (3.64 ha) was only slightly greater than the area in Superkilen (3 ha). The authors of the study mention that the size of Fælledparken and the relatively short distances between the parks may be key factors here. Although nearly all of the facilities observed were being used for physical activity, the number of users varied from facility to facility. Facilities that give users the option for playing games and playing in general, such as multi-purpose pitches, football pitches, trampolines, swings, climbing frames and skate parks, were being used more than facilities conceived for individual strength and fitness training, such as fitness equipment, gymnastic facilities and boxing rings.

According to the authors, the results indicate that it is important for many users to have the option to socialise and play while they are being physical active, and that outdoor strength and fitness facilities are not necessarily the best option when it comes to encouraging physical activity in urban green spaces. A variation of facilities located close together, plus the design and quality of facilities, also appears to bring about more use of the facilities.

Although the vast of majority of facilities were intended for a certain target group, the actual users of facilities did not match the expected target groups in some cases. The interviews with the architects, for example, showed that while football and multi-purpose pitches were aimed at both children and teenagers, children used smaller multi-purpose pitches and spaces to a greater extent. The larger spaces and multi-purpose pitches, on the other hand, were used more by adults. The architects expressed that it was sometimes difficult for them to obtain information about the target group, intended purpose and anticipated effect of each facility. Furthermore, in several cases the aesthetics of the facilities were found to be more important than practicalities. These findings mean that the authors are identifying a need for architects and planners to increase their knowledge of how to design facilities that will encourage activity in urban green spaces.

The importance of outdoor areas at schools for physical activity

In 2015, Andersen et al[3] published a study in which they investigated the importance of outdoor areas at schools for the physical activity of pupils. The purpose of this was to investigate how school children use different outdoor areas during playtime, and whether there is any connection between these areas and different levels of physical activity among the pupils.

The study used baseline data from the study *When Cities Move Children (WCMC),* which is a longitudinal natural experiment. Data was collected in and around the Haraldsgade quarter in Copenhagen, which is a multi-ethnic urban area in which 30 different nationalities are represented. Pupils in the 5th to 8th grades (aged 10–15 years) from four schools in the area made up the population study in WCMC. Data was collected from April 2010 until September 2011, with a total of 523 pupils taking part. Physical activity was measured using accelerometers, with the collected GPS data used to determine the location of the pupils in the outdoor areas. The outdoor areas were subdivided into five main categories – grass, multi-purpose pitches (delimited areas with AstroTurf, rubber or tarmac surfaces, designed for ball games), hard surfaces (tarmacked areas, often with markings for games and benches in different places), natural areas (e.g. areas containing bushes and trees) and play parks (e.g. swings and climbing walls).

The results indicated that children (5th to 6th class in the Danish education system) on average spent more time in their school's outdoor spaces and engaged in more moderate to vigorous physical activity (MVPA) compared to adolescents (7th to 8th class in the Danish education system). The pupils spent most time doing MVPA in grass areas (27 percent), then areas containing play parks (26 percent) and multi-purpose pitches (22 percent). On average, boys spent more time doing MVPA than girls, with the biggest difference between the sexes discovered in relation to multi-purpose pitches, where boys were engaging in MVPA 28 percent of the time and girls 16 percent of the time.
The biggest difference between children and adolescents was found in areas containing multi-purpose pitches, where adolescents were only engaging in MVPA 7 percent of the time, compared to 17 percent of the time for children. The areas in which the biggest proportion of pupils were sedentary were the areas with hard surfaces (47 percent), with the results indicating that girls generally were spending significantly more time pursuing sedentary activities than boys. The proportion of sedentary time varied between children and adolescents, with significant differences identified for areas containing multi-purpose pitches and hard surfaces, where adolescents spent more time 'sedentary' than children.

On average, boys spent more time doing MVPA than girls; the authors noted in relation to this how it is interesting that no sex-related difference was found in terms of the time spent in each of the five outdoor areas. They underline that this finding makes it essential to investigate the different areas and functions of the outdoor areas at schools in order to be able to encourage physical activity among girls. While grass and play areas do play an important role in relation to the amount of physical activity at schools, the authors also recognise that physical activity in schools' outdoor areas could be encouraged if improvements were made to the hard surfaces, as it is here where many sedentary activities happen.

Appendix 2 Search string

The basis and starting point for the systematic search will be outlined in the following section. As the search is highly relevant to the purpose of the publication, this will be outlined first. Inclusion criteria and the work done before for the final search will be described subsequently. Finally, the last search matrix for each of the three databases used will then be presented.

Purpose

The purpose of this publication is to share knowledge on how the planning, design, management and maintenance of the urban environment can enhance physical activity

Based on the identified knowledge, the following questions will be answered:

1. How can the urban environment support physical activity behaviour with focus on urban design and infrastructure, urban green areas and school settings?
2. How the urban environment encourages different age groups to be physically active?

Inclusion criteria

The articles must cover how the urban environment, including infrastructure, parks and green spaces, as well as schools, influences physical activity in its different forms. The entire population is the target population. With regard to the reviews or meta-analyses included, priority is given to articles written in English and published in the past 15 years (2004-2018).

Searching - three databases

The structured literature search was performed in three databases – PubMed, Scopus and Web of Science. The three databases all contain a large number of peer-reviewed articles, covering topics such as medicine, health and social sciences, and therefore is thought to be relevant to the identification of reviews relevant to the publication.

The Boolean operators AND and OR were used to combine the search terms and thus structure the delimitation in the databases. In addition, the truncation * was used in relation to individual search terms and thus make it possible to include several grammatical declensions of these. Searches for the individual words were performed in each database in preparation for the finalised search terms. On this basis, the terms were then included or excluded according to the number of hits and their relevance in relation to the objectives. The search strings were adjusted for the three databases against the background of the individual searches and will thus differ to some degree.

Structured literature search in PubMed

The final search was conducted on November 1st 2018 and resulted in 1,049 hits. The following restrictions were put into place: 1) year of publication: 2004–2018, 2) study design: review and 3) language: English.

Terms for 'The urban environment'		Terms for 'Physical activity'
	AND	
	“Urban renewal” [MeSH Terms]	“Exercise” [MeSH Terms]
	“Urban renewal”	"Physical activity"
	“Urban development”	“Physical exercise”
	“Urban area*”	“Walking” [MeSH Terms]
	“City planning” [MeSH Terms]	“Running” [MeSH Terms]
	“City planning”	“Leisure activities” [MeSH Terms]
	“Urban design”	“Leisure activity”
	“Cities” [MeSH Terms]	“Leisure activities”
	“Cities”	“Sedentary lifestyle” [MeSH Terms]
	“Urbanization” [MeSH Terms]	“Sedentary lifestyle”
	“Urbanization*”	“Play and Playthings” [MeSH Terms]
	“Urbanisation*”	“Physical inactivity”
	“Environment design” [MeSH Terms]	“Active transport*”
	“Environment design”	“Active travel”
	“Built environment”	“Active Living”
	"Residence characteristics” [MeSH Terms]	
	“Residence characteristics”	
	“Neighborhood*”	
	’’Neighbourhood*”	
	“Living arrangement”	
OR	“Living arrangements”	
	“Parks, Recreational” [MeSH Terms]	
	“Parks”	
	“Schools” [MeSH Terms]	
	“School environment”	
	“School facilities”	
	“Child day care centers” [MeSH Terms]	
	“Adult day care centers” [MeSH Terms]	
	“Day care”	
	“Physical environment*”	
	“Urban environment*”	
	“Urbanism”	
	“Infrastructure”	
	“Walkability”	
	“Bikeability”	
	“Green areas”	
	“Greenery”	
	“Green space*”	
	“Public areas”	
	“Playground*”	
	“Recess”	
	“Modern society”	

Structured literature search in Scopus

The final search was conducted on November 1st 2018 and resulted in 1,787 hits. The following restrictions were put into place: 1) year of publication: 2004–2018, 2) study design: review, 3) language: English.

Terms for 'The urban environment':		Terms for 'Physical activity'
	AND	
"Urban renewal"		"Exercise"
"Urban develop*"		"Physical activit*"
"Urban area*"		"Walking"
"Urban plan*"		"Running"
"City plan*"		"Recreation"
"Town plan*"		"Leisure activit*"
"Urban design"		"Sedentary"
"Urbanization*		"Physical inactivit*"
"Urbanisation*"		"Active transport*"
"Central cit*"		"Active travel"
"Environmental design"		"Active Living"
"Built environ*"		"Commuting"
"Residence characteristics"		
"Neighborhood*"		
''Neighbourhood*"		
"Living arrangement*"		
"Parks"		
"Physical environ*"		
"Urban environ*"	**OR**	
"Urbanism"		
"Public realm"		
"Walkability"		
"Bikeability"		
"Green area*"		
"Greenery"		
"Green space*"		
"School environ*"		
"School facilit*"		
"Day care"		
"Playground*"		
"Recess"		
"Infrastructure"		
"Environmental plan*"		
"Public transport*"		
"Living arrangement*"		

Structured literature search in Web of Science

The final search was conducted on November 1st 2018 and resulted in 981 hits. The following restrictions were put into place: 1) year of publication: 2004–2018, 2) study design: review, 3) language: English.

Terms for 'The urban environment'		Term for 'Physical activity'
	AND	
"Urban renewal"		"Exercise"
"Urban develop*		"Physical activit*"
"Urban area*"		"Physical inactivit*"
"Urban plan*"		"Walking"
"City plan*"		"Running"
"Town plan*"		"Recreation"
"Urban design		"Leisure activit*"
"Cities"		"Active transport*"
"Urbanization*"		"Active travel"
"Urbanisation"		"Active living"
"Environment* design"		"Commuting"
"Built environment*"		"Sedentary"
"Residence characteristics"		
"Neighborhood*"		
''Neighbourhood*"		
"Living arrangement*"		
"Parks"		
OR "Recreational area*"		
"Physical environment*"		
"Urban environ*"		
"Urbanism"		
"Public realm"		
"Walkability"		
"Green area*"		
"Greenery"		
"Green space*"		
"Public area*"		
"Public space*"		
"School environment*"		
"School facilities"		
"Day care"		
"Playground"		
"Recess"		
"Infrastructure"		
"Modern society"		

Appendix 3 Characteristics of included studies

The urban environment's importance for physical activity

Author(s), year, country	Purpose	Population	Design and method (e.g. type of primary studies)	Time of literature search	Area in the urban environment
Bird et al., 2018, England.	To investigate the connection between the man-made and natural environment and health, with the focus on five areas: design of the local environment, housing, food environment, natural and sustainable environment and transport.	Children, youths and adults (all ages).	Umbrella review. Systematic literature search in seven electronic databases. Additional literature search involving relevant researchers and organisations and chain searching in references. Studies should have been published between January 2005 and April 2016, from high- and middle-income countries, and be quantitative systematic reviews and *stakeholder* reviews.	April 2016.	The urban environment and its accessibility in general (man-made environment, infrastructure, land use, safety).
Brown, Moodie & Carter, 2017, Australia.	To investigate the connection between traffic-calming elements/safety and active transportation or obesity.	Children, adolescents and adults (all ages).	Scoping review. Systematic literature search in five electronic databases for primary studies which reported quantitative data.	June 2016.	Traffic-calming elements and safety in the urban environment.
Carlin et al., 2017, USA.	To identify elements of the physical environment that have influence on physical activity in someone's lifetime.	All ages (children, adolescents, adults and the elderly).	Systematic umbrella review. Systematic literature search in four electronic databases. Only systematic reviews and meta-analyses from April 2004 to January 2016 of observational studies were included.		The urban environment generally, parks and green spaces, schools.
Ferdinand et al, 2012, USA.	To investigate the connection between the man-made environment and physical activity or rates of obesity.	All ages (children, adolescents, adults and the elderly).	Systematic review. Systematic literature search for studies from five electronic databases. Studies should be in English and published between 1990 and April 2011 and could be both quantitative and qualitative.		The urban environment generally, parks and green spaces, schools.
Fraser & Lock, 2010, UK.	To collect evidence at a global level from observational studies and experimental studies that investigate the man-made environment's impact on cycling behaviour.	All ages.	Systematic review. Systematic literature search in nine electronic databases and search of studies in the grey literature as well as chain searching in selected references. Studies should be in English and published up to and including June 2009 and could be both quantitative and qualitative.	July 2009.	The urban environment and its accessibility with the focus on cycling (e.g. infrastructure, land use, safety).
Giles-Corti et al., 2016, Australia.	To identify regional and local interventions which, when combined, encourage people to walk, cycle and use public transportation, while reducing use of private motorised vehicles.	All ages (but mainly adults).	First part in a series of publications dealing with the health-related importance of town planning in relation to forms of transport. Evidence from different disciplines as well as critical and systematic reviews were used in this part, if available. In addition, eight integrated regional and local interventions were identified, which as a combined whole encourage walking, cycling and use of public transport and reduce private use of motor vehicles.		The urban environment and its accessibility generally (e.g. infrastructure, land use).
Hajna et al., 2015, Canada.	To summarise the existing knowledge of the connection between *walkability* in the local environment and adults' daily step count.	Adults (> 18 years).	Systematic review and meta-analysis. Systematic literature search in three electronic databases. The studies should be in English and published before May 2014.		The urban environment and its accessibility (walkway links, land use and population density).
Karmeniemi et al., 2018, Finland.	1) To identify crucial factors in the man-made environment that are associated with physical activity. 2) To evaluate how changes to the man-made environment are linked to physical activity.	All ages (children, adolescents, adults and the elderly).	Systematic review. Systematic literature search in six electronic databases for longitudinal studies and natural experiments published in English between 2003 and December 2015. Reference lists from previous systematic reviews and other relevant literature were also screened.	On January 2016, the protocol was entered in the international prospective register of systematic reviews.	The urban environment and its accessibility (e.g. infrastructure, land use, safety, aesthetics).
Kelly et al., 2016, UK.	1) To identify key issues (barriers and facilitators) that prevent, restrict, help or motivate middle-aged people to be healthy in their behaviour. 2) To identify specific factors that may have an influence on health inequalities.	Adults (40–64 years). Younger adults from lower socio-economic groups or minority groups were also included to reflect previous potential outbreaks of diseases.	Systematic review (a rapid systematic review). Systematic literature search in 12 electronic databases. Studies should be English-language systematic reviews or qualitative/longitudinal cohort studies published from 2000 to March 2014.		The urban environment and its accessibility (e.g. land use, safety).

Author(s), year, country	Purpose	Population	Design and method (e.g. type of primary studies)	Time of literature search	Area in the urban environment
Lee & Moudon, 2004, USA.	To highlight key findings confirming that walking is the most common form of physical activity and identify location preferences and perceived barriers in the way of physical activity. Another intention is to investigate the environmental variables used, with the focus on highly empirical evidence in relation to support for physical activity.	All ages.	Systematic review. Literature search in three databases and one further search in studies from federal and local public health agencies.	September 2002 and periodic update up to June 2003.	The urban environment and its accessibility (e.g. infrastructure and land use).
McCormack & ShieLL, 2011, Canada.	To collate knowledge from quantitative studies regarding the correlation between the man-made environment and physical activity.	Adults.	Systematic review. Systematic literature search in eight electronic databases. The studies should be in English and quantitative.	September 2010.	The urban environment and its accessibility (e.g. land use, walkway links and population density).
Mush & Clifton, 2016, USA.	To investigate existing knowledge of how land use influences cycling.	Adults.	Review.		The urban environment and its accessibility (e.g. form, land use and population density).
Nathan et al., 2018, USA.	To summarise evidence of influence the man-made environment has on health throughout a person's lifetime and in different contexts.	All ages.	Summary of existing literature within the field.		The urban environment and its accessibility, including parks and green spaces, as well as schools.
Panter & Jones, 2010, UK.	To outline existing knowledge of psychological and environmental influence on active transportation in the adult population.	Adults (18-65 years).	Review. Structured literature search in three electronic databases and subsequent chain search in selected reference lists. The studies should be English-language quantitative studies published between January 1990 and January 2009.		The urban environment and its accessibility (e.g. infrastructure and land use).
Pucher, Dill & Handy, 2010, USA.	To evaluate existing research in relation to the effects of different interventions on the amount of cycling activity. The interventions should include infrastructure, and interaction with public transportation, among others.	Adults and children in small number of school-based interventions.	Review. Structured literature search for quantitative studies from electronic databases and grey literature. Additional literature was identified when reviewing references and contact was made with leading researchers within the field.		The urban environment and its accessibility, mainly infrastructure.
Rees-Punia, Hathaway & Gay, 2018, USA.	To estimate the odds of achieving high levels of physical activity (PA) when the perception of safety from criminality is high, and when the number of objectively measured crimes is high.	All ages.	Meta-analysis. Structured literature search in four electronic databases for studies published up to and in 2016.		Safety and criminality in relation to the accessibility of urban environments for physical activity (infrastructure).
Renalds, Smith & Hale, 2010, USA.	To compile and summarise literature about the man-made environment's relationship with health.	All ages.	Systematic review. Systematic literature search in two electronic databases. The studies should be English-language and published between January 2003 and January 2009.		The urban environment and its accessibility (including infrastructure and land use).
Saelens & Handy, 2008, USA.	To identify the correlation between factors in the man-made environment and walking activity.	All ages.	Review. Structured literature search in three electronic databases. The studies should be English-language and published between 2000 and May 2006.		The urban environment and its accessibility (including infrastructure and land use).
Sallis et al., 2012, USA.	1)To outline ecological behavioural models and key terms at several levels applicable to physical activity. 2) To summarise evidence of the relationship between the features of the man-made environment and physical activity and obesity. 3) To make recommendations for changes in the man-made environment that may increase physical activity.	Children, adolescents and adults.	Non-systematic review. Presentation of conclusions from previous reviews and illustration of results by highlighting selected studies.		The urban environment and its accessibility (e.g. parks, land use and infrastructure).

Author(s), year, country	Purpose	Population	Design and method (e.g. type of primary studies)	Time of literature search	Area in the urban environment
Salvo et al., 2018, Canada.	To summarise results from qualitative research in relation to how man-made construction in local environments has an impact on adult physical activity.	Adults.	Systematic review. Systematic literature search in seven electronic databases. The studies should be qualitative and in English.	April 2016.	The urban environment and its accessibility (e.g. parks, land use and infrastructure).
Schulz, Romppel & Grande, 2018, Germany.	To investigate the existing evidence of the role of the man-made environment in relation to risk factors and health behaviours in Germany.	All ages.	Systematic review. Systematic literature search in two electronic databases for studies from Germany.	September 2016.	The urban environment and its accessibility (e.g. land use and infrastructure) as well as parks and green spaces.
Smith et al., 2017, New Zealand.	1) To identify environmental interventions that increase physical activity for residents at a local level. 2) To build on the evidence base by evaluating intervention costs and the different effects of interventions in relation to ethnicity and socio-economic status.	All ages.	Systematic review. Systematic literature search in four electronic databases. The studies should be quantitative and published between 1977 and 2015.	June 2015.	The urban environment and its accessibility (e.g. facilities, land use and infrastructure) as well as parks and green spaces.
Stafford & Baldwin, 2018, Australia.	1) To understand how different ages and possibilities are investigated in relation to design and method. 2) To investigate the characteristics identified as having an influence on the walkability of the local environment. 3) To identify which gaps exist in the planning of walkable local environments for all ages.	All ages.	Review. Structured literature search in three electronic databases. The studies should be English-language and published between 2000 and 2016.		The urban environment and its accessibility, especially in relation to walkability.
Stewart, Anokye & Pokhrel, 2015, UK.	To investigate which interventions increase the amount of cycling among commuters.	Adults (18+ years).	Systematic review. Systematic literature search in eight electronic databases. Studies should be English-language and include a control group or data before and after the intervention.	October and November 2014.	The urban environment and its accessibility (in particular in relation to the cycling infrastructure).
Stappers et al. 2018, Holland.	To investigate the effect of infrastructural changes in the man-made environment on physical activity, active transport and sedentary behaviour.	Adults.	Systematic review. Systematic literature search in two electronic databases. Studies may be published up to February 2018 and should be in English.		The urban environment and its accessibility (e.g. land use and infrastructure).
Van Holle et al., 2012, Belgium.	To summarise evidence from Europe of the correlation between the physical environment and the different domains of physical activity for adults.	Adults (18-65 years).	Systematic review. Systematic literature search in six electronic databases. The studies should be observational studies, investigate European adults and be published between January 2000 and August 2011.	Databases were screened up to January 2010.	The urban environment and its accessibility (e.g. infrastructure, land use, recreational facilities, aesthetics, safety).
Wang, Chau & Leung, 2016, Hong Kong	1) To identify the most significant environmental barriers that prevent walking and cycling activities. 2) To identify the general and specific characteristics of the most significant properties of the man-made environment in residential areas that may help to overcome different types of barriers and improve levels of walking and cycling activity. 3) To determine the effectiveness of properties in the man-made environment at improving walking and cycling activities.	All ages.	Review. Literature search in four electronic databases. The studies should be English-language and published between 1977 and 2015. References in reports issued by authoritative organisations within the field such as the World Health Organization were also included.		The urban environment and its accessibility (e.g. land use and infrastructure) as well as parks and green spaces.
Wendel-Vos et al., 2006, Netherlands.	To gain insight into potential factors that are important for different types and intensities of physical activity among adults.	Adults (>18 years).	Systematic review. Systematic literature search in four electronic databases. The studies should be observational studies and published between January 1980 and December 2004.		The urban environment and its accessibility, mainly infrastructure.

Children and adolescents

Author(s), year, country	Purpose	Population	Design and method (e.g. type of primary studies)	Time of literature search	Area in the urban environment
Christian et al. 2015, Australia.	To provide an overview of the correlation between early development in children (0–7 years) and 1) the man-made environment 2) green spaces 3) outdoor spaces in the home.	Children (0-7 years).	Systematic review. Systematic literature search in six electronic databases. The studies should be quantitative, in English and published between 1982 and 2013.		The urban environment and its accessibility, green spaces and outdoor areas linked to children's homes.
Binns et al., 2009, USA.	To emphasise how the man-made environment in the community can create opportunities for physical activity among children.	Children (4-12 years).	Political declaration incorporating literature deemed relevant by the researchers.		The urban environment and its accessibility (e.g. infrastructure) as well as schools.
Davison & Lawson, 2006, USA.	To investigate the connection between the man-made environment and physical activity among children.	Children and adolescents.	Review. Literature search in five electronic databases. Studies should be in English.		The urban environment and its accessibility, including infrastructure, land use, facilities and safety.
D'Haese et al., 2015, Belgium.	To investigate the correlation between multiple characteristics of the physical environment and different contexts and active transport among children across different contexts.	Children (6-12 years).	Systematic review. Systematic literature search in six electronic databases. The studies should be English-language and published between January 2000 and August 2014.		The urban environment and its accessibility (e.g. walkability, density and safety).
Ding Ding et al. 2011, USA.	To sum up findings from scientific studies into the correlation between the local environment and physical activity among adolescents.	Children and adolescents (13–18 years).	Review. Review of studies from the 'Active Living Research' database identified in three electronic databases. The studies should be quantitative observational studies and published before January 2010.	October 2010.	The urban environment and its accessibility (e.g. infrastructure and land use) as well as parks and green spaces.
Ferreira et al., 2007, Netherlands.	To investigate environmental factors with a link to the physical activity of young people to ultimately have information about how to develop effective intervention strategies.	Children and young people (3–18 years).	Systematic review. Systematic literature search in five electronic databases. The studies should be published between January 1980 and December 2004. A chain search based on references from a previous systematic review was also conducted.		The urban environment and its accessibility (e.g. infrastructure and safety) as well as schools.
Hesketh, Lakshman & Sluijs, 2017, UK.	To summarise qualitative literature that investigates barriers and facilitators of activity behaviour for the youngest children (0-6 years), and in turn determine the perceived influence on activity behaviour, then locate and evaluate any inconsistencies and gaps in the (qualitative and quantitative) evidence that more broadly may inform future research.	Children (0-6 years).	Systematic review. Systematic literature search in eight electronic databases. The studies should be qualitative.	July 2016.	The urban environment and its accessibility, including parks and green spaces, safety and nursery schools.
Marzi, Demetriou & Reimers, 2018, Germany.	To create an overview of gender-specific socio-ecological correlators of independent mobility in children.	Children (3-12 years or an average age in this range).	Systematic review. Systematic literature search in five electronic databases. The studies should be in English or German and have a quantitative design. A chain search of studies was also conducted using the reference lists and quotes of the studies included.	November 2017.	The urban environment and its accessibility (design, infrastructure, safety).
McGrath, Hopkins & Hinckson, 2015, Switzerland.	To investigate studies linking aspects of the man-made environment to young people's moderate to vigorous physical activity, including walking.	Children and young people (5-17 years).	Systematic review and meta-analysis. Systematic literature search in three electronic databases. The studies should be English-language and published between January 2000 and March 2013. Different statistical analyses were used in relation to the meta-analyses, with an evaluation conducted to determine the extent to which the features of the urban environment encourage playing and/or walking.		The urban environment and its accessibility (e.g. infrastructure, land use, schools).
Panter, Jones & van Sluijs, 2008, UK.	To conduct a critical review of existing literature about the environmental influence on active transport behaviour among children and adolescents.	Children and adolescents (5-18 years).	Critical review. Literature search in three electronic databases.		The urban environment and its accessibility (infrastructure, land use, safety, aesthetics).

Author(s), year, country	Purpose	Population	Design and method (e.g. type of primary studies)	Time of literature search	Area in the urban environment
Sallis & GLanz, 2006, USA.	To investigate how improvements aimed at encouraging more physical activity and healthier diets can simultaneously decrease rates of childhood obesity.	Children and adolescents.	Status report and summary of existing knowledge.		The urban environment and its accessibility (e.g. *walkability,* infrastructure and safety).
Wong, Faulkner & Buliung, 2011, USA.	To investigate and summarise the correlation between objective measures of the properties of the man-made environment and active transportation to school, as well as critically discussing GIS methods used in this context.	Children and young people (5-18 years).	Systematic review. Systematic literature search in six electronic databases. The studies should be published in English. References in the identified studies and previous reviews were also included.	May 2010.	The urban environment and its accessibility (e.g. infrastructure and land use).

Older adults

Author(s), year, country	Purpose	Population	Design and method (e.g. type of primary studies)	Time of literature search	Area in the urban environment
Baert et al., 2011, Belgium.	To investigate literature that focuses on the identification of motivation factors and barriers in the way of physical activity among people aged 80 years+.	Oldest in elderly age group (average age >80 years).	Systematic review. Systematic literature search in three databases. The studies should be English-language and published after 1989. A chain search was also performed in the references. as was a search of quotes in relation to the identified studies.	December 2010.	The urban environment and its accessibility (e.g. infrastructure, recreational areas).
Barnett et al., 2017, Australia.	To provide a more extensive overview of studies investigating the correlation between properties of the man-made environment and measures of overall physical activity (including total amount of walking).	Elderly (average age >65 years).	Systematic review and meta-analysis. Systematic literature search in six databases. The studies should be quantitative and published between January 2000 and September 2016. A chain search of references from the identified studies was also conducted, as was a search of the grey literature.	November 2016.	The urban environment and its accessibility (e.g. infrastructure, land use and safety) as well as parks and green spaces.
Cerin et al., 2017, China.	To investigate existing literature about correlators of physical activity in the local environment and active transportation among the elderly.	Elderly (>65 years).	Systematic review and meta-analysis. Systematic literature search in six electronic databases. The studies should be English-language and published between January 2000 and 6 September 2016. A search of relevant websites for walking literature was also conducted and systematic reviews, meta-analyses and the authors' personal archives were screened.	September 2016.	The urban environment and its accessibility (e.g. infrastructure, land use).
Kerr, Rosenberg & Frank, 2012, USA.	To investigate the existing literature about the correlation between the man-made environment, walking and health of the elderly to obtain a better understanding of how community designs affect the health and mobility of the elderly.	Elderly (>65 years).	Review. Identified existing literature relating to how community designs have an influence on the health and mobility of elderly citizens.		The urban environment and its accessibility (e.g. infrastructure) as well as parks and green spaces.
Moran et al. 2015, Israel.	To investigate the potential effect of the physical environment on elderly people's behaviour with regard to physical activity.	Elderly (average age >65 years).	Systematic review. Systematic literature search in 11 electronic databases. The studies should be qualitative.		The urban environment and its accessibility (e.g. infrastructure and safety).
Van Cauwen- berg et al., 2018, Belgium.	To conduct a systematic review and a qualitative summary of results from studies dealing with the relationship between the properties of the physical environment and physical activity of the elderly in their free time.	Elderly (average age >65 years).	Systematic review and meta-analysis. Systematic literature search in six electronic databases. The studies should be English-language and published between January 2000 and December 2017. A search for grey literature was also conducted, as was a chain search of references in the identified studies.	December 2017.	The urban environment and its accessibility (e.g. infrastructure) as well as parks and green spaces.

Parks and green spaces

Author(s), year, country	Purpose	Population	Design and method (e.g. type of primary studies)	Time of literature search	Area in the urban environment
Andkjær & Arvidsen, 2015, Denmark.	To analyse the literature and examine the influence that different outdoor recreational contexts have on people's participation in active outdoor recreation.	All ages (the general population).	Scoping review. Literature search in four electronic databases.		Parks and green spaces.
Audrey & Batista-Ferrer, 2016, UK.	To investigate evidence from interventional studies involving changes to the urban environment and report results in relation to children and adolescents.	Children and adolescents.	Systematic review. Systematic literature search in six electronic databases. The studies should be English-language interventional studies from high-income countries.	October 2014.	The urban environment and its accessibility (e.g. infrastructure and safety) as well as parks and green spaces.
Hartig et al., 2014, Sweden.	To investigate the concept of nature and evaluate causes of the current expansion of research, as well as creating a 'review of reviews'. Factors relative to air quality, physical activity, social cohesion and stress reduction are investigated.	All ages (but mainly studies of children).	Review. Systematic literature search in two electronic databases. The studies should be review articles or reports. A search of grey literature was also conducted.	April 2013.	Nature, parks and green spaces.
Hunter et al., 2015, UK.	To evaluate the effect of interventions aimed at encouraging physical activity in urban green spaces.	All ages.	Systematic review. Systematic literature search in five databases. The studies should be English-language, contain a control/comparative group and published by July 2014. A chain search of reference lists was conducted.	July 2014.	Green spaces, including parks.
Kaczynski & Henderson, 2008, USA.	To summarise reported associations between parks and recreational spaces as features of the man-made environment and different functions for and intensities of physical activity.	All ages (children and adults).	Review. Systematic literature search in four electronic databases. The studies should be English-language and published between 1998 and December 2005.	December 2005.	Parks and recreational spaces.
Kaczynski & Henderson, 2007, USA.	To collate and critically evaluate evidence related to parks and recreational spaces as features of the man-made environment and the correlation between these contexts and physical activity.	All ages (children and adults).	Review. Systematic literature search in four electronic databases. The studies should be English-language and published between 1998 and December 2005.	December 2005.	Parks and recreational spaces.
Lee & Maheswaran, 2011, UK.	To investigate evidence of the health-related benefits of green spaces for the population and provide a narrative summary of health policy decision-makers and town planners.	All ages.	Review. Systematic literature search in nine electronic databases and a search in grey literature. The studies should be English-language and published before 1990.	June 2010.	Green spaces.
Levy-Storms, Chen & Loukaitou-Sideris, 2018, USA.	To investigate the needs and preferences of older adults in and near parks.	Older adults (>65 years).	Systematic review. Systematic literature search in eight electronic databases. The studies should be English-language and published between January 1970 and December 2015.	December 2015.	Parks.
Limstrand, 2008, Norway.	1)To identify relevant knowledge of how sports facilities influence young people's physical activity. 2) To clarify the status of factors investigated or not investigated. 3) To create a conceptual model that will guide future research.	Children and adolescents (3-19 years).	Review. Literature search in 11 electronic databases. The studies should be English-language and published by November 2006. References from relevant reviews were also investigated and incorporated.	November 2006.	Sports facilities (parks and recreational spaces).

Author(s), year, country	Purpose	Population	Design and method (e.g. type of primary studies)	Time of literature search	Area in the urban environment
McCormack et al, 2010, Canada.	1)To summarise qualitative evidence of how the characteristics of urban parks may influence the use of the parks and in turn the patterns of physical activity. 2) To evaluate the correlation or lack of correlation between qualitative and quantitative evidence in relation to parks, use of parks and patterns of physical activity.	All ages.	Systematic review. Systematic literature search in four electronic databases for English-language qualitative studies.	February 2009.	Parks in the urban environment.
Park, 2017, USA.	To understand perceived factors affecting use of parks and to identify methods to measure these.	All ages.	Systematic review. Structured literature search in Google Scholar.	February 2016.	Parks.
Wen, Albert & Von Haaren, 2018, Germany.	To summarise existing knowledge of the preferences of older adults, particularly how they interact with green spaces, which landscape characteristics they prefer or do not care about and how practitioners can improve planning to better meet their needs.	Older adults.	Systematic review. Systematic literature search in two electronic databases. The studies should be in English and published between January 2000 and December 2017.	December 2015 and September 2017.	Green spaces.

Schools

Author(s), year, country	Purpose	Population	Design and method (e.g. type of primary studies)	Time of literature search	Area in the urban environment
Broekhuizen, Scholten & de Vries, 2014, Netherlands.	To present an overview of the existing evidence in relation to the value of (pre-)school playgrounds for the health of children, in the form of physical activity, cognitive and social results.	Children and adolescents (2-18 years).	Systematic review. Systematic literature search in three electronic databases. The studies should be English-language and published between January 2000 and September 2012. Subject-related grey literature was also identified.	September 2012.	Schools.
Escalante et al., 2014, Spain.	To investigate interventions aimed at increasing the physical activity of children at school.	Children (2-12 years).	Systematic review. Systematic literature search in seven electronic databases. The studies should be RCT or CCT.	July 2012.	Schools.
Harrison & Jones, 2012, UK.	To investigate evidence of the correlation between the physical environment of schools and diet, physical activity and obesity.	Children and adolescents (<18 years).	Review. Structured literature search in three electronic databases. Studies should be in English.	August 2010.	The school and the school's location in the urban environment.
Ickes, Erwin & Beighle, 2013, USA.	To investigate interventions in relation to playtime breaks aimed at increasing physical activity among young people and make recommendations for developing optimal practice.	Adolescents.	Systematic review. Systematic literature search in five electronic databases. The studies should be English-language and published between 1986 and May 2011.	May 2011.	Schools.
Ikeda et al., 2018, New Zealand.	1) Systematic identification of research from New Zealand covering active transportation to school, distance to school and the man-made local environment of children and young people. 2) To collect data from identified studies and combine these consistently. 3) To identify associations between active transportation to school and features of the man-made environment across combined data sets.	Children and adolescents (5-19 years).	Systematic review. Systematic literature search in seven electronic databases and a search for grey literature. The studies should be English-language and published between January 1990 and June 2016.	May-June 2016.	The school's location in the urban environment.
Lopez & Wong, 2016, Spain.	To deliver a comprehensive review of literature available about children's active transportation to school.	Children.	Review. Structured literature search in Scopus. Studies should be in English or Spanish. One further search was conducted in Google Scholar to obtain other literature, e.g. from reference lists.	October 2016.	The school's location in the urban environment.
Loprinzi et al., 2012, USA.	To identify the most important environmental contexts and determinants that influence the activity behaviour of children and adolescents and outline strategies that can be used to influence physical activity in this group.	Children and adolescents.	Review. Current relevant reviews summarised. Results of newer original investigations also covered.		The school and the school's location in the urban environment, among others.
Morton et al., 2016, UK.	To summarise existing evidence of the influence school-based policy and the physical and social environment have on the physical activity and sedentary behaviour of adolescents.	Adolescents (11–18 years).	Systematic review. Systematic literature search in four electronic databases. References in included studies were investigated for further publications.		Schools.
Parrish et al., 2013, Australia.	Systematically investigate the effect of interventions during playtime/break time on the level of physical activity among children and adolescents of school age.	Children and adolescents (5-18 years).	Systematic review. Systematic literature search in six electronic databases. The studies should be English-language and published between January 2000 and April 2011.	April 2011.	Schools.
Ridgers et al., 2012, Australia.	To investigate correlators for the physical activity of children and adolescents in periods that have playtime or break time.	Children and adolescents (5-18 years).	Systematic review. Systematic literature search in six electronic databases. The studies should be English-language and published between January 1990 and April 2011.	April 2011.	Schools.
Stanley, Ridley & Dollman, 2012, Australia.	To identify correlators for the physical activity of children taking place in playtime (break time) and in periods after school.	Children and adolescents (8-14 years).	Review. Structured literature search in four general electronic databases. The studies should be English-language and published between 1990 and January 2011. A chain search of reference lists was also conducted.		Schools.
Temple & Robinson, 2014, USA.	To conduct a systematic review of school-based interventions aimed at encouraging physical activity among pre-school children.	Children (3-11 years, predominantly pre-school children).	Systematic review. Systematic literature search in nine electronic databases. The studies should be English-language and published between 2002 and 2014. A chain search of reference lists was also conducted.		(Pre-)school.

How the urban environment impacts physical activity
A scoping review of the associations between urban planning and physical activity

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