Toward Active Transport as a Utilitarian and Recreational Form of Sustainable Urban Mobility

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Abstract. The ongoing growth of motorized transport modes poses serious challenges to urban environments such as air and noise pollution, adverse health impacts, and improper allocation of space in the city. Over time, the paradigms of transport planning have shifted gradually toward active transport as a utilitarian and recreational form of sustainable urban mobility with desirable ecological, economical, and social properties. Active travel modes, concerning the physical activity of locomotion, generally include walking and bicycling, which have environmental benefits such as a decrease of carbon and reduction of traffic congestions. Besides, active transport, as a form of an active lifestyle, is one of the most usual physical activities which have numerous benefits regarding health and wellbeing, including reducing risk factors of chronic diseases, such as overweight and obesity, and increasing happiness, contentment, and engagement. Therefore, active transport has been increasingly considered in transportation and urban planning studies as an alternative for motorized transport and a sedentary lifestyle. Studies have shown that the built environment can facilitate active transport by walking or cycling to destinations and accordingly contributes to residents' physical activity. Hence, this study aims to explore and explain the association between the built environment and active transport by urban residents through a literature review. Insights such as there are important natural/physical and macro/micro environmental characteristics that encourage the tendency for active transport as well as socioeconomic and sociodemographic attributes differently affect this indicative relationship, are subsumed in a conceptual framework that can guide future empirical studies.

Keywords: Active transport · Physical activity · Built environment · Sustainable urban mobility · City

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1 Introduction: Active Transport as an Active Lifestyle

Sustainable urban mobility as a critical issue faced by cities globally, needs restructuring toward non-motorized modes and physical activity with multiple beneficial and positive effects on the function of the city and human health (Skayannis et al. 2017, 2018). Active transport modes such as walking or cycling pose one of the most promising solutions to cope with increasing challenges arising from motorized transportation (Hackl et al. 2019). Therefore, cities aim at shifting transportation solutions toward more environment- and people-focused means of mobility. This transition - reducing motorized transport and promoting active transport - also has public health benefits in the short and long term (Nieuwenhuijsen and Khreis 2016).

Active transport, active mobility, active commuting, or active travel as a form of an active lifestyle is one of the most usual physical activities concerning their associated increases in human body energy expenditure. As shown by recent findings of the World Health Organization (WHO), physical inactivity is a significant risk factor affecting global mortality, and hence an active lifestyle is essential (An et al. 2019; Vich et al. 2019). Therefore, the Global Action Plan on Physical Activity has been adopted by WHO in 2018 to ensure that all people have access to safe and enabling environments and to diverse opportunities to be physically active in their daily lives, as a means of improving individual and community health and contributing to the social, cultural and economic development of all nations (WHO 2018).

Accordingly, "World Health Organization advocates strategies that target entire populations, including the design of environments to promote physical activity for transportation and recreation as part of everyday life, or active living" (Day 2018, p. 303). These strategies have identified active transport as an alternative for minimizing sedentary lifestyles, reducing risks of consequent chronic diseases such as obesity and diabetes, and improving health standards by increasing physical activity levels (Gao et al. 2018; Vich et al. 2019).

Meanwhile, improvements in the built environment characteristics are also essential for health-oriented urban planning and management, as built environments have long-lasting, positive or negative effects on the health outcomes and effects for entire populations (Day 2018; Sallis et al. 2018). Poor quality of sidewalks, limited access to recreational facilities such as parks, and lack of available nearby destinations are possible causes of inactivity and decreasing physical activity/active transport. Next, the built environment characteristics vary in supporting physical activities, including active transport. Bornioli et al. (2019) state, for instance, that "a strategy to promote active mobility in the built environment can be constructed around safety, comfort, and moderate sensory stimulation by targeting the micro elements that prevent them" (p. 200). Therefore, active transport, which relates to physical activity, health, and chronic disease prevention, has been considered increasingly important in transportation and urban planning studies.

Many studies show evidence of the significant relationship between the neighborhood-scale built environmental characteristics, such as density, land-use, and connectivity, and travel behavior centered on active transportation modes. The pervasive effect of density, land-use, type of urban fabric, and slope of terrain on urban

mobility, especially concerning automobile travel reduction and non-auto trip encouraging, are some of the findings that are being assessed by these studies. Safe walking and cycling accessibility concerning well-connected streets, walking paths, sidewalks, bike infrastructures and bike lanes, traffic safety, and less motorized traffic are other neighborhood or street features that have been considered (An et al. 2019; Ferrer and Ruiz 2018; Gao et al. 2018; Helbich 2017; Lindelow et al. 2017).

In short, there is a crucial opportunity for urban planners to plan and design cities and neighborhoods which are conducive to physical activity, especially by active transport modes. Nevertheless, this goal will not be realized without a proper understanding of the association between the built environment characteristics and physical activity patterns, especially active transport. The quality and nature of diverse types of neighborhood and also street scale-built environment may diversely affect active lifestyle among residents (An et al. 2019). Thus, findings should be analyzed in more depth, both theoretically and practically, to gain deeper insight into the relationship between the built environment characteristics and the active transport by residents in urban neighborhoods (Gao et al. 2018). Supplementing research with neighborhood and street scale-built environment measures could acquire more reliable and valid understanding and filling the knowledge gap concerning the significant relationship between environmental characteristics and active transport. Therefore, facing the challenge of increasing physical inactivity and subsequently overweight and obesity, yet it is necessary to explain the role and impact of the built environment, aimed at increasing physical activity and active transport and reversing that growing threatening tendency in terms of motorized transport and passive lifestyle (Lin 2018).

So, while there are already multiple studies on the relationship between the built environment characteristics and active transport, we lack a comprehensive overview of the findings. To address this gap, this paper reviews the recent literature on how the built environment characteristics affect active transport (walking, cycling) by urban residents. Based on the review, it develops a conceptual framework that can guide future empirical studies on this significant association.

2 Approach and Methodology

Since we have been interested in recent scientific articles, we limited our search to sources published in 2015 or later. They were identified through six databases, including PubMed, Sage, ScienceDirect, Springer, Taylor & Francis, and Wiley. Search keywords for articles' titles and also abstracts were "active commuting," "active mobility," or "active transport." Moreover, we used simultaneous combinations of "built environment," "neighborhood environment," "neighborhood qualities," or "physical environment" and "cycling," "physical activity," or "walking." After careful reading of title, abstract, and keywords, we considered 19 articles, listed in the reference section, relevant for analyzing the relationship between the built environment and active transport as a type of physical activity. The articles were analyzed by exploring the main factors and characteristics. Insights were subsumed in a conceptual framework to explain the significant association between the built environment and active transport.

The literature review serves to develop a conceptual framework. It provides a starting point for all who are interested in a particular field (Pare and Kitsiou 2016), the discussed relationship between the built environment and active transport. More specifically, it prepares a well-structured overview in a specific area, active transport as a utilitarian and recreational form of sustainable urban mobility concerning the built environment characteristics. On this base, it also outlines the implications and interpretations of the findings to present the evidence on a meta-level and discover areas in which more research is required, essential for developing theoretical and conceptual frameworks (Snyder 2019; Van Wee and Banister 2016).

3 Active Transport and the Built Environment

Recent international policy frameworks on environment and health attach more importance to promoting walking and cycling as usual forms of physical activity (Kahlmeier et al. 2020). Advancing active transport is the main aim of many European cities regarding improving environmental qualities at the local level and subsequently increasing the health and wellbeing of their residents (Ferreira et al. 2016). In the duality of active and passive modes, walking and cycling have been combined into a category of active modes that refer to physical behaviors that are affected differently by different correlates of urban form. While some Anglophone research has been published, European studies still are mainly underrepresented concerning urban form correlates and urban design variables (Helbich 2017). So, as mentioned earlier, defining research on contextualized ways in which specific features of the built environment affect the physical activity/active transport at higher levels, is also considerable. They can identify what we learn, uncover gaps in knowledge, and direct future research (Day 2018).

Studies have shown that walkable and cyclable neighborhoods encourage active transport (walking or cycling) to destinations and accordingly can contribute to residents' physical activity (Sallis et al. 2018). Lindelow et al. (2017), for instance, state that "the travel behavior of residents in a neighborhood can partly be explained by the fact that residents have selected to live in a neighborhood that they perceive lives up to their preferences of, for instance, walkability. Consequently, neighborhoods with a large share of walking could be understood as consisting of residents that have chosen to live where they perceive walking to be feasible, pleasant, etc., in addition to the built environment itself encouraging walking" (pp. 520–521). So, on the one hand, people are looking for a place to encourage their physical activity/active transport. On the other, location also can motivate people to do physical activity/active transport.

Active transport counters the emerging sedentary lifestyle issue. Some practical findings have shown that people who do active transport in forms of walking or cycling are likely to be achieving physical activity levels significantly more than the minimum recommended levels. Meanwhile, active transport is positively associated with some socioeconomic variables such as age, income, and bicycle ownership, and some built environment characteristics such as land-use and urban density. So, the various effects of individual factors and neighborhoods' spatial physical, social and environmental qualities should be taken into consideration (Ferreira et al. 2016; Fishman et al. 2015).

On this base, the focus on active transport as a type of physical activity for all age groups, which allows them to change the inactive and sedentary lifestyles through their favorite intensity, requires significant classifications concerning purposes, mechanisms of the impact, and finally factors and characteristics. Regarding the purposes, two modes of active transport, including walking and cycling, can be further divided into two categories including transport or travel-related, aims at reaching a destination, and leisure or recreational-related, addresses achieving entertainment (Gao et al. 2018; Wang et al. 2016).

Regarding the mechanisms of the impact, some physical built environment characteristics act as motivators or incentives, and some act as barriers or obstacles to physical activity/active transport. The motivators and barriers that affect each other are as following (Wang et al. 2016):

1. Motivators or incentives: opportunities including availability and suitability of facilities and shortening the distance, safe accessibility such as improving personal security, and improving transport safety, and physical settings in terms of increasing comfort level and provision of supporting facilities;
2. Barriers or obstacles: opportunities barriers such as limited foot and cycling paths and lack of land for recreation, accessibility barriers including longer travel distance, poor access to the facilities, and no interesting destinations, safety barriers in terms of unsafe foot or cycling paths, traffic safety, and security of exercise place, and physical setting barriers such as lack of pleasant routes, discomfort, and no supporting facilities.

They could be classified as facilitators or motivators and barriers or deterrents to the active transport. For example, lack of car parking space at the destination, pleasant walking routes, short distances to destinations, pedestrian streets, and driving restriction zones or stress due to traffic congestion are the primary facilitators or motivators to the decision to walking as the primary form of active transport. On the other hand, insecurity due to crime, absence of people, inadequate lighting at night, or walking along a conflictive area, presence of traffic lights, walking along large avenues, lack of sidewalks, and steep streets are the main barriers or deterrents (Ferrer and Ruiz 2018).

According to the influential factors and characteristics, first, it is necessary to identify and distinguish between personal and social factors as well as natural and built environmental characteristics that have a significant role regarding active transport (Wang et al. 2016). The proportion of green space such as parks and agricultural and natural areas, water spaces, daily maximum air temperature, daily precipitation sum, and daily average wind speed are the critical natural ones. Building density, land-use diversity, street density, number of bus stops, and distance to high-quality public transport nodes are important built environmental variables (Gao et al. 2018).

Also, socioeconomic status disparities are essential as effect modifiers of the relationship between the built environment characteristics and health-related outcomes (Lee et al. 2015; Sallis et al. 2018). The socioeconomic levels or individual factors around the city and place of residence are expected to be related to physical activity as well as active transport. They can be considered as a percentage of foreign residents, unemployed, part-time workers, university graduates, homes occupied by their owners, households with a parking space, and median income (Feuillet et al. 2015). Gender,

age, household structure, education, ethnicity, and car ownership are other major individual variables concerning the significant relationship between the built environment and active transport (Gao et al. 2018).

Generally, the built environment factors which are associated with transportation-based physical activities are as follows, that their adequacy or appropriate condition can act as a stimulus and their lack or inappropriate status can act as an obstacle to active transport (Feuillet et al. 2015):

1. Land-use and facilities including the percentage of area covered by individual housing, collective housing, vegetation cover, as well as proximity facilities density;
2. Level of walkability and bikeability such as walk and bike paths conditions and bike-sharing facilities;
3. Public transport availability in terms of the distance to the nearest subway, bus, or train station from each home.

Many research studies provide evidence for the relationship between neighborhood design and active transport and indicate that the impacts happen at the neighborhood level (Ferrer and Ruiz 2018). Accordingly, Lee et al. (2015) state that "there is growing evidence that neighborhood environment, such as green space, parks, and pedestrian environment, is associated with physical activity and various health outcomes, especially obesity-related diseases. However, among the possible factors contributing to physical activity and obesity-related diseases, little is known about the urban neighborhood environment, such as slopes or street patterns, and trigger factors that encourage residents to walk" (p. 1205). So, all the factors should be evaluated in two mutual hypotheses regarding the mentioned barriers or deterrents and facilitators or motivators. The first hypothesis is that obesogenic environments[1] in terms of low-walkable and automobile-oriented neighborhoods with few facilities for physical activity/active transport may direct residents to be inactive based on spending more time in their cars or doing more sedentary recreation, including television viewing and computer gaming. Regarding increasing physical activity as a critical health-based strategy, the alternative hypothesis states that the physical activity/active transport as possible mechanism/mechanisms for achieving health outcomes is influenced by the neighborhood environment (Lee et al. 2015; Sallis et al. 2018).

On the other hand, Ferrer and Ruiz (2018, p. 111) argue that "in addition to meso-scale (or neighborhood scale) built environmental factors such as residential density, land-use mix or street connectivity, special attention should be given to micro-scale (or street level) built environment characteristics, such as the presence of trees, the width of the sidewalks, and the quality of the streets, as the roles of micro-scale elements are not well understood due to limited data availability." They have analyzed factors of the built environment affecting the decision to walking in the form of a short trip as less than 30–45 min walking distance. On this base, the main characteristics of the built

[1] Obesogenic environments describe specific aspects of living environments which facilitate overeating relative to need and partaking in sedentary activities. They are characterized as involving a great preponderance of motorized transport and sedentary occupations and encouraging the consumption of high-fat and energy-dense foods (Poortinga et al. 2011; Ulijaszek 2018).

environment influencing walking as active transport are safety from crime (street lighting, people's presence, cleanliness), traffic safety (traffic volume and speed and times of crossing waiting), walking facilities (sidewalk width, obstacles), aesthetics (green elements, buildings, noise), convenience, and other perceptions (car parking availability, hills, and pedestrian volume, open and wide spaces, and length) (Ferrer and Ruiz 2018).

In another study, Zandieh et al. (2016) indicated that outdoor walking level is the most common type of health-beneficial physical activity associated with the built environment in a residential neighborhood. However, most previous analyses have considered macro built environment characteristics as inclusive design and structure, including residential density, mixed land-use, and route connectivity. Accordingly, it is also necessary to focus on micro built environment characteristics, which can be modified easier than macro ones. They include safety (well lighting, people's presence, and crime rate), pedestrian infrastructure (traffic condition, sidewalk condition, and amenities) and aesthetics (trees, attractive sights, and buildings) in the neighborhood. Moreover, spatial inequalities in perceived built environment characteristics may affect disparities regarding neighborhood support for walking (Zandieh et al. 2016).

Furthermore, regarding the widely accepted influence of environmental factors on usual physical activities, including active transport modes, the conceptual framework should be contextualized to local conditions. Besides, local targeting of health-based policies might be more effective in promoting physical activity/active transport. It seems that the association of the individual or sociodemographic attributes, as well as the built and natural environmental characteristics, with active transport, as a type of physical activity, is context-specific. So, it is necessary to analyze the area-specific significant association between the built environmental and socioeconomic factors and active transport in forms of walking and cycling in different locations with diverse specifications (Feuillet et al. 2015; Gao et al. 2018).

4 Discussion: Toward a Conceptual Framework

The crucial role of the everyday living environment in personal and public health has become more and more important in recent decades due to the predominance of mechanized life and, accordingly, sedentary lifestyles. The built environment can motivate the physical activity of individuals as an inevitable necessity or demotivate them as a serious challenge. Active transport as a type of usual physical activity is one of the critical areas in this vision due to its multiple roles and functions in addition to promoting health through physical activity. Therefore, focusing on active transport is a vital opportunity for researchers in various fields, including urban planners and designers, who also need to analyze the mechanism of its effectiveness and improvement as a great response. Such studies will also provide a reasonable basis for the formulation and application of future efficient policies.

So, it is necessary to explore and explain the significant associations between the built environment characteristics and active transport. To this end, the first step in our research is to develop a conceptual framework for addressing and clarifying the various aspects of this relationship. Based on the literature review, we obtained the following

insights. First, active transport as the most usual physical activity can be regarded as walking, cycling, and other forms based on a human-powered street vehicle. Second, active transport can have different purposes as utilitarian transport or travel for reaching a destination and attractive leisure or recreation for achieving entertainment. Meanwhile, if we focus on the association between active transport and substantial characteristics, categorizing factors into two categories of motivators, incentives, and facilitators, on the one hand, and barriers, obstacles, and deterrents, on the other hand, can well direct us to achieve the practical results.

Furthermore, as Fig. 1 shows, focusing on the factors and characteristics requires some critical points to consider. On the one hand, socioeconomic and sociodemographic attributes such as gender, age, household structure, education, income, and car ownership differently affect the relationship between the built environment and active transport. On the other hand, there are significant environmental characteristics that encourage or inhibit the tendency for active transport. These characteristics can be analyzed in two distinct ways, with the possibility of integration. First, we can scrutinize the physical environmental aspects such as residential density, route connectivity, safety, and sidewalk condition. Secondly, we can focus on the natural ones, including slope, air temperature, and presence of trees.

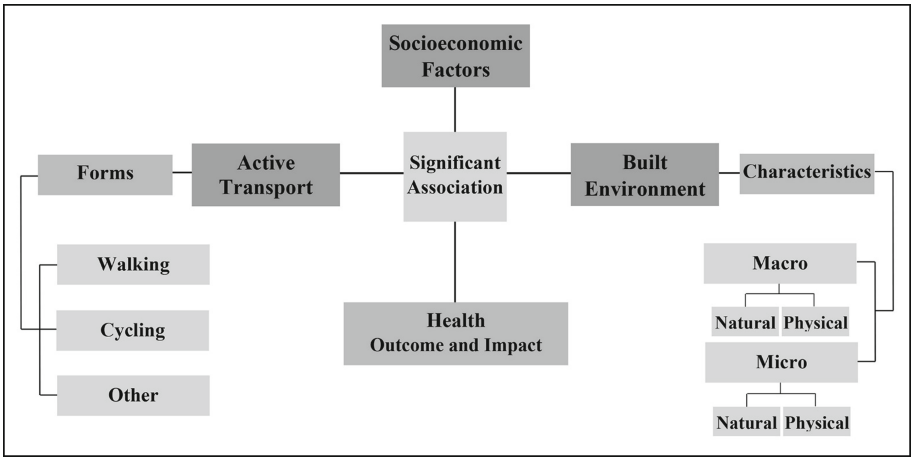

Fig. 1. Conceptual framework on the significant association between the built environment and active transport.

Meanwhile, we can peruse all of them at different scales; from the perspective of macro and meso characteristics which act at the city or neighborhood scale such as residential density, route connectivity, slope, and air temperature, while the micro characteristics have a vital role at the place or street level including safety, sidewalk condition, and presence of trees. The proposed conceptual framework aims to improve the understanding of the association between the built environment characteristics of active transport in a context-specific manner, which clarifies disparities in the evidence.

So, based on this conceptual framework, performing empirical studies in different and diverse contexts, concerning distinct urbanism and various lifestyle, completes this path. Efficient and innovative solutions, rather than general and perhaps ineffective, will be the consequence of this orientation.

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