Journal of Infrastructure, Policy and Development 2024, 8(5), 3069.
https://doi.org/10.24294/jipd.v8i5.3069

Article

Examining the impact of urban built environment on sport participation: Development of a conceptual framework

Troy T. Zhao[1], Yufei Bai[2,*], James J. Zhang[1]

[1] University of Georgia, Athens, Georgia 30602, USA
[2] Beijing Sport University, Beijing 100084, China
*** Corresponding author:** Yufei Bai, baiyufei@bsu.edu.cn

CITATION

Zhao TT, Bai Y, Zhang JJ. (2024). Examining the impact of urban built environment on sport participation: Development of a conceptual framework. Journal of Infrastructure, Policy and Development. 8(5): 3069 https://doi.org/10.24294/jipd.v8i5.3069

ARTICLE INFO

Received: 22 October 2023
Accepted: 27 November 2023
Available online: 6 May 2024

COPYRIGHT

Copyright © 2024 by author(s). *Journal of Infrastructure, Policy and Development* is published by EnPress Publisher, LLC. This work is licensed under the Creative Commons Attribution (CC BY) license. https://creativecommons.org/licenses/by/4.0/

Abstract: Increasing populations in cities have created challenges for the urban environment and also public health. Today, lacking sport participation opportunities in urban settings is a global concern. This study conceptualizes and develops a theoretical framework that identifies factors associated with effective urban built environments that help shape and reshape residents' attitude toward sport activities and enhances their participation. Based on a comprehensive review of literature and by following the Stimulus-Organism-Response (SOR) theory and attitude change theory, a four-factor measurement model is proposed for studying urban built environment, including Availability, Accessibility, Design, and Safety. Further examinations are made on how these factors are channeled to transform residents' attitudes and behavior associated with participating in sport activities, with Affordability as a moderator. Discussions are centered around the viability of the developed framework and its application for future research investigations.

Keywords: urban development; built environment; city communities; sport participation

1. Introduction

Both developed and developing countries are experiencing rapid urbanization. Approximately, a half of the world's population lives in urban areas (Ritchie and Roser, 2018). Researchers estimate that this number will increase to 68% by 2050 (Marzouk and Othman, 2020). Cities captivate people with better employment opportunities, education resources, health care, and cultural and sporting events, making significant and growing contributions to national economies (Richards and Duif, 2018). Nevertheless, urbanization usually follows industrialization, which pressures cities' environment and consequently, public health, in part due to the growing population, crowded space, and pollution (Jiang and Lin, 2012). Substandard housing, environmental deterioration, increased traffic congestion, limited free space availability and accessibility, and a more stressful life pace are all common outcomes of rapid and frequent urbanization and industrialization (Almulhim and Cobbinah, 2023).

Human health is jeopardized because of these circumstances. Various social issues generated by urbanization have led to physical and mental health problems for residents (Li et al., 2012). One key reason for the health issues is insufficient participation in sports, a rising concern globally (Piercy et al., 2018). Lack of exercise contributes to unhealthy physical conditions such as obesity and chronical diseases (Robroek et al., 2013). According to Ryan et al. (2020), around 42.4% of the U.S. population was obese in 2017–2018, and the rate is increasing annually. The risk of

weight gains and obesity is increased by sedentary lifestyles (Park et al., 2020), which also contribute to the general burden of disease in urban environments (Fisher et al., 2017). Sedentary lifestyles result partly from lack of urban physical spaces and infrastructure for exercise (Martins et al., 2020). Such infrastructure includes physical spaces that cater to all levels of fitness, serving as vital resources for public health (Wang and Wang, 2020). Public sport spaces are an essential component of mass fitness and public health initiatives. The global health crises emphasize the importance of alleviating health issues through urban planning and environmental design. The World Health Organization (WHO) has stated that an active city leads to a healthy city (Edwards and Tsouros, 2008).

The relationship between urban planning and sports has attracted considerable scholarly interest, which is becoming a multidisciplinary area of inquiry involving social, cultural, and economic domains. In recent years, researchers have begun to unpack the mystery in which sport initiatives and infrastructures contribute to urban environment, and vice versa (Francis and Murphy, 2007; Misener and Mason, 2006; Smith, 2010). Sport events and stadiums lead to urban transformation and development; in turn, urban settings influence the sports industry and mass participation in sports. From the 19th century, urbanization in cities such as New York was associated with crowding, crime, extremes of wealth and poverty, and a bare sense of belonging. Urban anomie, a term for lacking social or ethical standards, stimulated the trend of sporting fraternity that was eager to keep a normal lifestyle in rapid social change, and a prevailing sporting subculture alleviated urban pathology (Riess, 1991). Communities of citizens with similar cultures and backgrounds created sport clubs and organizations by ethnicity and class. In a sense, it was necessary for immensely individualistic and transient urbanities to root themselves with the social and cultural power of sports. Koch (2018) highlighted the power of urban colonialism in shaping sport development. For example, colonial officials, businessmen, and missionaries introduced football (soccer) as a part of their civilizing mission in Zambia, Africa. Historically, sport became desirable for African urban citizens as they saw Europeans playing soccer in the country's burgeoning cities. Thus, soccer's prevalence in Africa was a result of the emerging urbanism: "development of copper mines on the Copperbelt leading to massive industrialization, urbanization, and population increase, which provided very fertile ground for the popularization of the game from the 1920s to the 1940s" (Chipande, 2016). Though standardized rules of play had not been globally institutionalized, as was the case with most sports at the time, local conventions naturally evolved, and Zambians' perceptions of leisure time and space shifted dramatically (Keys, 2013). Urban spaces shape the way sports and individual identities are performed (Mangan, 2010).

In recent times, urban settings have become more essential for developing the sport industry. Professional sport teams are named after cities and compete against each other on behalf of cities, thus generating solid fan bases in support of their hometowns. Meanwhile, the culture and popularity of various urban sporting events impact mass sport participation through upgraded urban infrastructure. For example, Veal et al. (2012) examined the relationship between the Sydney 2000 Olympic Games and the legacy of grassroots sport participation in the host city. Smith (2010) examined the concept of "Sports-City," which is a themed sport zone with concentrated areas of

sport activities and supplemented sporting facilities, and its value as a tourism destination for cities. Another example is that Melbourne has become a "Sports-City" through establishing facilities such as the Telstra Dome, Tennis Centre, Melbourne Cricket Ground, Flemington Racecourse, and Aquatic Centre (Francis and Murphy, 2007). Meanwhile, cities can provide for sport-themed merchandising and create a complex of participatory activities, exhibits, and even media to draw sport participants and visitors (Smith, 2010). In general, urban redevelopment enhances sport consumption and participation (Misener and Mason, 2006).

Sports are intrinsically geographical. The surrounding environment, weather, and climate of a city can influence mass participation and physical activities (Tucker and Gilliland, 2007). Different type of cities can provide different urban settings for sports. Modern metropolitans such as New York City, Shanghai, and Toronto have over-occupied urban space while making efforts to provide indoor and outdoor sport facilities, some even with rooftop options, for their residents (Kwon et al., 2020). However, these urban neighborhoods in the contemporary world can be vehicle-oriented, leading a physically inactive trend. Additionally, whether a city has a spread out or compact structure can affect the availability and accessibility of public spaces (Shanahan et al., 2017). Cities in extreme weather have obvious impact on sports activities, too. For instance, residents in Yakutsk (Russia), spend quite little time outdoor with a yearly average temperature of −8.8 ℃ (Henander, 2019).

Today, the COVID-19 pandemic has substantially reduced their physical activities and sport participation due to government restrictions to control the spread of the disease. In densely populated urban areas, many people fear being infected in environments where total self-isolation is almost unattainable. The pandemic has limited indoor sports activities. Availability and accessibility of indoor gyms decreased sharply. Sport fans had difficulty attending on-site games because many sport organizations had to shut down or play in empty venues in 2020, causing sport teams to lose considerable revenue. The American Public Health Association and CDC have stressed the significance of staying physically active while sheltering in place during COVID-19, including going to parks and green spaces (Slater et al., 2020).

Sport activities frequently take place in the urban built environment. The built environment contains all the physical aspects of structures that people live and work (e.g., public areas, homes, streets, open spaces, and infrastructure) (CDC, 2011). Informal, unorganized, non-competitive, individual sports such as running, cycling, and working out in the gym have grown in popularity in recent decades, resulting in a wider range of locations for sport participation, including public spaces (Scheerder and Vos, 2011). According to the Eurobarometer survey 2014, 40% of European citizens aged 15 and older participate in sport activities in informal settings such as parks and outdoor spaces, 23% in gyms or other fitness centers, and only 13% as a member of a sport club (Deelen et al., 2018). Attendance at fitness centers in European countries is steadily increasing; at the end of 2016, there were 56.4 million members, up 4.4% from 2015 (Thidemann and Rekdal, 2016). Meanwhile, urban planners are increasingly aware of the importance of environmental designs of open spaces, such as providing locations for wholesome outdoor recreation and enhancing individuals' mental and physical health, as well as social well-being, during health crises and global pandemics. Notably, the influence of open spaces on sport engagement has been an

area of considerable interest among urban planners and researchers. Ranjbarnia et al. (2022) found a strong correlation between the proximity of green spaces and the likelihood of individuals engaging in physical activities. Citizens with easy access to parks are more likely to participate in physical activities. Xie et al. (2020) suggested that in Chengdu, China, urban parks and open outdoor spaces can provide residents with a safe location to go outside and socialize in a green environment, and function as a buffer zone between residence and urban hustling in order for people to maintain good health and quality of life. Heikinheimo et al. (2020) discovered similar trends in Helsinki, Finland. For cities with limited open space and/or under regular extreme weathers, indoor facilities provide locations for sports activities. Urban built environment has become more vital for residents' mental and physical well-being (Dickson and Zhang, 2020).

Sports and urban reconstruction have a reciprocal relationship. Each impacts and benefits the other. Sports can revitalize the urban landscape, transform communities, advance public infrastructure, improve destination image, invigorate the quality of life for city residents, promote healthy lifestyles, boost cohesion and sense of belonging, and accelerate economic growth (Dickson and Zhang, 2020). Particularly, professional leagues and sports mega-events bring opportunities to develop urban sports infrastructures (Baade, 1996). Millions live in steadily increasing metro areas with populations large enough to make them a viable location for a professional sports team. Consequently, both present and future urban areas are competing to keep and attract franchises (Rappaport and Wilkerson, 2001). Since the 1990s, professional sports teams in North America have made efforts to bind their arenas to urban development in their host cities (Mason et al., 2017).

Sports mega-events play a crucial role in catalyzing urban reconstruction (Azzali, 2016). Mega-events are large-scale cultural events with a dramatic dimension, broad public appeal, and international relevance, such as soccer, rugby, and hockey World Cups, and localized events such as the Pan-American Games or the Commonwealth Games (Malfas et al., 2004). Many cities desire to host mega-events, believing that they will benefit urban regeneration and development (Sánchez and Broudehoux, 2013). One of the most important mega-events is the Olympic Games. Throughout Olympics history, the Olympics have frequently benefitted the host cities. For instance, Beijing in 2008 and London in 2012 went through urban rehabilitation (Ren, 2008; Poynter et al., 2018). One of the major effects of mega-events is physical impact, referring to infrastructure transformation, including new roads, new parks, and upgraded or newly built facilities, that remain as a legacy of the event (Malfas et al., 2004). Urban Planners consider the usage, availability, and accessibility of sport facilities after a mega-event to enhance citizens' participation in sport activities (Veal et al., 2012).

Not only elite sports but also mass sport participation has been affected by the COVID-19 pandemic, which has highlighted the necessity for city administrations and urban planners to consider sport participation environments when designing and renovating city communities. This study conceptualizes and develops a theoretical framework to encompass fundamental factors of effective urban built environments that help shape and reshape residents' attitude and enhance their participation in sport activities. Based on the attitudinal change theory and stimulus-organism-response

theory, we propose a theoretical model to channel the impact of urban built environments on transforming residents' attitudes and behavior associated with participating in sport activities. We also discuss the viability of the developed framework and its application for future research and professional practices to enhance urban residents' overall sport participation.

The phrase "physical activity"(PA) is most used in the public health field (Eime et al., 2014) while "sport" is mostly used by sports organizations and affiliated government departments. In this study, "PA" and "sport" are used interchangeably unless specified. For urban communities to develop and tailor policies to boost sport participation, they need more insight into the preferences and behavioral patterns of sport participants (Deelen et al., 2018). For renovations of existing traditional communities, strategies are necessary to promote sport engagement. For site selections and designs of new sport facilities used for sporting events, sports teams, and/or community functions, it is of vital significance to provide a direction for investigating sport participants' perceptions on built environment dimensions and develop corresponding strategies and plans to enhance overall sport participation, leading a better quality of residents' life.

2. Developing a theoretical framework

2.1. Stimulus-Organism-Response theory and attitude change theory

The Stimulus-Organism-Response (SOR) theory has been widely used to investigate the relationships among stimuli, processes (organism), and outputs (response) (Kim et al., 2018; Nagoya et al., 2021). The SOR theory, developed by Mehrabian and Russell (1974), provides in-depth and exploratory understanding in evaluating human activities, particularly in the field of environmental psychology. Environmental psychology is a multidisciplinary field that studies how people interact with their environment. Natural surroundings, social settings, physical environments, learning environments, and informational contexts are all included in the broad concept of environment. According to the SOR theory, individuals respond to situations in one of two ways: (a) approach or (b) avoidance behaviors. Approach behaviors comprise all positive activities, such as the urge to explore, remain, associate, or work; whereas, avoiding behaviors include the desire not to positively act (Mehrabian and Russell, 1974). The SOR theory emphasizes the environment's emotion-eliciting or emotional features, which can be called aesthetic incitements (Wohlwill, 1976). This study uses SOR to examine various dimensions of the environment to predict mass sports participation.

In the social and behavioral sciences, attitude construct remains a significant focus of theory and research (Wood, 2000). Attitude is "a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor" (Eagly and Chaiken, 1993), which is not stable and subject to change by external influences (Linton, 1955). According to the Attitude Change Theory, when individuals are influenced by new external information through their direct experiences, their attitude change will occur (Zimbardo and Leippe, 1991). Internalized effect arises when an individual embraces influence because the induced activities content—the ideas and behaviors of which it is comprised—is intrinsically rewarding (Kelman,

1958). As such, the aforementioned four dimensions of built environment in urban settings (i.e., availability, accessibility, design, and safety), as stimuli (S), make an impact on attitudinal change (Organism) of sports participants. As a major part of organism, attitude significantly affects sports participation behavior, namely the Response, due to the internalized reward of improved health. While Trost et al. (2002) conducted a comprehensive review of literature and identified inconsistent findings for the relationship between attitudes toward PA and participation behavior, Beenackers et al. (2011) reported that positive attitude toward perceived neighborhood safety was highly correlated with sports participation. Perceptions of a neighborhood can influence attitudes toward walking through the neighborhood and the intention-behavior gap (Rhodes et al., 2006). Positive attitudes about cycling are positively correlated with active travel (Titze et al., 2007). Considering the general significance of attitudinal effect on behavior, it appears that studies of participation in sports in urban settings should factor in the role of attitude toward the urban environment.

In the current study, the concept of response is examined through a list of proposed measures of behavioral responses (R), including the duration, frequency, and types of sports participation. Following the S-O-R mechanism, behavioral responses are activated by perceptions and attitudes (O) originating from various dimensions of environmental stimuli (S). Overall, the proposed framework enables researchers to conceptualize how the four factors in urban built environment influence sport participation.

2.2. Conceptual models of sport participation in urban built environment

Various conceptual models have been developed to explore the built environment's role. For instance, Cervero and Kockelman (1997) proposed the 3D model: Density, Diversity, and Design. Density refers to a location's level of vitality. Diversity identifies the degree to which various types of activities are offered in one place. Design refers to the physical layouts of individual facility and their appearances. Pikora et al.'s (2003) model of four built environment dimensions related to PA includes function, safety, aesthetics, and destinations. Function refers to the facility and path's physical attributes, which reflect the essential structural aspects of the local environment. Safety underlines the importance of providing individuals with safe physical environments. Aesthetic features include the existence and condition of trees; the presence of parks and private gardens; pollution levels; and the diversity and attraction of natural sights and architectural designs within the neighborhood. Destination identifies the availability of communal and commercial facilities in the surroundings. These concepts are useful for identifying the presence or absence of built environment elements; yet they do not portray human spatial behavior or engagement in PA (Butler et al., 2011).

Early research in the field of built environment made significant progress by identifying environmental variables associated with PA. Representatively, Butler et al. (2011) adapted and integrated Penchansky and Thomas' (1981) access model to explore the built environment that affects PA behavior, which contains the following dimensions: (a) availability, (b) accessibility, (c) accommodation, (d) acceptability, and (e) affordability. Availability refers to adequacy of resources for PA and the

proximity to popular destinations. Accessibility relates to various aspects of the built environment such as street and pedestrian networks that make it easier for residents to get to available facilities. Accommodation identifies supplementary elements for describing environmental favorability for PA participation. Acceptability refers to the degree to which people believe the built environment meets their needs for PA participation. Affordability contains measures of population-level socioeconomic status such as income to describe social disparities.

In this study, we conceptualize and develop a theoretical framework that examine the links between developmental objectives and perceived features of the built environment, and their influence on sport participation (**Figure 1**). Building on previous research findings, we identify four general categories of perceived factors of the built environment that influence PA, including Availability, Accessibility, Design, and Safety, along with Affordability as a moderator.

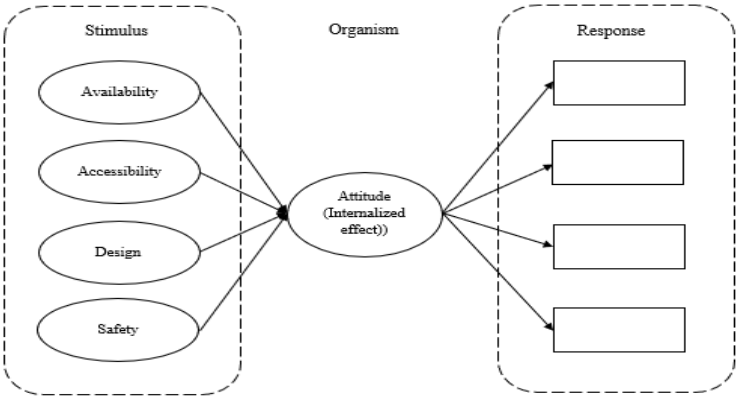

Figure 1. Conceptualizing built environment's impact on sports participation.

2.3. Availability

Butler et al. (2011) defined availability as resources for PA participation and proximity to popular places. Land-use mix is a measure of availability. Handy (2005) identified land use as the spatial distribution of different activities. The relative vicinity of various kinds of activities, including specific types of public and private facilities, is determined by land-use patterns. In studies of travel behavior, the measure of land use includes population and/or employment density (Frank and Pivo, 1994; Greenwald and Boarnet, 2001) and land-use mix (Frank and Pivo, 1994; Kockelman, 1997). A few studies have focused on perceived measures of land use availability. Sallis et al. (1990) applied density of pay and free facilities to examine residents' frequency of exercise in San Diego. Troped et al. (2001) used neighborhood features as a perceived measure of availability to assess community paths and trails, including residential, mixed residential-commercial, and mostly commercial. De Bourdeaudhuij et al. (2003) developed a model of neighborhood design and recreational surroundings, including three items to measure residential density and 13 items to measure land-use diversity. They proposed that the number of convenient activity facilities outside the home influenced vigorous sports participation. Increased availability is linked to a greater amount of entire PA (Kondo et al., 2009; Nagel et al., 2008).

The pandemic has challenged indoor sport activities. Closure of indoor sports centers has made it more difficult for people to cope with the pandemic and accompanying lockdowns (Grix et al., 2020). These factors have led to increased visiting rates and availability of open space for various recreational activities in a local community, along with renewed appreciation for natural surroundings. According to a recent poll of over 750 people performed by the Department of Planning, Industry, and Environment in Australia, nearly 100% of respondents increased their outdoor activity during the pandemic (Low and Maguire, 2020). Higher levels of leisure-time sport participation are associated with a variety of land-use mix and the availability of green and public open space (Cervero et al., 2009; Tilt et al., 2007).

2.4. Accessibility

Accessibility refers to a variety of built environment elements, such as street and pedestrian networks, that make it easier to get to available destinations (Butler et al., 2011). PA is correlated with convenient access to exercise facilities (Humpel, 2002). Specific features of land use and transportation convenience make the built environment more accessible for PA. For active travel behaviors, the measure of accessibility includes all objectives to which individuals intend to walk or bike, such as a restaurant, grocery store, or gym, because the destination provides an incentive for PA but is not normally the site of PA (Brownson et al., 2004). Activity sites can also include destinations for out-of-home exercise or entertainment such as parks, gyms, swimming pools, and other sports facilities. Measures of accessibility reflect both land use and transportation systems (Handy, 2005). In previous studies, McCormack et al. (2001) measured accessibility by straight-line distance to the nearest commercial street while Kitamura et al. (1997) calculated the distance to the nearest bus stop, rail station, groceries, gas station, and park. To analyze a non-linear relationship, Black et al. (2001) measured the accessibility of walking to school by the distance to the school and the square of that distance. Cervero and Radisch (1996) employed a range of accessibility indicators, including residence in the core city, proximity to a highway/railroad/airport within 300 feet, appropriate public transportation in the neighborhood, and distance from home to work (McCormack et al., 2001). However, in Butler et al.'s (2011) review of the literature, objective measures of accessibility did not seem to play a major role in participation in sport activities. Shay et al. (2009) found that the accessibility factor that most increased PA was the existence of sidewalks. Sidewalk coverage and street connectivity were two accessibility indicators linked to leisure-time PA (Forsyth et al., 2008).

Notably, a few studies have used both objective and subjective measures of accessibility. Brownson et al. (2000) estimated the number of metrics relating to the type of walking paths and the nature of access to them, including trail mileage. Troped et al. (2001) used GIS to calculate the distance to the trail, hills on the way there, and the need to cross a major roadway to get there. In three independent studies, Giles-Corti et al. used metrics of accessibility to both built amenities (e.g., sport and recreation centers, gyms, swimming pools, tennis courts, golf courses) and natural amenities (e.g., attractive open space, beaches, rivers) (Giles-Corti and Donovan, 2002a, 2002b; Giles-Corti et al., 2003). For each type of facilities, they developed

gravity-style accessibility measurements, calibrating the distance-decay parameter separately for each. As Humpel et al. (2002) stated, "evidence appears to be accumulating for the importance of accessibility of facilities as an important environmental factor related to PA" (pp.16). Active travel is negatively influenced by distances to possible destinations but positively influenced by cumulative opportunities and gravity measures of accessibility (Handy, 2005).

More recent studies have examined accessibility from various perspectives. Mell and Whitten (2021) discussed the importance of accessibility to parks, gardens, canals and other "green infrastructure" for equitable environmental planning. Feng et al. (2019) evaluated the social equity of urban park accessibility with Gini coefficient and Lorenz curve. The findings highlighted disparities in access to green spaces, particularly for the elderly, and suggested that the current urban planning metrics may not adequately ensure an equitable distribution of parks. In a study of park use in England and Wales during the COVID-19 pandemic, Shoari et al. (2020) found that residential areas with a higher proportion of flats have higher need to access to a community park and yet, due to the high residential density, community parks tend to be packed during peak hours. Overall, accessibility is a crucial factor that affects mass participation in sports activity at all levels.

2.5. Design

According to Handy (2005), design refers to the aesthetic features of the built environment, especially in terms of building and streetscape design (Cunningham and Michael, 2004). It combines both the interior and exterior design of structures and aspects of private and public areas, including the visual elements of the constructed environment and also the styles, textures, color, and ornamentation of physical structures. Handy's (2005) definition of design is similar to the aesthetic dimension in Pikora et al.'s (2003) model, indicating that aesthetic feature elements include cleanliness, attractiveness of natural sights, garden maintenance, presence of parks, level of pollution, condition and size of trees, architectural designs, and street maintenance.

Gul et al. (2016) summarized the design feature of a community as the aesthetics of the location measured by buildings and streetscape of neighborhoods. The infrastructure, shade walks, streetlights, and benches of streets add up to the neighborhood's streetscape. Some researchers have studied how environmental aesthetics and neighborhood attractiveness are related to leisure activities (De Bourdeaudhuij et al., 2003; Giles-Corti and Donovan, 2002a; Pikora et al., 2003). Ball et al. (2001) proposed that perceived environmental aesthetics and convenience are significant indicators of walking activities for Australian adults in an urban setting. Aesthetic features are positively related to PA participation (Strath et al., 2007; Craig et al.,2002), such as walking and biking (Burden et al., 1999). People in poor neighborhoods with fewer, dirtier, less iconic buildings and no sidewalks are less physically active than people in wealthier districts with better aesthetics and safety (Neckerman et al., 2009). Many nations, such as Australia, China, and the U.S., have emphasized the role of sport infrastructure design in increasing people's PA

(Sotiriadou, 2009; Xiong, 2007). The design of urban sport facilities and neighborhood landscape potentially influences individuals' attitudes toward sports participation.

In more recent studies, scholars examined pleasantness of neighborhood and aesthetics of the street, Yoo and Kim (2017) categorized factors that affect PA under three themes of significance: daily living, accessibility, and attractiveness/pleasantness.. Cassarino et al. (2021) explored associations between perceived neighborhood characteristics and cognitive vulnerability, and the moderating role of age and urbanity of the place of residence. They found that higher self-reported neighborhood pleasantness was associated with lower cognitive vulnerability, especially in older adults residing in the most rural and urban areas. This suggests that the perceived quality of neighborhood environments can have a significant impact on cognitive well-being across different age groups and levels of urbanity, with potential implications for planning interventions aimed at improving community support for vulnerable demographics. Overall, the design of urban sport facilities and neighborhood landscape potentially influences individuals' attitudes toward sports participation.

2.6. Safety

Safety is another crucial factor in the relationship between neighborhood environment and PA participation (Carver et al., 2008; Timperio et al., 2004). In Pikora et al.'s (2003) framework, safety involves two elements, traffic and personal. The construction of urban streets, along with traffic volume and speed, are all factors that affect traffic safety (Marshall and Garrick, 2011). Traffic safety can be improved by a variety of measures, notably installing traffic calming devices and providing a safe pedestrian pathway to cross the street (De Bourdeaudhuij et al., 2003). Personal safety involves providing enough illumination, adequate grounds on which to walk or cycle, and urban design that offers natural monitoring of streets by inhabitants of houses and other structures, as well as reducing fear of strangers and dogs in the neighborhood (Kamphuis et al., 2008). Additionally, numerous studies have focused on perceived safety instead of objective measures, including safety for walking (Troped et al., 2001; Wilcox et al., 2000) and safety from crime (De Bourdeaudhuij et al., 2003). PA is positively correlated with enhanced neighborhood safety, traffic safety, and visually pleasing neighborhoods (Kamphuis et al., 2008; Kondo et al., 2009; Nagel et al., 2008). Notably, safety issues related to COVID-19 have now become an essential and pressing concern. Governments are making efforts to maintain safe places for people to stay active. Sallis et al. (2020) addressed the significance of managing the safe use of sport activity locations. Overall, perceived safety in urban environments can encourage or discourage participation in sports activities, both individually and collectively.

2.7. Sports participation

Sport participation has been defined and measured in a variety of ways (Eime et al., 2013). Some studies have measured participation by club sport (Deelen et al., 2018), team sport (Sabiston et al., 2013), or competitive versus recreational sport participation (Ruwald et al., 2015). The American College of Sports Medicine (ACSM)

established recommendations for the amount of exercise adults need using the FITT Principle: Frequency, Intensity, Time, and Type (American College of Sports Medicine, 2017). Previous studies have widely applied these to assess PA participation (Billinger et al., 2014). However, this study excludes the intensity factor, which measures heart rate, rate of oxygen consumption (VO_2), and rating of perceived exertion (RPE) (Billinger et al., 2014) because the proposed conceptual model focuses on behavioral responses rather than physiological responses.

2.7.1. Frequency

Numerous studies have used frequency to measure sport participation (Deelen et al., 2018; Kamphuis et al., 2008). A range of factors can affect the frequency of sports participation, including objectively measured accessibility and availability of sports facilities (Hallmann et al., 2012). Furthermore, social variables such as socioeconomic level and neighborhood safety affect sport participation frequency (Beenackers et al., 2011). When urban settings provide a variety of locations such as parks and open spaces for informal leisure activities, the frequency of sport participation can be influenced by the availability, accessibility, design, and safety of the built environment (An et al., 2019).

2.7.2. Duration

Time, or duration, refers to the number of minutes per day an individual spends on sports activities (American College of Sports Medicine, 2017). Several studies have used duration to measure the level of sport participation (e.g., Eakins, 2018; Troped et al., 2010). According to Troped et al. (2010), certain features of the built environment, such as land use mix, residential density, and greenness, are associated with time spent on moderate to vigorous level of sport activities. A favorable urban environment may positively affect the duration of an individual's participation in sports.

2.7.3. Type of sports

Some researchers classify leisure-time PA into two types: (1) organized sports participation and (2) non-organized sport participation (Eime et al., 2014). Another method of classification in literature uses individual vs. team sports as a major dichotomy in sport participation (Laborde et al., 2016). In this study, the distinction between individual and team sport participation was taken into consideration because the proposed conceptual framework focuses on their relevance of built environment; whereas, the distinction between organized and vs. non-organized sports was not considered because the concept was relevant to the process of sport program management (Eime et al., 2014). Individual sport is a sport activity where only one individual plays or competes against other individuals. Popular individual sports include such activities as swimming, cycling, running, snowboarding, and tennis. Some recreational individual sports are usually non-organized leisure PA, and they are unsupervised, spontaneous, freely selected, and unstructured (Kemp et al., 2021). Recreational cycling, jogging, walking, and fitness have all grown in popularity as informal individual sports. The trending of informal, unorganized, and individual types of sports have grown to an extensive range of diverse locations for sports activities, including public places and natural settings (Borgers, 2016). Team sports include any sport in which individuals are organized into rival teams and compete to

win. Most team sports are known worldwide, such as soccer, basketball, baseball, and football. Many studies have examined health-related behaviors and mental health effect that are influenced by team sport participation (e.g., Poulsen et al., 2007; Sabiston et al., 2013). Even so, very little research has been found that explored the relationship between team sports participation and urban built environment. Different type of sports has diverse requirements on a particular facility and location (Hallmann et al., 2012). Wicker et al. (2012) suggested that the availability of swimming pools and parks make a significant impact on sport participation. Reasonably, the availability of sport facilities with feasible built environment characteristics for various sport activities would have an impact on an individual's attitude and in turn, on his/her behavior of sport participation. According to Downward et al. (2014), availability, accessibility, and type of facilities in the local neighborhood are essential for increasing overall participation in both individual and team sports.

All of the concepts and factors discussed herein can interact with one another. The Availability, Accessibility, Design, Safety, Affordability, and their interactions within urban built environment could impact participants' attitudes to engage in sport activities and in turn participation behaviors. Their presence and interrelationships are the foundation of the proposed conceptual framework, which deserves to be further investigated through empirical investigations. Potential measurement model and items are presented in **Figure 2** and **Table 1**.

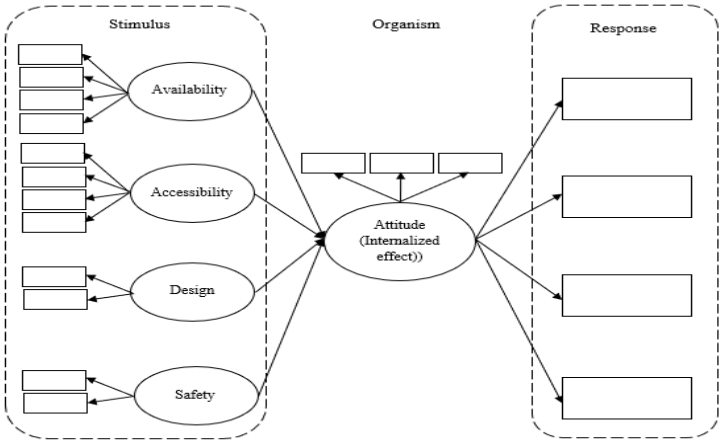

Figure 2. Measurement model of built environment's impact on sports participation.

Table 1. Potential measurements for the conceptual model.

Variables	Items	References
Availability	How common are each type of facilities listed below in your immediate neighborhood? Open gyms. (AVA1) Open parks. (AVA2)	(De Bourdeaudhuij et al., 2003)
	There are bike lanes on most of the streets in my neighborhood. (AVA3)	
	There are sidewalks on most of the streets in my neighborhood. (AVA4)	
Accessibility	I can play most of my favorite sport or work out at local gyms. (ACC1)	(Saelens et al., 2003)
	Facilities are within easy walking distance of my home. (ACC2)	

Table 1. (*Continued*).

Variables	Items	References
	There are many places to participate in sports within easy walking distance of my home. (ACC3)	
	For each of these places where you can exercise, please indicate if it is on a frequently traveled route (e.g., to and from work) or within a 5-min drive from your work or home. (ACC4)	
Design	There are attractive gyms/open parks in my neighborhood. (DES1)	(Cerin et al., 2006)
	There are many attractive natural sights in my neighborhood (such as landscaping, views). (DES2)	
Safety	The speed of traffic on most nearby streets is usually slow (30 mph or less). (SAF1)	(Saelens et al., 2003)
	There is a high crime rate in my neighborhood. (SAF2)	
Attitude	I enjoy gyms within 10-min walking. (ATT1) I prefer attractive parks with beautiful sights. (ATT2)	(Chen & Kim, 2014)
	Available sport field in the neighborhood is a good thing. (ATT3)	

2.8. Affordability as moderator

Affordability refers to population-level socioeconomic features such as income to describe social disparities (Butler et al., 2011). It is widely established that socioeconomic status (SES) is an important component in recreational sport participation in general (Eime et al., 2013). SES refers to the social position or class that shapes a person or group, which is measured by a fusion of income, education, and occupation (Lynch and Kaplan, 2000). Social, economic, and cultural characteristics of a neighborhood impact residents' participation in PA (Alfonzo, 2005). Conner et al. (2013) found that SES moderates the relationship between health intention and PA behaviors. Researchers have consistently reported that individuals with higher SES are more likely to participate in sports than those with lower SES (e.g., Federico et al., 2013; Steenhuis et al., 2009). Neighborhood income is an essential environmental aspect of SES (Van Dyck et al., 2013). In low-income communities, environmental factors such as cleanliness, traffic infrastructure, criminal safety, and access to recreation facilities are less favorable (Lovasi et al., 2009). Franzini et al. (2010) investigated socioeconomic and racial/ethnic discrepancies in neighborhood characteristics that are linked to outdoor PA and found that higher-poverty neighborhoods and non-White neighborhoods have better accessibility, but they are less safe, less comfortable, and less enjoyable for outdoor physical exercise, due in part to having less favorable social dynamics. In a study among White, African American, and Hispanic populations at three different income levels in the U.S., Floyd et al. (2008) found disparities in park-based PA according to neighborhood income and racial/ethnic composition. Low-income Hispanic neighborhoods had the least amount of park-based PA, whereas high-income African American neighborhoods had the most. Furthermore, neighborhood social cohesion, which facilitates communication and social interaction among people, may contribute to the formation of healthier activities and a fitness culture (Christakis and Fowler, 2007). The final proposed conceptual model including modertor is showed in **Figure 3**.

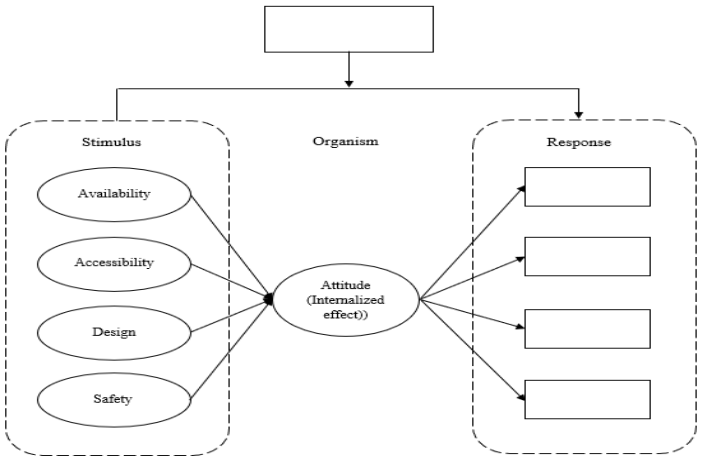

Figure 3. Conceptualizing built environment's impact on sports participation with moderating effect.

3. Discussion and conclusion

Sports are a vital force in urban transformation, modernity, and belonging in a city (Koch, 2018). While major sporting events can be a tool for cities to improve their international profile, attract media attention, boost tourism, and encourage economic growth (Dickson and Zhang, 2020), city infrastructure and environment have strongly influenced both professional and grassroots sport development. Each has impacted on and profited from the other. Previous studies have primarily explored the connection between cities and sports on an elite level such as sports mega-events, major league teams, and their venues (De Oliveira, 2020); however, amateur and mass sports participation is growing faster than ever and is more important than ever due to the global health crisis. It is the intention of this research by formulating a framework to help facilitate the interdisciplinary studies of urban development and sport.

This study has embarked on an exploratory journey to understand the intricate relationship between the urban built environment and sport participation. Informed by the 3D model of Density, Diversity, and Design, along with previously proposed models, we found that past studies have explored these factors and relationships separately. Through a meticulous synthesis of literature and the development of a robust theoretical framework, we have laid the groundwork for future empirical research in this domain. The proposed conceptual model, grounded in the Stimulus-Organism-Response theory and complemented by the attitude change theory, provides a comprehensive lens through which the multifaceted influences of the built environment on sport participation can be examined. This paper takes a more holistic approach by incorporating four key aspects of the urban built environment—availability, accessibility, design, and safety—and examining how these factors influence individual perceptions, attitudes, and sub-sequent participation in sports. We aim to offer a nuanced structure for investigating how urban planning and policy can be leveraged to foster a more active and engaged community through sports.

The significance of this framework lies in its potential to guide urban planners, policymakers, and community stakeholders in creating environments that not only encourage sport participation but also enhance the overall quality of life for urban residents. The novelty lies in the application of the S-O-R theory, typically utilized in

environmental psychology, to elucidate the dynamics of urban sports participation, thereby extending its applicability to the realm of urban planning and sports studies.

A key takeaway from this conceptual framework is the role of the urban built environment as a vital force in shaping the attitude and behavior of residents towards sports participation. The study posits that a well-designed urban space, with its emphasis on the accessibility, availability, safety, and design of sports facilities, can contribute significantly to promoting mass sports participation, crucial in a world grappling with the implications of the global health crisis. This paper also underscores affordability as a moderating factor that could potentially impact the relationship between the built environment and sports participation, a perspective that has been relatively underexplored in existing literature.

4. Implications

Lack of sport participation in urban environments leads to people's obesity, weakened immune systems, and various illnesses. The COVID-19 pandemic has highlighted the importance of spaces and facilities for mass sports participation. Although trending modern urbanization has provided immense convenience, including sport amenities and locations for citizens, urbanization continues to raise issues such as overpopulation and spatial overcrowding (Lanrewaju, 2012). These problems have been magnified by the pandemic situation since the limited public space is facing unprecedented pressure to provide safe and sufficient facilities for urban sports activities. To promote public health and well-being, global governments are trying to encourage mass sport participation. Without a comprehensive understanding of how the urban built environment influences participation in sports, it can be difficult to formulate strategies to promote sport participation.

The effort towards enhancing sport participation through the urban built environment is a multifaceted challenge that requires an interdisciplinary approach. Drawing upon literatures in urban planning, public health, sport management, and behavioral psychology, this study offers a foundational framework that paves the way for a deeper understanding of the interplay between urban spaces and physical activity. Our conceptual model, rooted in the Stimulus-Organism-Response (SOR) theory, provides a multidimensional perspective on how environmental factors shape residents' attitudes and behaviors towards sports.

It appears apparent that more rigorous, systematic research studies are needed to explore the phenomenon. The conceptual framework resulted in this study can be used as an initial step for this very purpose. As we move forward, it is imperative that future research endeavors operationalize the constructs within our framework and apply rigorous empirical methods to validate the proposed relationships. This empirical pursuit should aim to capture the voices and perceptions of urban residents, understanding their experiences and interactions with the built environment that shape their participation in sports. Such research will not only validate the conceptual framework presented but also contribute actionable insights to facilitate the design and development of cities that promote healthier, more active lifestyles.

For urban administrators and policymakers, robust support for sports initiatives is crucial. Policies must incorporate the value of sports within the community's

consciousness, leveraging the legacy of large-scale sporting events to foster a culture of participation. The design and development of urban sports facilities require a balanced approach, ensuring equitable access and rational development that align with the principles of location, accessibility, design, safety, and affordability. These principles are the cornerstones for creating dynamic, sport-friendly urban spaces that not only cater to physical needs but also inspire and nurture a vibrant culture of activity.

This derived model serves as a guide for researchers and city planners to explore how urban environments influence residents' perceptions and attitudes, and how these, in turn, translate into active participation. By understanding the positive elements that encourage sport engagement and mitigating factors that hinder it, urban administrators can identify strategies to enhance participation rates, addressing global health concerns and elevating the quality of life for urban residents. Thus, our explanatory model extends beyond theoretical constructs; it is a practical blueprint for city administrations aiming to invigorate urban mass sport participation and foster healthier communities.

Last but not least, the significance of sustainable urban planning in sport are manifold: from improving public health, reducing healthcare costs, enhancing social cohesion, to stimulating local economies with sport tourism opportunities (Pozoukidou & Chatziyiannaki, 2021). This aligns with the broader goals of urban sustainable development, including promoting wellbeing for all, building sustainable cities and communities, and ensuring responsible consumption and production (Fei et al., 2021). By fostering a culture of active sports participation, cities can become more resilient and adaptable to the challenges of the 21st century, ultimately contributing to the global sustainability agenda.

5. Limitation

While the study contributes to understanding the relationship between urban built environments and sport participation, it also acknowledges several limitations. The primary limitation is that the conceptual framework, grounded in the S-O-R theory, remains theoretical at this stage, with empirical testing and validation yet to be conducted. The current framework has considered four factors—availability, accessibility, design, and safety—but these variables may not capture the full complexity of the urban built environment that could affect sport participation. Other unexplored variables such as climate, sociocultural norms, or economic status may also influence participation.

The framework also assumes a linear relationship between the built environment, individual attitudes, and sport participation, which may oversimplify the nuanced and complex dynamics at play. The reality could involve feedback loops and interdependent relationships among variables. For instance, increased sport participation might lead to changes in individual perceptions of safety or design, influencing the urban built environment in return. Additionally, the study does not account for individual-level factors, such as age, gender, physical ability, and personal interest, which can significantly influence sport participation rates. Future research should take these factors into consideration to provide a more accurate and nuanced understanding of sports participation in urban environments.

Lastly, the moderating role of affordability in the relationship between the built environment and sport participation is proposed but not thoroughly examined in this study. Future research is required to delve deeper into this potential moderating effect and to understand how financial constraints interact with urban environmental factors to influence sport participation.

Author contribution: Conceptualization, TTZ and JJZ; methodology, TTZ; software, TTZ; validation, TTZ, YB and JJZ; formal analysis, TTZ; investigation, TTZ; resources, TTZ; data curation, TTZ; writing—original draft preparation, TTZ; writing—review and editing, TTZ; visualization, TTZ; supervision, JJZ; project administration, YB; funding acquisition, YB. All authors have read and agreed to the published version of the manuscript.

Conflict of interest: The authors declare no conflict of interest.

References

Alfonzo, M. A. (2005). To Walk or Not to Walk? The Hierarchy of Walking Needs. Environment and Behavior, 37(6), 808–836. https://doi.org/10.1177/0013916504274016

Almulhim, A. I., & Cobbinah, P. B. (2023). Can rapid urbanization be sustainable? The case of Saudi Arabian cities. Habitat International, 139, 102884. https://doi.org/10.1016/j.habitatint.2023.102884

American College of Sports Medicine. (2017). ACSM's exercise testing and prescription. Lippincott Williams & Wilkins.

An, R., Shen, J., Yang, Q., & Yang, Y. (2019). Impact of built environment on physical activity and obesity among children and adolescents in China: A narrative systematic review. Journal of Sport and Health Science, 8(2), 153–169. https://doi.org/10.1016/j.jshs.2018.11.003

Azzali, S. (2016). Mega-events and urban planning: Doha as a case study. URBAN DESIGN International, 22(1), 3–12. https://doi.org/10.1057/s41289-016-0011-y

Baade, R. A. (1996). Professional Sports as Catalysts for Metropolitan Economic Development. Journal of Urban Affairs, 18(1), 1–17. https://doi.org/10.1111/j.1467-9906.1996.tb00361.x

Ball, K., Bauman, A., Leslie, E., & Owen, N. (2001). Perceived Environmental Aesthetics and Convenience and Company Are Associated with Walking for Exercise among Australian Adults. Preventive Medicine, 33(5), 434–440. https://doi.org/10.1006/pmed.2001.0912

Beenackers, M. A., Kamphuis, C. B., Burdorf, A., et al. (2011). Sports participation, perceived neighborhood safety, and individual cognitions: how do they interact? International Journal of Behavioral Nutrition and Physical Activity, 8(1), 114. https://doi.org/10.1186/1479-5868-8-114

Billinger, S. A., Boyne, P., Coughenour, E., et al. (2014). Does Aerobic Exercise and the FITT Principle Fit into Stroke Recovery? Current Neurology and Neuroscience Reports, 15(2). https://doi.org/10.1007/s11910-014-0519-8

Black, C., Collins, A., & Snell, M. (2001). Encouraging Walking: The Case of Journey-to-school Trips in Compact Urban Areas. Urban Studies, 38(7), 1121–1141. https://doi.org/10.1080/00420980124102

Borgers, J., Breedveld, K., Tiessen-Raaphorst, A., et al. (2016). A study on the frequency of participation and time spent on sport in different organisational settings. European Sport Management Quarterly, 16(5), 635–654. https://doi.org/10.1080/16184742.2016.1196717

Bors, P., Dessauer, M., Bell, R., Wilkerson, R., et al. (2009). The Active Living by Design national program: community initiatives and lessons learned. American journal of preventive medicine, 37(6 Suppl 2), S313–S321. https://doi.org/10.1016/j.amepre.2009.09.027

Brownson, R. C., Chang, J. J., Eyler, A. A., et al. (2004). Measuring the Environment for Friendliness Toward Physical Activity: A Comparison of the Reliability of 3 Questionnaires. American Journal of Public Health, 94(3), 473–483. https://doi.org/10.2105/ajph.94.3.473

Brownson, R. C., Housemann, R. A., Brown, D. R., et al. (2000). Promoting physical activity in rural communities. American Journal of Preventive Medicine, 18(3), 235–241. https://doi.org/10.1016/s0749-3797(99)00165-8

Butler, E. N., Ambs, A. M. H., Reedy, J., & Bowles, H. R. (2011). Identifying GIS Measures of the Physical Activity Built Environment Through a Review of the Literature. Journal of Physical Activity and Health, 8(s1), S91–S97. https://doi.org/10.1123/jpah.8.s1.s91

Carver, A., Timperio, A., & Crawford, D. (2008). Playing it safe: The influence of neighbourhood safety on children's physical activity—A review. Health & Place, 14(2), 217–227. https://doi.org/10.1016/j.healthplace.2007.06.004

Cassarino, M., Shahab, S., & Biscaya, S. (2021). Envisioning Happy Places for All: A Systematic Review of the Impact of Transformations in the Urban Environment on the Wellbeing of Vulnerable Groups. Sustainability, 13(14), 8086. https://doi.org/10.3390/su13148086

CDC. (2011). Impact of the Built Environment on Health. Available online: https://www.cdc.gov/nceh/publications/factsheets/impactofthebuiltenvironmentonhealth.pdf (accessed on 17 January 2024).

Cervero, R., & Kockelman, K. (1997). Travel demand and the 3Ds: Density, diversity, and design. Transportation Research Part D: Transport and Environment, 2(3), 199–219. https://doi.org/10.1016/s1361-9209(97)00009-6

Cervero, R., & Radisch, C. (1996). Travel choices in pedestrian versus automobile oriented neighborhoods. Transport Policy, 3(3), 127–141. https://doi.org/10.1016/0967-070x(96)00016-9

Cervero, R., Sarmiento, O. L., Jacoby, E., et al. (2009). Influences of Built Environments on Walking and Cycling: Lessons from Bogotá. International Journal of Sustainable Transportation, 3(4), 203–226. https://doi.org/10.1080/15568310802178314

Chipande, H. D. (2016). Mining for Goals. Radical History Review, 2016(125), 55–73. https://doi.org/10.1215/01636545-3451736

Christakis, N. A., & Fowler, J. H. (2007). The Spread of Obesity in a Large Social Network over 32 Years. New England Journal of Medicine, 357(4), 370–379. https://doi.org/10.1056/nejmsa066082

Conner, M., McEachan, R., Jackson, C., et al. (2013). Moderating Effect of Socioeconomic Status on the Relationship between Health Cognitions and Behaviors. Annals of Behavioral Medicine, 46(1), 19–30. https://doi.org/10.1007/s12160-013-9481-y

Craig, C. L., Brownson, R. C., Cragg, S. E., & Dunn, A. L. (2002). Exploring the effect of the environment on physical activity. American Journal of Preventive Medicine, 23(2), 36–43. https://doi.org/10.1016/s0749-3797(02)00472-5

Cunningham, G. O., & Michael, Y. L. (2004). Concepts Guiding the Study of the Impact of the Built Environment on Physical Activity for Older Adults: A Review of the Literature. American Journal of Health Promotion, 18(6), 435–443. https://doi.org/10.4278/0890-1171-18.6.435

De Bourdeaudhuij, I., Sallis, J. F., & Saelens, B. E. (2003). Environmental Correlates of Physical Activity in a Sample of Belgian Adults. American Journal of Health Promotion, 18(1), 83–92. https://doi.org/10.4278/0890-1171-18.1.83

Deelen, I., Ettema, D., & Kamphuis, C. B. M. (2018). Sports participation in sport clubs, gyms or public spaces: How users of different sports settings differ in their motivations, goals, and sports frequency. PLOS ONE, 13(10), e0205198. https://doi.org/10.1371/journal.pone.0205198

Dickson, G., & Zhang, J. J. (2020). Sports and urban development: an introduction. International Journal of Sports Marketing and Sponsorship, 22(1), 1–9. https://doi.org/10.1108/ijsms-11-2020-0194

Downward, P., Lera-López, F., & Rasciute, S. (2014). The correlates of sports participation in Europe. European Journal of Sport Science, 14(6), 592–602. https://doi.org/10.1080/17461391.2014.880191

Eagly, A. H., & Chaiken, S. (1993). The psychology of attitudes. Harcourt Brace Jovanovich College.

Eakins, J. (2018). An analysis of the determinants of sports participation and time spent in different sporting contexts. Managing Sport and Leisure, 23(3), 157–173. https://doi.org/10.1080/23750472.2018.1527713

Edwards, P., & Tsouros, A. D. (2008). A healthy city is an active city: a physical activity planning guide. World Health Organization.

Eime, R. M., Harvey, J. T., Sawyer, N. A., et al. (2013). Understanding the Contexts of Adolescent Female Participation in Sport and Physical Activity. Research Quarterly for Exercise and Sport, 84(2), 157–166. https://doi.org/10.1080/02701367.2013.784846

Eime, R. M., Sawyer, N., Harvey, J. T., et al. (2015). Integrating public health and sport management: Sport participation trends 2001–2010. Sport Management Review, 18(2), 207–217. https://doi.org/10.1016/j.smr.2014.05.004

Forsyth, A., Hearst, M., Oakes, J. M., & Schmitz, K. H. (2008). Design and Destinations: Factors Influencing Walking and Total Physical Activity. Urban Studies, 45(9), 1973–1996. https://doi.org/10.1177/0042098008093386

Federico, B., Falese, L., Marandola, D., & Capelli, G. (2013). Socioeconomic differences in sport and physical activity among Italian adults. Journal of Sports Sciences, 31(4), 451–458. https://doi.org/10.1080/02640414.2012.736630

Fei, W., Opoku, A., Agyekum, K., et al. (2021). The Critical Role of the Construction Industry in Achieving the Sustainable Development Goals (SDGs): Delivering Projects for the Common Good. Sustainability, 13(16), 9112. https://doi.org/10.3390/su13169112

Feng, S., Chen, L., Sun, R., et al. (2019). The Distribution and Accessibility of Urban Parks in Beijing, China: Implications of Social Equity. International Journal of Environmental Research and Public Health, 16(24), 4894. https://doi.org/10.3390/ijerph16244894

Fisher, J. E., Andersen, Z. J., Loft, S., & Pedersen, M. (2017). Opportunities and challenges within urban health and sustainable development. Current Opinion in Environmental Sustainability, 25, 77–83. https://doi.org/10.1016/j.cosust.2017.08.008

Floyd, M. F., Spengler, J. O., Maddock, J. E.,et al. (2008). Park-based physical activity in diverse communities of Two U.S. Cities. American Journal of Preventive Medicine, 34(4), 299–305. https://doi.org/10.1016/j.amepre.2008.01.009

FRANCIS, S. (2005). Sport tourism destinations: the active sport tourist perspective. Sport Tourism Destinations, 73–92. https://doi.org/10.1016/b978-0-7506-5937-6.50013-4

Franzini, L., Taylor, W., Elliott, M. N.,et al. (2010). Neighborhood characteristics favorable to outdoor physical activity: Disparities by socioeconomic and racial/ethnic composition. Health & Place, 16(2), 267–274. https://doi.org/10.1016/j.healthplace.2009.10.009

Giles-Corti, B., & Donovan, R. J. (2002a). Socioeconomic Status Differences in Recreational Physical Activity Levels and Real and Perceived Access to a Supportive Physical Environment. Preventive Medicine, 35(6), 601–611. https://doi.org/10.1006/pmed.2002.1115

Giles-Corti, B., & Donovan, R. J. (2002b). The relative influence of individual, social and physical environment determinants of physical activity. Social Science & Medicine, 54(12), 1793–1812. https://doi.org/10.1016/s0277-9536(01)00150-2

Giles-Corti, B., Macintyre, S., Clarkson, J. P.,et al. (2003). Environmental and Lifestyle Factors Associated with Overweight and Obesity in Perth, Australia. American Journal of Health Promotion, 18(1), 93–102. https://doi.org/10.4278/0890-1171-18.1.93

Giles-Corti, W. (1998). The relative influence of, and interaction between, environmental and individual determinants of recreational physical activity in sedentary workers and home makers. [Doctoral Thesis, The University of Western Australia].

Greenwald, M. J., & Boarnet, M. G. (2001). Built Environment as Determinant of Walking Behavior: Analyzing Nonwork Pedestrian Travel in Portland, Oregon. Transportation Research Record: Journal of the Transportation Research Board, 1780(1), 33–41. https://doi.org/10.3141/1780-05

Grix, J., Brannagan, P. M., Grimes, H., & Neville, R. (2020). The impact of Covid-19 on sport. International Journal of Sport Policy and Politics, 13(1), 1–12. https://doi.org/10.1080/19406940.2020.1851285

Gul, Y., Sultan, Z., & Johar, F. (2016). Effects of neighborhood's built environment on physical activities in gated communities: A review. International Journal of Built Environment and Sustainability, 3(1), 60-69. https://doi.org/10.11113/ijbes.v3.n1.112

Hallmann, K., Wicker, P., Breuer, C., & Schönherr, L. (2012). Understanding the importance of sport infrastructure for participation in different sports – findings from multi-level modeling. European Sport Management Quarterly, 12(5), 525–544. https://doi.org/10.1080/16184742.2012.687756

Handy, S. (2005). Critical assessment of the literature on the relationships among transportation, land use, and physical activity. Transportation Research Board and the Institute of Medicine Committee on Physical Activity, Health, Transportation, and Land Use. Resource paper for TRB Special Report, 282(1), 1-81.

Henander, B. (2019). Cities with the Most Extreme Weather. World Atlas. https://www.worldatlas.com/articles/the-worlds-most-extreme-cities-wettest-driest-coldest-hottest-highest-isolated-least-accessible-and-windiest-cities.html

Humpel, N. (2002). Environmental factors associated with adults' participation in physical activity A review. American Journal of Preventive Medicine, 22(3), 188–199. https://doi.org/10.1016/s0749-3797(01)00426-3

Jiang, Z., & Lin, B. (2012). China's energy demand and its characteristics in the industrialization and urbanization process. Energy Policy, 49, 608–615. https://doi.org/10.1016/j.enpol.2012.07.002

Kamphuis, C. B., Van Lenthe, F. J., Giskes, K.,et al. (2008). Socioeconomic status, environmental and individual factors, and sports participation. Medicine & Science in Sports & Exercise, 40(1), 71–81. https://doi.org/10.1249/mss.0b013e318158e467

Kelman, H. C. (1958). Compliance, identification, and internalization three processes of attitude change. Journal of Conflict Resolution, 2(1), 51–60. https://doi.org/10.1177/002200275800200106

Kemp, B. J., Cliff, D. P., Batterham, M., & Parrish, A. M. (2021). Socio-ecological predictors of non-organized physical activity participation and decline between childhood and adolescence. Journal of Sports Sciences, 39(2), 120–130. https://doi.org/10.1080/02640414.2020.1808296

Keys, B. J. (2013). Globalizing Sport. Amsterdam University.

Kim, M. J., Lee, C. K., & Jung, T. (2018). Exploring consumer behavior in virtual reality tourism using an extended stimulus-organism-response model. Journal of Travel Research, 59(1), 69–89. https://doi.org/10.1177/0047287518818915

Kitamura, R., Mokhtarian, P. L., & Daidet, L. (1997). A micro-analysis of land use and travel in five neighborhoods in the San Francisco Bay area. Transportation, 24(2), 125–158. https://doi.org/10.1023/a:1017959825565

Koch, N. (2018). Sports and the city. Geography Compass, 12(3), e12360. https://doi.org/10.1111/gec3.12360

Kockelman, K. M. (1997). Travel behavior as function of accessibility, land use mixing, and land use balance: evidence from San Francisco Bay area. Transportation Research Record: Journal of the Transportation Research Board, 1607(1), 116–125. https://doi.org/10.3141/1607-16

Kondo, K., Lee, J. S., Kawakubo, K.,et al. (2009). Association between daily physical activity and neighborhood environments. Environmental Health and Preventive Medicine, 14(3), 196–206. https://doi.org/10.1007/s12199-009-0081-1

Kwon, Y. S., Lee, B. K., & Sohn, S. Y. (2020). Optimal location-allocation model for the installation of rooftop sports facilities in metropolitan areas. European Sport Management Quarterly, 20(2), 189–204. https://doi.org/10.1080/16184742.2019.1598454

Laborde, S., Guillén, F., & Mosley, E. (2016). Positive personality-trait-like individual differences in athletes from individual- and team sports and in non-athletes. Psychology of Sport and Exercise, 26, 9–13. https://doi.org/10.1016/j.psychsport.2016.05.009

Lanrewaju, F. (2012). Urbanization, housing quality and environmental degeneration in Nigeria. Journal of Geography and Regional Planning, 5(16), 422–429. https://doi.org/10.5897/jgrp12.060

Li, X. H., Liu, J. L., Gibson, V., & Zhu, Y. G. (2012). Urban sustainability and human health in China, East Asia and Southeast Asia. Current Opinion in Environmental Sustainability, 4(4), 436–442. https://doi.org/10.1016/j.cosust.2012.09.007

Linton, H. B. (1955). Dependence on external influence: Correlates in perception, attitudes, and judgment. The Journal of Abnormal and Social Psychology, 51(3), 502–507. https://doi.org/10.1037/h0046282

Lovasi, G. S., Hutson, M. A., Guerra, M., & Neckerman, K. M. (2009). Built environments and obesity in disadvantaged populations. Epidemiologic Reviews, 31(1), 7–20. https://doi.org/10.1093/epirev/mxp005

Low, S., & Maguire, M. (2020). Public space during COVID-19. Social Anthropology.

Lynch, J., & Kaplan, G. (2000). Socioeconomic position (Vol. 2000, pp. 13-35). Social epidemiology. New York: Oxford University Press.

Malfas, M., Theodoraki, E., & Houlihan, B. (2004). Impacts of the Olympic Games as mega-events. Proceedings of the Institution of Civil Engineers - Municipal Engineer, 157(3), 209–220. https://doi.org/10.1680/muen.2004.157.3.209

Mangan, J. A. (2010). 'Muscular, militaristic and manly': The middle-class hero as moral messenger. The International Journal of the History of Sport, 27(1–2), 150–168. https://doi.org/10.1080/09523360903339197

Marshall, W. E., & Garrick, N. (2011). Does street network design affect traffic safety? Accident Analysis & Prevention, 43(3), 769–781. https://doi.org/10.1016/j.aap.2010.10.024

Martins, L. C. G., Lopes, M. V. D. O., Diniz, C. M., & Guedes, N. G. (2020). The factors related to a sedentary lifestyle: A meta-analysis review. Journal of Advanced Nursing, 77(3), 1188–1205. https://doi.org/10.1111/jan.14669

Marzouk, M., & Othman, A. (2020). Planning utility infrastructure requirements for smart cities using the integration between BIM and GIS. Sustainable Cities and Society, 57, 102120. https://doi.org/10.1016/j.scs.2020.102120

Mason, D., Sant, S. L., & Soebbing, B. (2017). The peculiar economics of sports team ownership. Sport, Business and Management: An International Journal, 7(4), 358–374. https://doi.org/10.1108/sbm-10-2016-0067

McCormack, E., Rutherford, G. S., & Wilkinson, M. G. (2001). Travel impacts of mixed land use neighborhoods in Seattle, Washington. Transportation Research Record: Journal of the Transportation Research Board, 1780(1), 25–32. https://doi.org/10.3141/1780-04

Mehrabian, A., & Russell, J. A. (1974). An Approach to Environmental Psychology. MIT.

Mell, İ., & Whitten, M. (2021). Access to nature in a post COVID-19 world: Opportunities for green infrastructure financing, distribution and equitability in urban planning. International Journal of Environmental Research and Public Health, 18(4), 1527. https://doi.org/10.3390/ijerph18041527

Misener, L., & Mason, D. S. (2006). Creating community networks: Can sporting events offer meaningful sources of social capital? Managing Leisure, 11(1), 39–56. https://doi.org/10.1080/13606710500445676

Nagel, C. L., Carlson, N. E., Bosworth, M., & Michael, Y. L. (2008). The relation between neighborhood built environment and walking activity among older adults. American Journal of Epidemiology, 168(4), 461–468. https://doi.org/10.1093/aje/kwn158

Nagoya, R., Bernarto, I., Antonio, F., et al. (2021). Exploring intention to enroll university using an extended stimulus-organism-response model. Academy of Strategic Management Journal, 20. https://www.abacademies.org/articles/exploring-intention-to-enroll-university-using-an-extended-stimulusorganismresponse-model.pdf

Neckerman, K. M., Lovasi, G. S., Davies, S., et al. (2009). Disparities in urban neighborhood conditions: evidence from GIS measures and field observation in New York City. Journal of Public Health Policy, 30(S1), S264–S285. https://doi.org/10.1057/jphp.2008.47

Park, J. H., Moon, J., Kim, H. J., et al. (2020). Sedentary Lifestyle: Overview of updated evidence of potential health risks. Korean Journal of Family Medicine, 41(6), 365–373. https://doi.org/10.4082/kjfm.20.0165

Penchansky, R., & Thomas, J. W. (1981). The concept of access: Definition and relationship to consumer satisfaction. Medical Care, 19(2), 127–140. http://www.jstor.org/stable/3764310

Piercy, K. L., Troiano, R. P., Ballard, R. M., et al. (2018). The physical activity guidelines for Americans. JAMA, 320(19), 2020. https://doi.org/10.1001/jama.2018.14854

Pikora, T., Giles-Corti, B., Bull, F., et al. (2003). Developing a framework for assessment of the environmental determinants of walking and cycling. Social Science & Medicine, 56(8), 1693–1703. https://doi.org/10.1016/s0277-9536(02)00163-6

Poulsen, A. A., Ziviani, J. M., Cuskelly, M., & Smith, R. (2007). Boys with developmental coordination disorder: Loneliness and team sports participation. The American Journal of Occupational Therapy, 61(4), 451–462. https://doi.org/10.5014/ajot.61.4.451

Poynter, G., Viehoff, V., & Li, Y. (2018). The London Olympics and Urban Development: The Mega-Event City. Routledge.

Pozoukidou, G., & Chatziyiannaki, Z. (2021). 15-Minute City: Decomposing the new urban planning eutopia. Sustainability, 13(2), 928. https://doi.org/10.3390/su13020928

Ranjbarnia, B., Kamelifar, M. J., & Masoumi, H. E. (2022). The association between active mobility and subjective wellbeing during COVID-19 in MENA Countries. Healthcare, 10(9), 1603. https://doi.org/10.3390/healthcare10091603

Rappaport, J., & Wilkerson, C. (2001). What are the benefits of hosting a major league sports franchise? Economic Review-Federal Reserve Bank of Kansas City, 86(1), 55-86.

Ren, X. (2008). Architecture and nation building in the age of globalization: Construction of the national stadium of Beijing for the 2008 Olympics. Journal of Urban Affairs, 30(2), 175–190. https://doi.org/10.1111/j.1467-9906.2008.00386.x

Rhodes, R. E., Brown, S. G., & McIntyre, C. A. (2006). Integrating the perceived neighborhood environment and the theory of planned behavior when predicting walking in a Canadian adult sample. American Journal of Health Promotion, 21(2), 110–118. https://doi.org/10.4278/0890-1171-21.2.110

Richards, G., & Duif, L. (2018). Small cities with big dreams. In Routledge eBooks. https://doi.org/10.4324/9781351201193

Riess, S. A. (1991). City Games: The Evolution of American Urban Society and the Rise of Sports (Sport and Society). University of Illinois Press.

Ritchie, H., & Roser, M. (2018). Urbanization. https://ourworldindata.org/urbanization

Robroek, S. J., Reeuwijk, K. G., Hillier, F. C., et al. (2013). The contribution of overweight, obesity, and lack of physical activity to exit from paid employment: a meta-analysis. Scandinavian Journal of Work, Environment & Health, 39(3), 233–240. https://doi.org/10.5271/sjweh.3354

Ruwald, A. C., Marcus, F., Estes, N. M., et al. (2015). Association of competitive and recreational sport participation with cardiac events in patients with arrhythmogenic right ventricular cardiomyopathy: results from the North American multidisciplinary study of arrhythmogenic right ventricular cardiomyopathy. European Heart Journal, 36(27), 1735–1743. https://doi.org/10.1093/eurheartj/ehv110

Ryan, D. H., Ravussin, E., & Heymsfield, S. (2020). COVID-19 and the patient with obesity – the editors speak out. Obesity, 28(5), 847. https://doi.org/10.1002/oby.22808

Sabiston, C. M., O'Loughlin, E., Brunet, J., et al. (2013). Linking depression symptom trajectories in adolescence to physical activity and team sports participation in young adults. Preventive Medicine, 56(2), 95–98. https://doi.org/10.1016/j.ypmed.2012.11.013

Saelens, B. E., Sallis, J. F., & Frank, L. D. (2003). Environmental correlates of walking and cycling: Findings from the transportation, urban design, and planning literatures. Annals of Behavioral Medicine, 25(2), 80–91. https://doi.org/10.1207/s15324796abm2502_03

Sallis, J. F., Adlakha, D., Oyeyemi, A., & Salvo, D. (2020). An international physical activity and public health research agenda to inform coronavirus disease-2019 policies and practices. Journal of Sport and Health Science, 9(4), 328–334. https://doi.org/10.1016/j.jshs.2020.05.005

Sallis, J. F., Hovell, M. F., Hofstetter, C. R., et al. (1990). Distance between homes and exercise facilities related to frequency of exercise among San Diego residents. Public Health Reports, 105(2), 179.

Sánchez, F., & Broudehoux, A.-M. (2013). Mega-events and urban regeneration in Rio de Janeiro: planning in a state of emergency. International Journal of Urban Sustainable Development, 5(2), 132–153. https://doi.org/10.1080/19463138.2013.839450

Scheerder, J., & Vos, S. (2011). Social stratification in adults' sports participation from a time-trend perspective results from a 40-year household study. European Journal for Sport and Society, 8(1–2), 31–44. https://doi.org/10.1080/16138171.2011.11687868

Shanahan, D., Cox, D., Fuller, R.,et al. (2017). Variation in experiences of nature across gradients of tree cover in compact and sprawling cities. Landscape and Urban Planning, 157, 231–238. https://doi.org/10.1016/j.landurbplan.2016.07.004

Shay, E., Rodriguez, D. A., Cho, G., et al. (2009). Comparing objective measures of environmental supports for pedestrian travel in adults. International Journal of Health Geographics, 8(1), 62. https://doi.org/10.1186/1476-072x-8-62

Shoari, N., Ezzati, M., Baumgartner, J., et al. (2020). Accessibility and allocation of public parks and gardens in England and Wales: A COVID-19 social distancing perspective. PloS One, 15(10). https://doi.org/10.1371/journal.pone.0241102

Slater, S. J., Christiana, R. W., & Gustat, J. (2020). Recommendations for keeping parks and green space accessible for mental and physical health during COVID-19 and other pandemics. Preventing Chronic Disease, 17. https://doi.org/10.5888/pcd17.200204

Smith, A. (2010). The development of "sports-city" zones and their potential value as tourism resources for urban areas. European Planning Studies, 18(3), 385–410. https://doi.org/10.1080/09654310903497702

Sotiriadou, K. P. (2009). The Australian sport system and its stakeholders: development of cooperative relationships. Sport in Society, 12(7), 842–860. https://doi.org/10.1080/17430430903053067

Steenhuis, I. H., Nooy, S. B., Moes, M. J., & Schuit, A. J. (2009). Financial barriers and pricing strategies related to participation in sports activities: The perceptions of people of low income. Journal of Physical Activity and Health, 6(6), 716–721. https://doi.org/10.1123/jpah.6.6.716

Stodolska, M., Shinew, K. J., Acevedo, J. C., & Izenstark, D. (2011). Perceptions of urban parks as havens and contested terrains by Mexican-Americans in Chicago neighborhoods. Leisure Sciences, 33(2), 103–126. https://doi.org/10.1080/01490400.2011.550220

Strath, S., Isaacs, R., & Greenwald, M. J. (2007). Operationalizing environmental indicators for physical activity in older adults. Journal of Aging and Physical Activity, 15(4), 412–424. https://doi.org/10.1123/japa.15.4.412

Thidemann, A., & Rekdal, K. E. (2016). Treningssenterbransjen 2016. VIRKE Trening.

Tilt, J. H., Unfried, T. M., & Roca, B. (2007). Using objective and subjective measures of neighborhood greenness and accessible destinations for understanding walking trips and BMI in Seattle, Washington. American Journal of Health Promotion, 21(4), 371–379. https://doi.org/10.4278/0890-1171-21.4s.371

Timperio, A., Crawford, D., Telford, A., & Salmon, J. (2004). Perceptions about the local neighborhood and walking and cycling among children. Preventive Medicine, 38(1), 39–47. https://doi.org/10.1016/j.ypmed.2003.09.026

Titze, S., Stronegger, W. J., Janschitz, S., & Oja, P. (2007). Environmental, social, and personal correlates of cycling for transportation in a student population. Journal of Physical Activity and Health, 4(1), 66–79. https://doi.org/10.1123/jpah.4.1.66

Troped, P. J., Saunders, R. P., Pate, R. R., et al. (2001). Associations between self-reported and objective physical environmental factors and use of a community rail-trail. Preventive Medicine, 32(2), 191–200. https://doi.org/10.1006/pmed.2000.0788

Troped, P. J., Wilson, J. S., Matthews, C. E., et al. (2010). The built environment and location-based physical activity. American Journal of Preventive Medicine, 38(4), 429–438. https://doi.org/10.1016/j.amepre.2009.12.032

Trost, S. G., Owen, N., Bauman, A. E., et al. (2002). Correlates of adults' participation in physical activity: review and update. Medicine & Science in Sports & exercise, 34(12), 1996-2001.

Tucker, P., & Gilliland, J. (2007). The effect of season and weather on physical activity: A systematic review. Public Health, 121(12), 909–922. https://doi.org/10.1016/j.puhe.2007.04.009

Unterman, R. (1987). Changing design standards for streets and roads. Public Streets for Public Use, 255-260.

Van Dyck, D., Sallis, J. F., Cardon, G., et al. (2013). Associations of neighborhood characteristics with active park use: an observational study in two cities in the USA and Belgium. International Journal of Health Geographics, 12(1), 26. https://doi.org/10.1186/1476-072x-12-26

Veal, A. J., Toohey, K., & Frawley, S. (2012). The sport participation legacy of the Sydney 2000 Olympic Games and other international sporting events hosted in Australia. Journal of Policy Research in Tourism, Leisure and Events, 4(2), 155–184. https://doi.org/10.1080/19407963.2012.662619

Wang, K., & Wang, X. (2020). Providing Sports Venues on Mainland China: Implications for Promoting Leisure-Time Physical Activity and National Fitness Policies. International Journal of Environmental Research and Public Health, 17(14), 5136. https://doi.org/10.3390/ijerph17145136

Wicker, P., Hallmann, K., & Breuer, C. (2012). Micro and macro level determinants of sport participation. Sport, Business and Management: An International Journal, 2(1), 51–68. https://doi.org/10.1108/20426781211207665

Wilcox, S. (2000). Determinants of leisure time physical activity in rural compared with urban older and ethnically diverse women in the United States. Journal of Epidemiology & Community Health, 54(9), 667–672. https://doi.org/10.1136/jech.54.9.667

Wohlwill, J. F. (1976). Environmental Aesthetics: The Environment as a Source of Affect. Human Behavior and Environment, 37–86. https://doi.org/10.1007/978-1-4684-2550-5_2

Wood, W. (2000). Attitude Change: Persuasion and Social Influence. Annual Review of Psychology, 51(1), 539–570. https://doi.org/10.1146/annurev.psych.51.1.539

Xie, J., Luo, S., Furuya, K., & Sun, D. (2020). Urban Parks as Green Buffers During the COVID-19 Pandemic. Sustainability, 12(17), 6751. https://doi.org/10.3390/su12176751

Xiong, H. (2007). The evolution of urban society and social changes in sports participation at the grassroots in China. International Review for the Sociology of Sport, 42(4), 441–471. https://doi.org/10.1177/1012690208089836

Yoo, S., & Kim, D. H. (2017). Perceived urban neighborhood environment for physical activity of older adults in Seoul, Korea: A multimethod qualitative study. Preventive Medicine, 103, S90–S98. https://doi.org/10.1016/j.ypmed.2016.12.033

Zimbardo, P. G., & Leippe, M. R. (1991). The psychology of attitude change and social influence (1st ed.). McGraw-Hill.