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Review Article

A Systematic Review of Associations Between Physical Activities and Environmental Factors among Older Adults in Urban Parks

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ABSTRACT

With the escalating global trend of population ageing, urban parks are increasingly recognised as pivotal spaces for leisure activities among older adults. Comprehensive reviews focusing on older adults' activities in urban parks, along with the pertinent environmental factors, remain scarce. This paper provides an in-depth study of the literature on older adults' activity patterns in urban parks and the environmental factors that influence their activities. A systematic search was conducted using keywords in reputed databases such as SCOPUS and WoS, resulting in the review of 85 papers, which were subsequently analysed thematically using ATLAS.TI software. Research trends can be categorised into health indicators, proximity and psychosocial factors from 2003 to 2024. The most common activity that older adults engage in is walking, and park design factors such as path width, vegetation cover and pet-friendliness significantly influence their walking behaviour. In addition, older adults' physical activity is influenced by the physical environment and by psychosocial factors, showing geographic and gender differences. Older adults' motivations for using parks include thermal comfort, meaning of place, and social interaction, factors strongly associated with their physical and mental recovery, as well as well-being. Future research should further explore the specific mechanisms at play between environmental factors and physical activity among older adults, with attention to differences across cultural contexts, to provide a more comprehensive guide to the design of urban parks.

Keywords: Activity patterns, ageing population, environmental impacts, park design

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INTRODUCTION

With the deepening of social ageing, the focus of societal attention has shifted to older individuals' quality of life. Promoting older adults' physical activity is essential to maintaining and enhancing their well-being. One of the most crucial goals of public health has always been to encourage physical activity among the general people (Chenghe et al., 2019). The physical benefits of physical activities in a green environment have been proven (Battaglia et al., 2020; Han et al., 2021; Kabisch et al., 2021; Sun & Yu, 2021; K. Wang et al., 2021; M. Wang et al., 2021). For instance, strolling through urban parks promotes psychological and physiological relaxation as well as a diverse perception of the scenery (Pratiwi et al., 2020). Parks are acknowledged as a public health measure that encourages physical activity (King et al., 2015).

The Ecological Theory of Ageing (ETA) emphasises the significance of the physical context (Lawton & Nahemow, 1973). The early research of two classic theories explains the restorative effect of the environment on people, namely the stress reduction theory and the attention restoration theory (S. Kaplan, 1995; Ulrich et al., 1991). Research from Bohari et al. (2024) states that green compounds and gardens will stimulate comfort for older people and make them feel restful, thus encouraging them to be more involved in recreational activities. They studied the characteristics of retirement villages and their surrounding environment from the perspective of Generation X individuals residing in East Malaysia. Previous research has highlighted the physical benefits of leisure activities in green environments. However, studies on park utilisation showed that over half of city dwellers avoid going to parks for active or passive purposes during the week (Bai et al., 2013).

Previous reviews of the built environment and older adults' physical activities have not found consistent correlations (Barnett et al., 2017; Van Cauwenberg et al., 2011). Many environmental attributes are understudied in physical activity outcomes for seniors (Van Cauwenberg et al., 2018). Gibson's (1979/1986) affordance theory was used to position this study, namely that the different functions of urban parks influence the activities of older adults in urban parks. This highlights the need for further research into the interactions between activity and environmental factors in urban parks for older adults. Physical activities in parks allow seniors to remain socially active and promote an optimal fit between seniors and their environment (Levy-Storms et al., 2018). Therefore, this paper aims to identify the activity patterns of older adults in urban parks and the factors that influence their physical activities.

LITERATURE REVIEW

Multiple review articles have delved into the factors that influence the physical activities of older adults in urban environments. Qualitative studies can provide nuanced insights into the factors influencing physical activities but have often been excluded from previous reviews.

An early review concluded that most of the environmental characteristics studied were not related to physical activities in older adults (Van Cauwenberg et al., 2011). Most of the studies reviewed were in North America and Europe. However, a study by R. Zhang, Duan, et al. (2019) is inconsistent with this view. Their examination of exercise in parks and community environmental features emphasises paths/trails, lighting, and incivilities as key factors for park physical activities. Safety, walking accessibility, and proximity to parks, natural landscapes, and recreational facilities are among the key elements identified (Bonaccorsi et al., 2020; Van Cauwenberg et al., 2018). The evidence regarding these factors is inconclusive for older adults in urban parks.

Barnett et al. (2017) revealed variations in the strength of the association between these factors and physical activities depending on the older adults' activities and environmental indicators. D. Li et al. (2023) suggested a positive correlation between various environmental factors and physical activities among older adults, aligning with the emphasis on safety, aesthetics, and amenities. McCormack et al. (2010) underscored that socio-demographic characteristics and perceptions of park attributes may influence physical activity patterns in older individuals. Nevertheless, D. Li et al.'s (2023) review, which excluded qualitative research, poses a limitation in capturing nuanced perspectives, contrasting with McCormack's approach. Another review by Kaczynski and Henderson (2007) indicates a general association between park proximity and increased physical activity. However, reviews by Kaczynski lack

Table 1
Related literature review on PA in older adults in different environments

	Bonaccorsi et al. (2020)	**Van Cauwenberg et al. (2018)**	**R. Zhang, Wulff, et al. (2019)**	**D. Li et al. (2023)**	**McCormack et al. (2010)**	**Kaczynski & Henderson (2007)**
Safety	√			√	√	
Walking accessibility	√	√		√		
Urbanisation	√					
Walkability	√	√				
Proximity					√	√
Natural landscapes	√	√		√		
Amenities				√	√	
Aesthetics				√	√	
land-use mix	√	√				
Incivilities			√			
Paths			√	√		
Water				√		
Lighting	√		√			
Maintenance					√	

specific information on park characteristics that influence physical activities in older adults. The variables covered in these reviews are listed in Table 1.

In addition to environmental factors, the interplay between social, environmental, and individual factors is complex and dynamic, influencing physical activity (Sallis et al., 2006). Psychosocial factors and individuals' perceptions of their environment influence older adults' physical activity patterns (Wagner et al., 2020).

These reviews suggest that factors such as safety, aesthetics, accessibility, and proximity play a crucial role in influencing patterns of physical activities. However, findings on the relationship between different built environments and activity levels of older adults are inconsistent, as are results on whether many environmental features are related to older adults' physical activities. There is a lack of specific information on park features that influence physical activities in older adults. Therefore, a comprehensive review that includes quantitative and qualitative studies is necessary to gain insight into the factors influencing physical activities among older adults in urban parks.

METHODS

A thematic review was conducted using ATLAS.ti 9, a software which aligns with the methodology that employs a thematic analysis procedure in the literature review (Zairul, 2020). Theme analysis is the act of finding patterns and developing themes after carefully reading the subject (Braun & Clarke, 2013). The next steps are identifying patterns and constructing categories to gain insight into the activity patterns and influencing factors. The selection of documents was based on several criteria. Studies that were identified and satisfied all requirements were eligible.

Published literature between the year 2003–2024. The start of 2003 was chosen for this paper because of the shift in attention during that time to how design affects other important factors in health, particularly physical activities (Killingsworth et al., 2003).-Literature searches were conducted through Scopus and WoS database searches. The search terms were applied to the title, abstract, and keyword fields, focusing on urban park issues for older adults. The article type is a peer-reviewed publication in English. Articles published in international peer-reviewed journals were preferred to conference papers because they were rigorously reviewed and avoided additional criteria for assessing the quality of a potentially large number of papers. Research design contains quantitative, qualitative, or mixed methods. The keywords used in the search are shown in Table 2.

The studies' screening procedure is shown in Figure 1. Thirteen hundred and fifty-one articles were found. There are 1272 papers in Web of Science and 79 articles in Scopus, among the publications that were found using keywords, titles, and abstracts. Based on the screening criteria, 1216 articles were excluded by title and abstract screening. Forty-one articles were excluded as they were reviews and did not

Table 2
Searching from Scopus and WoS

Database	Search strategy
Scopus	(TITLE-ABS-KEY (older adults) AND TITLE-ABS-KEY (urban AND park) AND TITLE-ABS-KEY activity) OR TITLE-ABS-KEY (park AND based AND physical AND activities)) AND PUBYEAR > 2002 AND PUBYEAR < 2024 AND (LIMIT-TO (DOCTYPE, "ar") AND(LIMIT-TO (LANGUAGE, "English")) Document types: Article 2003-2023
WoS Core Collection database	TS=(older adults) AND TS=(urban park) AND TS=(activity*) OR TS=(park based physical activities) Document types: Article 2003-2023

involve older adults or did not explore the relationship between physical activities and landscapes. Additionally, articles concerning implementing and evaluating fitness programs were excluded (Collins et al., 2021; Orsega-Smith et al., 2003) due to their limited relevance to environmental factors. Consequently, 85 articles met the selection criteria and were included. These articles were uploaded into ATLAS. Ti 9, serving as the literature to be reviewed. Each paper was categorised by author, issue number, journal, publisher, number of publications, and year of publication, as shown in Figure 2.

The remaining 134 documents were transferred to Atlas after all 1346 data were processed in Mendeley. Ti 8. In Atlas, the full-text reading, in the first round of coding, generated 85 initial codes. This result shows that research on the physical activities in senior citizens' parks is on the rise. There were only four papers in 2024 at the time of writing, probably because some were still in progress (Figure 3).

Later, the code was divided into four main categories, contributing to the final four. The research article was analysed and

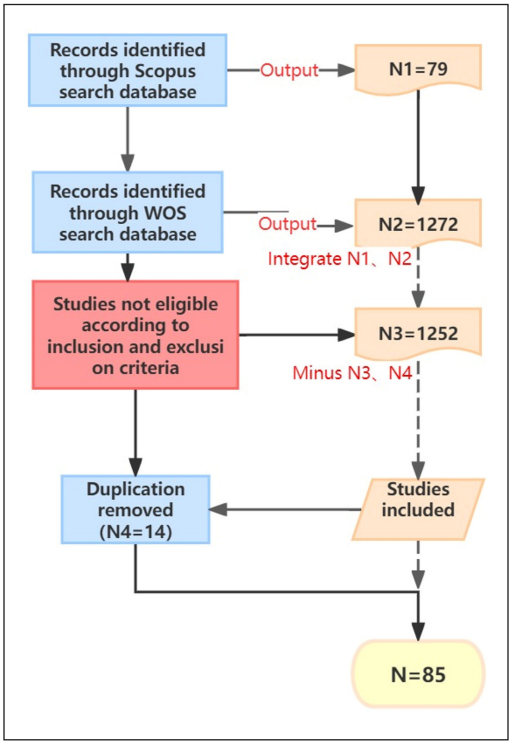

Figure 1. Inclusion and exclusion criteria

further divided into four topics from the initial coding: Activity, Characteristic and Activity, Motivation, Characteristic and Perception.

Articles appear most frequently in the following journals. There are 12 articles in the *International Journal of Environmental*

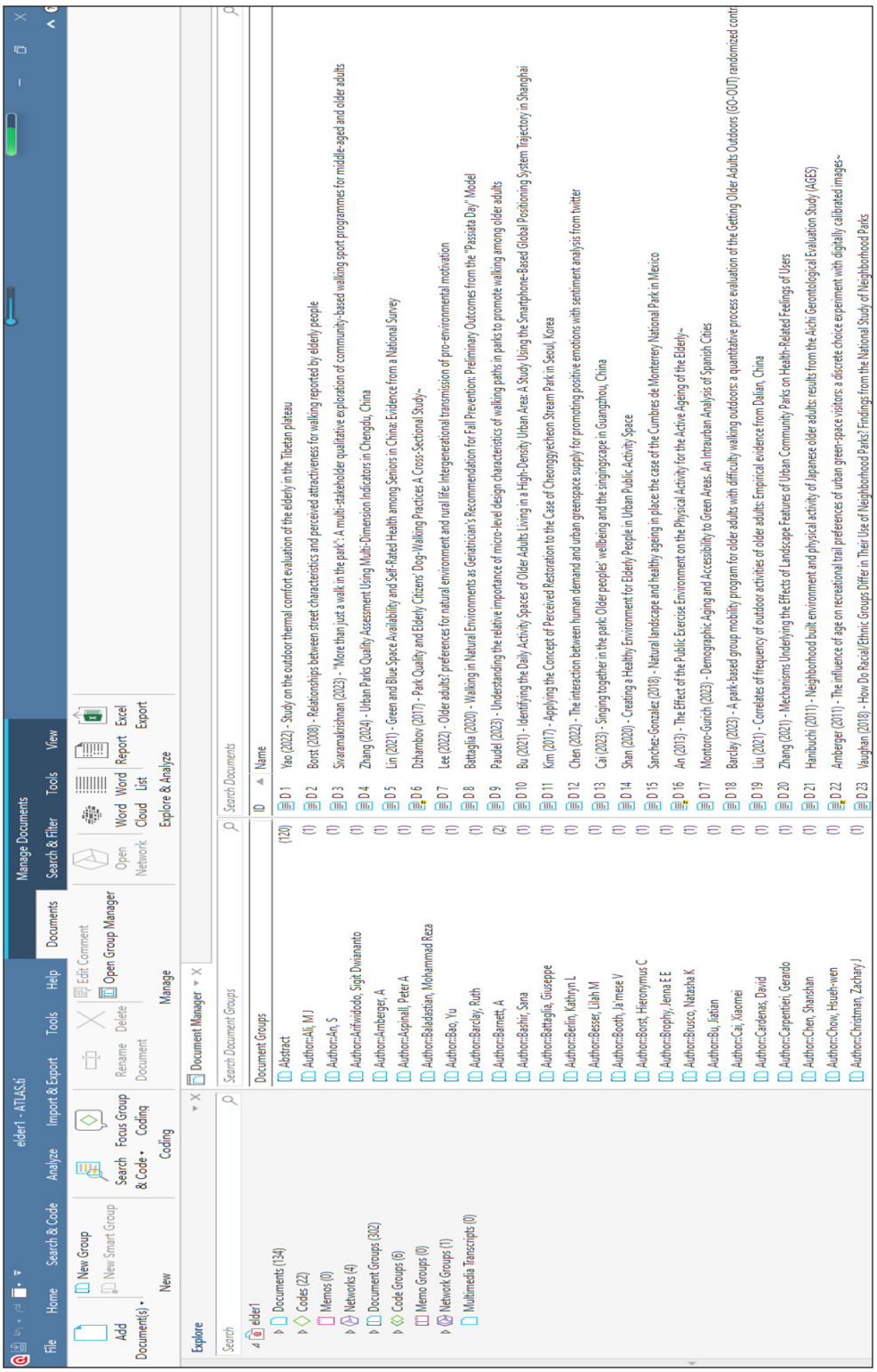

Figure 2. The Mendeley metadata

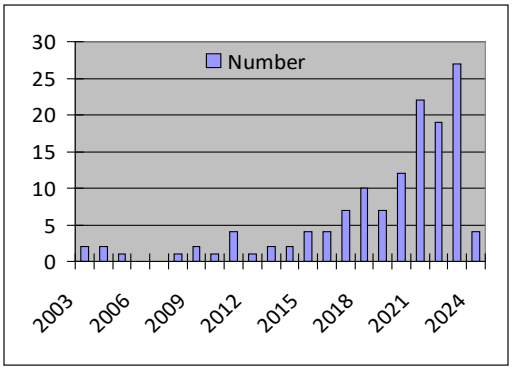

Figure 3. Metadata timeline

Research and Public Health, eight articles in *Sustainability*, five articles in *BMC Public Health*, five articles in the *Journal of Aging and Physical Activity*, five articles in *Urban Forestry and Urban Greening*, five articles in *Landscape and Urban Planning*. Additional publications were distributed across journals focusing on gerontology, urban ecology, and public health disciplines. As can be seen from these journals, interdisciplinary research has begun to take shape involving non-design-related journals, such as *BMC Public Health* and *the Journal of Aging and Physical Activity.*

RESULTS AND DISCUSSION

The research is divided into three phases, with the early research running from 2003 to around 2008, focusing on the correlation between environmental and health indicators and on walking in the neighbourhood, in addition to older adults exercising in parks for activities (Figure 4). In the second phase, from 2009 to 2018, the proximity of parks drew attention as a factor influencing physical activities among seniors in both the neighbourhood and the natural environment. In the third phase, starting in 2019, studies focused on psychosocial factors. The conclusions about this were inconsistent and influenced by different cultural contexts. Meanwhile, in the post-COVID-19 pandemic, the relationship between physical activities and the environmental characteristics of older adults has been complemented by qualitative research. The increased ability of older adults to use smart electronic devices has led to more research directions and possibilities.

The exploration into the physical activities research for seniors gained momentum in 2003, triggering initial evaluations conducted in neighbourhoods and parks to identify suitable environments for senior exercise (Orsega-Smith et al., 2003). At the same time, research has found that park experience and its correlation with physical health indicators (Orsega-Smith et al., 2004). Studies also delved into how

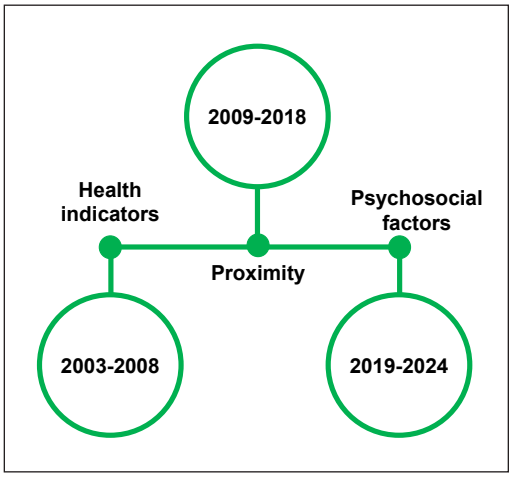

Figure 4. Research trends

street characteristics influence walking and physical activities (Borst et al., 2008; Hanibuchi et al., 2011). New techniques have emerged for studying features and walking activity, such as virtual observation with Google Street View (Christman et al., 2020).

The proximity of parks to residential areas was found to be linked with increased physical activities among seniors (Kaczynski et al., 2009, 2014; Ribeiro et al., 2015; Thornton et al., 2017). There has been a shift from an initial emphasis on seniors walking in neighbourhood environments to investigating how the naturally built environment within parks can promote physical activities (Costigan et al., 2017). Huang et al. (2018) have stated the crucial relationship between environmental dimensions and physical activities in older adults. The physical environment and the context influence the potential alternatives for parks and participation in park-based activities among older adults (Xie et al., 2018).

In Asian countries, park improvements have changed patterns of park use and physical activities among seniors (Arifwidodo & Chandrasiri, 2021). However, some studies emphasise that psychosocial factors are more influential on park activity levels than perceived park environments (R. Zhang, Duan et al., 2019). Factors such as ethnicity also contribute to variations in park usage, as evidenced (Vaughan et al., 2018). Additionally, Cohen et al. (2019) stated that park renovations have limited effects on seniors' physical activities, as highlighted. Walking activities correlate with the built environment, and the environmental requirements of older adults vary due to differences in social factors (Gao & Nagai, 2021). This complements the idea of the role of psychosocial factors such as race in influencing park use.

In the aftermath of the COVID-19 pandemic, researchers have gained increased attention on the importance of green spaces for improving the quality of life of older adults (Carpentieri et al., 2020). For older adults, social networking and going to green spaces enhance each other (Enssle & Kabisch, 2020). Whereas previous studies have pointed out that activity has little to do with environmental characteristics, recent studies have shown that older adults' social activity involvement and environmental features are connected (Liu et al., 2020). Qualitative research complemented the relationship between environmental characteristics and older adults' activities (Lee & Ho, 2021; Veitch et al., 2020). A relationship has also been shown between community park design features and older adults' total steps taken and energy expenditure during park visits (Zhai et al., 2020). Older adults are more active in neighbourhoods where walking transportation is more favourable (Neto et al., 2021).

Walking activities correlate with the built environment, and the environmental requirements of older adults vary due to differences in social factors (Gao & Nagai, 2021). In the past three years, research on using new technologies such as social

media and computer virtual simulation has gradually increased. Many studies show the popularity of online surveys after the epidemic and the improvement of older adults' ability to use smart or electronic devices (Paudel et al., 2023).

Activities

The research variables related to the activities of older adults in urban parks were divided into six categories based on the literature retrieved (Figure 5). The largest number of activities were related to walking, with studies from Australia talking about walking as the preferred activity for older adults in parks (Veitch et al., 2020). Path width, more vegetation, and pet-friendly paths are associated with walking (Paydar et al., 2023). A study from Bulgaria noted that the better the quality of the park, the less time spent walking the dog, the worse the perceived health and the need for better park planning for dog walkers (Dzhambov, 2017). It is necessary to better plan parks for dog walkers. In Hong Kong, China, social connectedness is considered the most important criterion for park planning for older adults (Yung et al., 2017), while in Chengdu, China, the activities of older adults in parks differ significantly by gender (Y. Li et al., 2022). In addition to playing cards, a sedentary activity that has received significant attention, activities such as singing and Tai Chi are popular among older adults in parks. All have healing effects on the body and mind (Cai et al., 2023; B. Zhang & Huang, 2023). It can be seen from the above studies that the activities of older adults in parks vary greatly depending on their cultural background. Walking is popular among older adults as an important physical activity, so the path design of urban parks is more important. It is necessary to avoid conflicts between dog and non-dog walkers through design, clarify the scope of their respective activities, and promote social interaction between dog walkers. Activities with social interaction seem to be more popular among Chinese samples, and activities are affected by gender factors. Elderly people's preferred activities need to improve the situation of sitting for a long time. Studies have shown that social interaction is negatively correlated with walking and that older people tend to sit down when participating in social activities (Schmidt et al., 2019). Spaces for park activities need to be designed to combine physical activity and social interaction to meet the needs of older adults.

Characteristics and Activities

Existing research on characteristics and activities focuses on nine categories, including space types and factors affecting activities (Figure 6). The space types are natural and built environments, architecture, exercise space, paths, and recreational facilities. The factors are proximity, acoustics, renovation, and psychological factors.

Regardless of age, the park features most important to residents for park-based recreation are, in order of importance: well-maintained, sense of safety, relaxing atmosphere, accessibility, and greenery

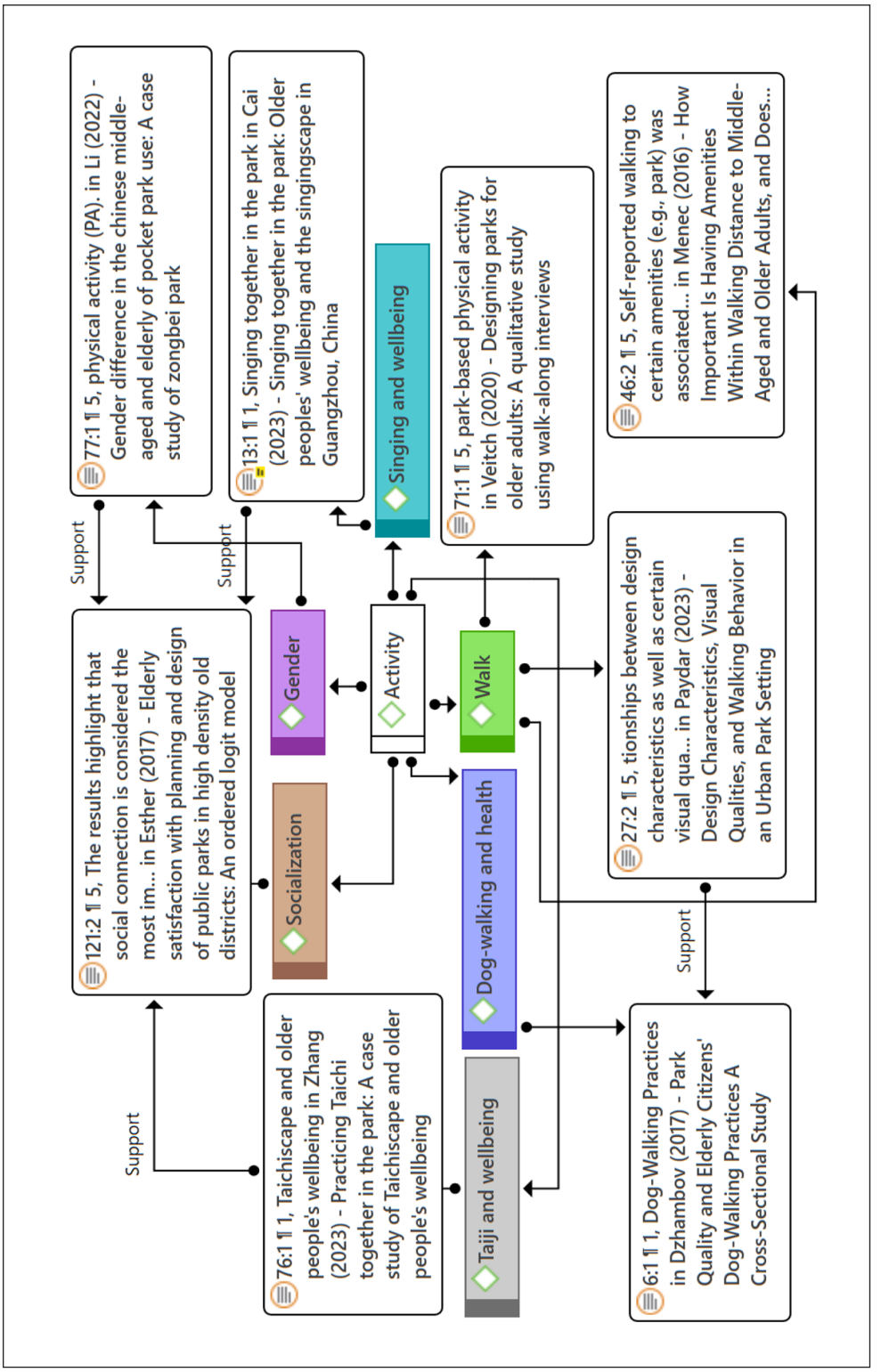

Figure 5. Activities of older adults in the park

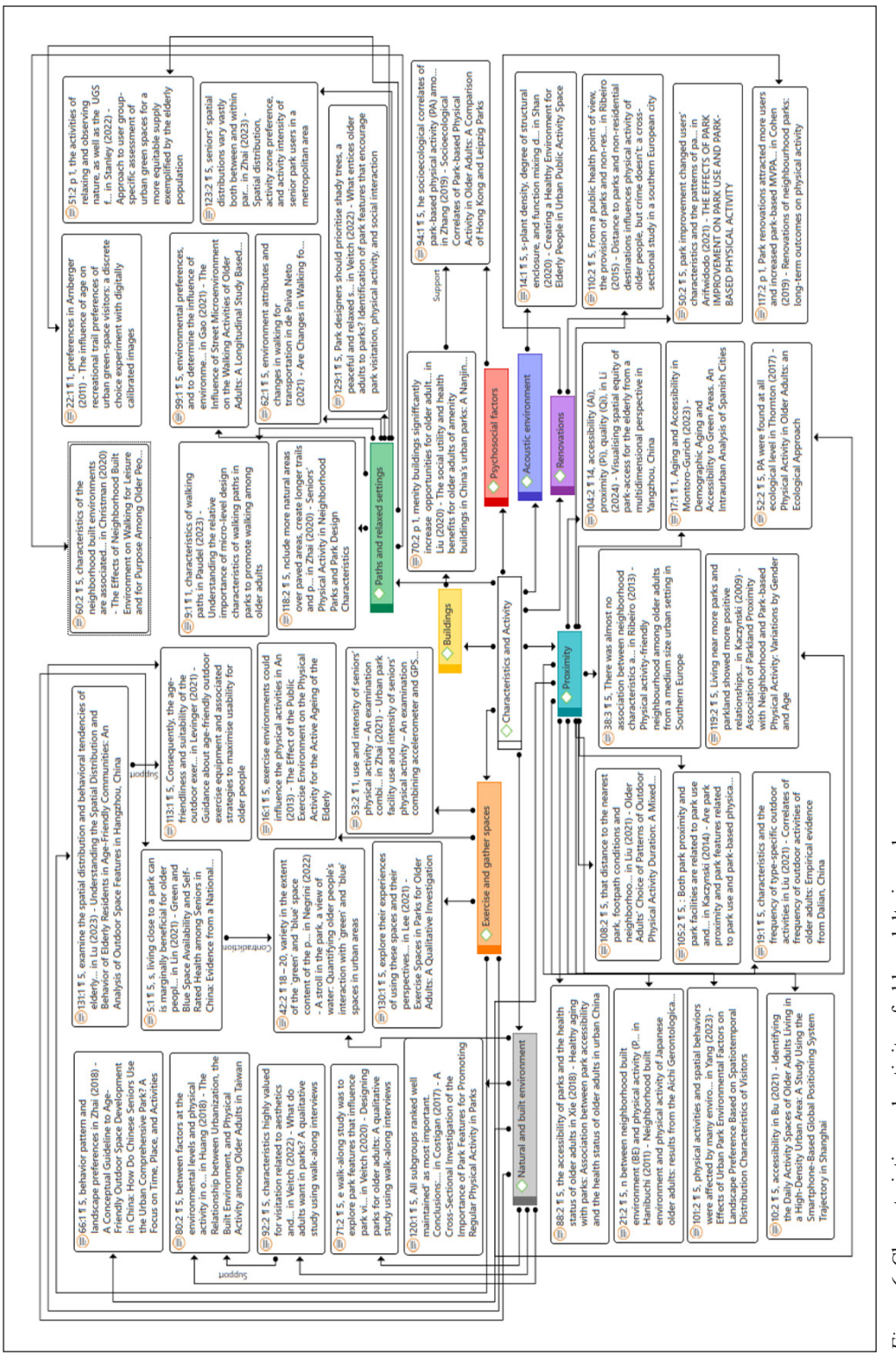

Figure 6. Characteristics and activity of older adults in parks

(Costigan et al., 2017). This is consistent with what is mentioned in Table 1. However, the concept of a relaxed atmosphere lacks a specific direction and needs further exploration in exploring parks for older adults. Samples from both different countries and the same country show that intergenerational conflict exists due to different park preferences between older adults and the young (Veitch et al., 2020, 2022; Zhai et al., 2018). As mentioned in Section 3.1, spaces that combine social interaction and physical activity can improve sedentary behaviour but may also introduce noise, such as square dancing (Zhou, 2014). There is a significant relationship between environmental factors and physical activities in older adults (Huang et al., 2018). However, this study only analyses from the perspective of built environment factors, such as urbanisation, land use classification, and income, and it is not clear what environmental characteristics promote physical activities for older adults. The use of green and blue spaces by older adults has aroused the interest of researchers, but the number of relevant studies is limited (Lin & Wu, 2021).

The gradient, length, shade of trees along the trail, and material are key features in path design that affect the activities of older adults (Christman et al., 2020; Mu et al., 2021; Paudel et al., 2023). Social psychological factors have an impact on the activities of older adults, and research should consider cultural background differences (Liu et al., 2020; R. Zhang, Duan, et al., 2019). Proximity and accessibility to parks are also important variables influencing physical activities among older adults. In addition, factors such as park renovation and maintenance, exercise facilities, and acoustic environment are also important considerations for older adults' activities (Shan et al., 2020). Among them, the sound environment has received less attention, and this perspective has a certain impact on the health of the elderly.

Motivation

Research on older adults' motivations for using parks includes thermal comfort, place meaning, and social interaction (Figure 7). Thermal conditions can greatly affect activities related to space satisfaction and season (Ma et al., 2021). Psychological motivations like childhood experiences of nature, place attachment and connection with family are studied as factors influencing older adults' activities in urban parks. Social connectedness is considered an important criterion influencing park use among older adults (Jahangir, 2019; Luna et al., 2024; Son et al., 2022; Yung et al., 2017). Providing social spaces with natural elements, such as emphasising blue spaces in parks like riverfronts, can improve thermal comfort and attract older people to use them.

Characteristics and Perception

The main perceptions of older adults are psychological well-being, satisfaction, cognition, recovery, and environmental factors (Figure 8). In terms of restoration perceptions, the old parks have a higher level of naturalness and restorative experience

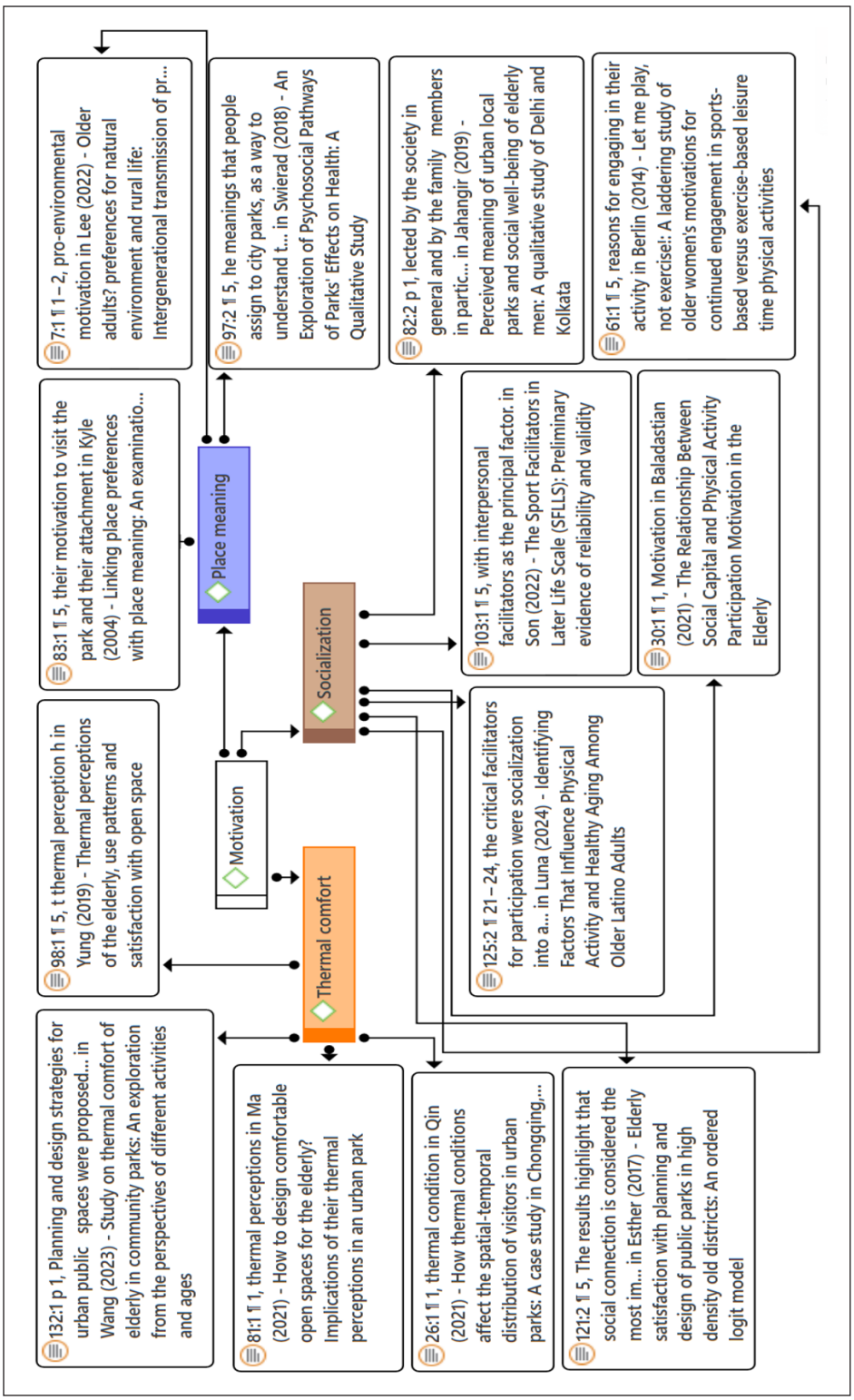

Figure 7. Motivation of older adults in parks

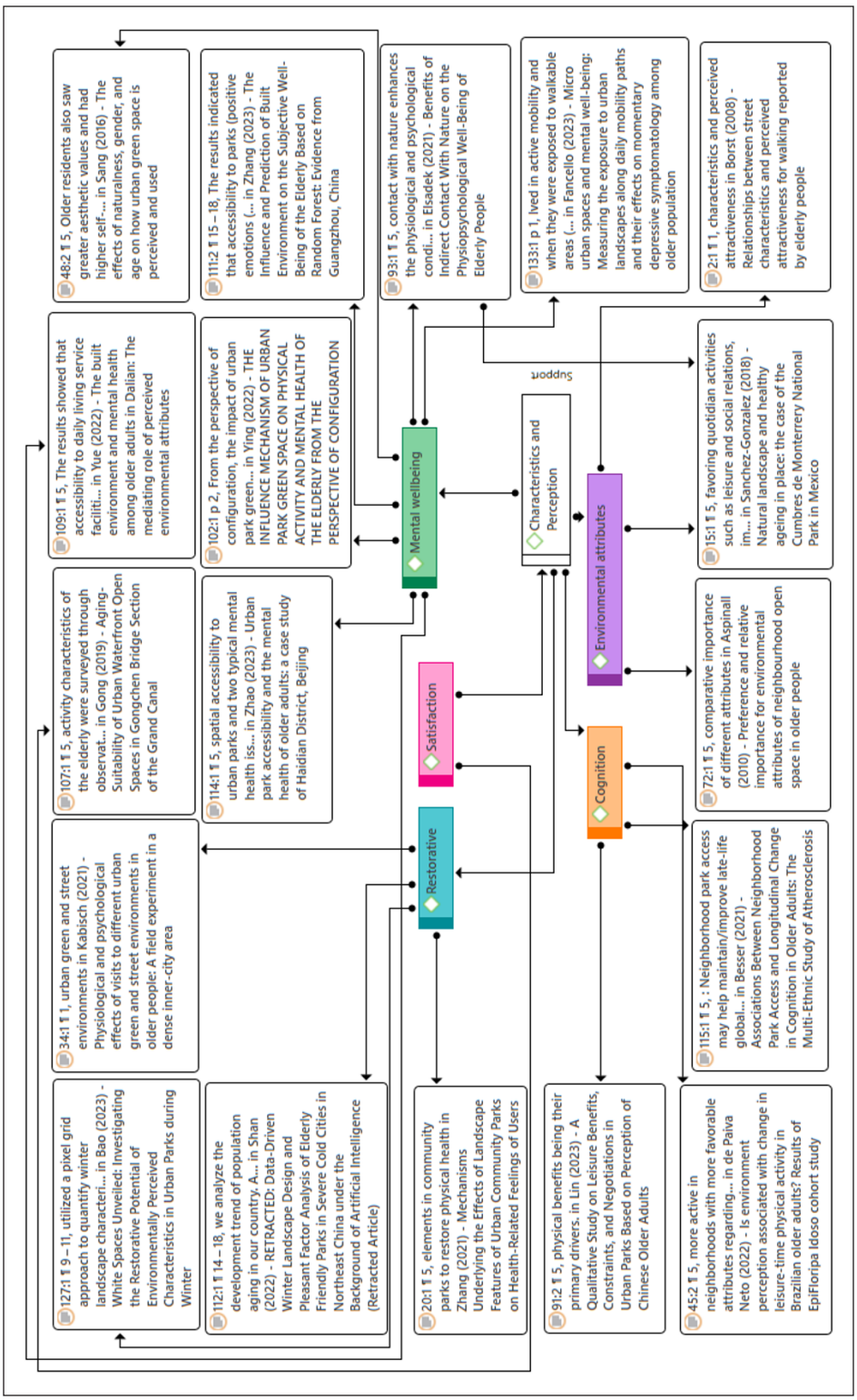

Figure 8. Characteristics and perception of older adults in parks

than streets, and their integration with sports activities has yet to be studied (Kabisch et al., 2021). Snowy parks, natural environments, and exercise areas all play a role in reducing stress (Bao et al., 2023; L. Zhang et al., 2021). It can be concluded that nature has a greater restorative effect than man-made landscapes, which are associated with psychological perceptions (Subiza-Pérez et al., 2020). However, this view needs to be further substantiated in older adults. As Schmidt et al. (2019) mentioned, walking in urban parks negatively correlates with social interaction. Because long periods of sedentary life are related to social interaction, promoting physical activity can increase attractiveness by adding natural elements, such as walking, which deserves further study.

Earlier research suggested that a greater sense of nature leads to increased levels of movement, aesthetic value, and self-reported well-being among locals who live close to green areas (Sang et al., 2016). Park accessibility contributes significantly to physical activities and well-being, mutually supporting the previous motivation (Y. Zhang et al., 2023). The importance of natural landscapes has also been proven (Fancello et al., 2023; Sanchez-Gonzalez et al., 2018).

CONCLUSION

The following conclusions and outlooks can be drawn by systematically reviewing and analysing the correlation between the physical activities and environmental factors of older adults in urban parks.

Firstly, there is a close correlation between physical activities and environmental factors in urban parks among older adults. Walking is the most popular activity for older adults in parks, and park design factors such as path width, vegetation, and pet-friendliness are crucial to promoting walking activities. For example, the width of the walking paths, the vegetation cover, and whether pets are allowed in the park all have an impact on the walking activities of older adults. Among them, vegetation coverage is related to a healthy, sound environment. The natural landscape in such parks has a positive effect on restoring health. In contrast, the role of artificial landscapes, such as buildings and squares, on the psychological variables of older adults needs to be further explored.

Secondly, the physical activities of older adults are affected by the physical environment and psychosocial factors. Older adults engage in a variety of types of physical activities, including walking, singing, and Tai Chi. The forms of activities for older adults vary greatly from region to region. As mentioned before, walking is a popular activity in different samples. Social activities are more popular in Chinese samples and are also affected by gender factors. Samples from different countries and the same country show an intergenerational conflict because the older adults' preference for parks is different from that of the younger generation. This suggests that the physical environment and psychosocial factors need to be considered comprehensively when planning and designing urban parks to better

meet older adults' activity needs. In addition to the motivations mentioned in the first part, the motivations for older adults to use parks include thermal comfort, place significance, and social interaction. This complements the earlier research that the nature sense brings more self-reported happiness. Providing space for social interaction needs further research, such as the connection between the space where physical activities occur and older adults' happiness.

This study contributes to the body of knowledge by integrating findings from the literature review with existing theoretical frameworks on physical activity and environmental factors in urban parks, particularly for older adults. First, this study extends affordance theory by showing how these environmental affordances are shaped by cultural preferences and psychosocial factors, indicating that affordances are not universally perceived but are modulated by cultural and social contexts. Furthermore, the findings extend Attention Restoration Theory (R. Kaplan & Kaplan, 1989), emphasising the role of natural environments in promoting psychological well-being. However, our study also reveals that artificial nature landscapes may have a less consistent effect. It highlights how older adults' engagement in physical activities is shaped not only by the physical environment but also by gender differences, social dynamics, and intergenerational conflicts. These findings suggest that theories of environmental behaviour should further incorporate the psychosocial dimensions of ageing populations to better explain the complexities of park use among older adults.

The limitations of this study are that, first, the search strategy may have missed relevant studies due to limited search terms or databases. Second, the quality of the included studies varied, which may affect the reliability of the findings. Finally, including only English literature may have missed urban park studies in other cultural contexts.

Future research can further delve into the specific mechanisms of action between environmental factors and the physical activities of older adults. For example, experimental or quasi-experimental designs can be used to measure and assess more accurately the physical activities and environmental factors of older adults using new technological tools and to explore the direct effects of park design features on older adults' activity behaviours, as well as how these effects are mediated through psychological, social factors. Future research could also focus on the relationship between physical activities and environmental factors among older adults in different cultural contexts. The cross-cultural study may yield a more thorough reference for the design and development of urban parks as well as a greater knowledge of the connection between physical activity and environmental characteristics of older adults.

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