sustainability

MDPI

Article

A Study on the Impact of a Community Green Space Built Environment on Physical Activity in Older People from a Health Perspective: A Case Study of Qingshan District, Wuhan

Jie Shen [1,2,*], Junhang Fan [1], Shi Wu [1], Xi Xu [1], Yuanbo Fei [1], Zhentian Liu [1] and Shijia Xiong [1]

[1] School of Urban Construction, Wuhan University of Science and Technology, Wuhan 430065, China; fanjunhang@wust.edu.cn (J.F.); w17362463845@163.com (S.W.); xuxi@wust.edu.cn (X.X.); feiyb4106@wust.edu.cn (Y.F.); wkdliuzhentian618@wust.edu.cn (Z.L.); shijiax1998@163.com (S.X.)

[2] Hubei Provincial Engineering Research Center of Urban Regeneration, Wuhan University of Science and Technology, Wuhan 430065, China

* Correspondence: shenjie@wust.edu.cn

Abstract: (1) Background: In the context of global population aging, how to enhance the health of older people has become a focus of attention in various fields. Although it is widely recognized that the effects of urban green space built environments on physical activity can substantially improve the health of older people, few studies have been conducted to understand the relationship between green spaces, physical activity, and the health of older people at the community level. This research gap has become a key issue hindering the sustainable development of health among the elderly. (2) Methods: This study used survey data from 1989 elderly individuals in Qingshan District, Wuhan, and applied multiple linear regression models to explore the relationship between community green space built environments and the overall intensity of physical activity, as well as the relationship with low, moderate, and high-intensity physical activity levels. (3) Results: The results show that education level, income level, health status, companionship, green view index, road cleanliness, and fitness facilities are positively correlated with the overall intensity of physical activity, while gender, age, self-assessed psychological stress, and road intersection density are negatively correlated with it. Companionship, green view index, road cleanliness, and recreational facilities are positively correlated with low-intensity physical activity levels among the elderly, while gender, income level, and fitness facilities are negatively correlated with them. Companionship, green view index, and road cleanliness are positively correlated with moderate-intensity physical activity among the elderly, while gender is negatively correlated with it. For high-intensity activities, education level and fitness facilities are positively correlated, while gender, self-assessed psychological stress, and road intersection density are negatively correlated. (4) Conclusions: Future research could expand the sample size while incorporating more longitudinal designs, expand the types of influencing factors, conduct more detailed classifications, and carry out broader data collection procedures to comprehensively analyze the effects of the community green space built environment on physical activity among older people, providing a stronger scientific basis for the formulation of healthy city policies.

Keywords: community green space; built environment; older people; physical activity; physical health; sustainable development

check for updates

Academic Editor: Jianming Cai

Received: 19 October 2024
Revised: 12 December 2024
Accepted: 16 December 2024
Published: 2 January 2025

Citation: Shen, J.; Fan, J.; Wu, S.; Xu, X.; Fei, Y.; Liu, Z.; Xiong, S. A Study on the Impact of a Community Green Space Built Environment on Physical Activity in Older People from a Health Perspective: A Case Study of Qingshan District, Wuhan. *Sustainability* **2025**, *17*, 263. https://doi.org/10.3390/su17010263

Copyright: © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

Population aging has become an increasingly serious global issue in the 21st century. The number of individuals over the age of 60, along with their proportion in the total population, continues to rise and will accelerate in the coming decades. This trend is particularly pronounced in developing countries [1]. China, being the largest developing nation in the world, is also home to one of the most rapidly aging populations globally; the number of those aged 60 and above is anticipated to rise to 402 million by 2040, making up 28 percent of the total population [2].

According to the World Health Organization, older individuals should engage in at least 150 min of aerobic exercise weekly to promote and maintain health [3]. In China, just 45% of the elderly adhere to the World Health Organization's guidelines recommending engaging in at least 150 min of moderate-to-vigorous physical activity weekly, and this figure is even lower in urban areas [4]. The worsening of population aging and insufficient physical activity not only reduce the well-being of older people but also exacerbate their health problems and increase the burden on healthcare systems. Consequently, it is crucial to investigate the factors encouraging physical activity among older individuals from a health standpoint and to suggest effective interventions aimed at enhancing their standard of living and reducing the pressure on healthcare systems.

However, due to functional and cognitive decline, as well as reduced mobility and social connections, older people are more susceptible to the influence of their surroundings compared to other age groups, and community green spaces have become important places for them to engage in physical activities. Thus, identifying the key environmental factors that notably impact physical activity in community green spaces for older adults can facilitate the development of health-oriented, age-friendly green spaces and offer a scientific foundation for evidence-based design.

Studies have shown that exposure to urban green environments significantly reduces anxiety in young people aged 14 to 24 and has a preventive effect on depression [5]. The mechanisms through which green space built environments influence health are particularly complex. Environmental exposure and health-related behaviors are important pathways through which green space built environments affect residents' health [6–8], among which physical activity has garnered considerable attention due to its close relationship with health [9,10]. Individuals who perform physical activities in parks filled with urban greenery could see enhanced health outcomes thanks to multiple factors working together, including reduced air pollution, enhanced social interactions, and improved psychological recovery [11,12]. Some minority and low-income groups face more barriers to accessing adequate urban public green spaces compared to non-minority and affluent groups, resulting in fewer opportunities for physical activity and a higher risk of chronic diseases [13–15].

Numerous systematic studies have underscored the connection between external and internal elements of urban green spaces and physical activity. In terms of the accessibility of external green space characteristics, road intersection density is positively correlated with physical activity. Residents living in areas with higher road intersection density experience an increase in both the duration and frequency of moderate-to-vigorous physical activity [16]. Meanwhile, the density of green space entrances plays a key role in moderate-to-vigorous physical activity among residents. Increasing the number of green space entrances improves the flow of people in and around parks and enhances the green space's permeability [17]. The diversity of green spaces is reflected in the richness of commercial, medical, and cultural facilities surrounding the green spaces. While visiting green spaces, residents also enjoy other convenient services, which increases their frequency of physical activity [18]. The green coverage rate serves as a measure of usability, and research

demonstrates that as green spaces increase in size, so does the coverage rate; this results in more opportunities for people to engage in outdoor physical activities, significantly reducing anxiety and depression, promoting mental recovery, and bringing more substantial health benefits [19]. A study from Norway also supports this finding [20].

In terms of the comfort of internal green space characteristics, a high green view index promotes an increase in outdoor physical activity and alleviates residents' psychological anxiety. For example, performing a 15-min session of physical activity at low-to-moderate intensity in an environment with a green view index of 40% can effectively regulate emotions, improve attention, and reduce mental stress [21]. Increasing the richness of plant species within green spaces, such as enhancing tree density and diversity, positively correlates with longer and more enthusiastic physical activity among residents, further improving psychological recovery and reducing the risk of depression [22]. Meanwhile, larger green spaces provide broader activity areas and more diverse activity options, leading to a higher frequency and longer duration of physical activity, which in turn decreases the likelihood of cardiovascular diseases [23]. Fitness and recreational facilities within green spaces enhance functionality by promoting physical activity and social interaction. Younger people, in particular, value the availability of fitness facilities in urban green spaces and tend to exercise more in areas with such equipment [24]. The safety of green spaces is closely related to their usage frequency; good lighting [25] and road flatness [26] can reduce the risk of accidents like falls, thus increasing the attractiveness of green spaces for physical activity.

Due to the complexity of factors influencing health behaviors, the social ecological theory provides a systematic analytical framework [27,28]. This theory posits that the interaction of factors such as social attributes, social environment, physical environment, and policy planning optimally influences health behaviors [29]. Among social attributes, gender differences significantly affect residents' motivations and preferences for physical activity: men tend to prefer competitive, outdoor, high-skill, and moderate-to-high-intensity activities, while women prioritize social interaction and prefer low-intensity activities at fixed times, thereby obtaining different health benefits [30,31]. Additionally, as age increases, physical activity levels typically decrease, while sedentary time significantly increases [32]. Moreover, higher education and income levels greatly determine the type and frequency of residents' participation in physical activities by influencing health awareness and behavioral choices [33,34].

As previously noted, most existing studies concentrate on the link between the built environment of green spaces and physical activity on a broader urban scale, with relatively fewer studies examining the built environment of green spaces at the community scale. Moreover, most studies target the general population, overlooking vulnerable populations, including older people, children, people with disabilities, and low-income individuals. Among these, older people, due to their unique physiological and psychological needs, often have higher requirements for the accessibility, safety, and comfort of green spaces. As China's aging population continues to increase, research should prioritize the elderly. Promoting physical activity among older people, maintaining their physical function, and extending their independent living in communities are essential.

The majority of studies indicate that elements within the green space built environment are effective in encouraging physical activity among residents. Only a few studies have considered the impact of the green space built environment on residents' physical activity at different intensity levels. For example, higher road intersection density [16] and green space entrance density [17] have been shown to significantly affect residents' moderate-to-vigorous physical activity. In addition, a higher green view index can also effectively promote residents' engagement in low-to-moderate-intensity physical activ-

ity [21]. However, analyses of the relationship between different intensity levels of physical activity among older people and the characteristics of green spaces remain scarce.

Therefore, in light of the increasing aging population in China, this study not only focuses on the elderly population but also explores the relationship between different levels of physical activity among older adults and the built environment of community green spaces, as well as social attributes. The goal is to highlight the importance of improving the built environment of community green spaces to enhance the health of older adults, which is crucial for the sustainable development of health among the elderly.

2. Study Area, Sampling Approach, Data Collection, and Methods

2.1. Study Area and Sampling Approach

Wuhan, as the capital city of Hubei Province, is one of the first cities in China to have an aging society. According to the United Nations, a society is classified as aging if the proportion of people aged 60 and above exceeds 10% of the total population [35]. According to the 2023 Wuhan Statistical Yearbook, the population aged 60 and above in Wuhan is 2.0919 million, accounting for 22.15% of the total population, while the population aged 65 and above is 1.5356 million, accounting for 16.26%. Wuhan has developed a deeply aging society. According to data from Wuhan's Center for Disease Control and Prevention in 2020, 83.44% of the elderly have chronic diseases, and 50.24% suffer from two or more chronic conditions, placing them in a sub-healthy state.

Qingshan District, one of the seven main urban districts of Wuhan, is located on the southern bank of the Yangtze River. It borders Wuchang District to the west, Hongshan District and the East Lake Scenic Area to the south, Tianxingzhou to the north, and the Wuhan Chemical Industry Zone to the east (Figure 1). According to 2023 data, the per capita GDP of Qingshan District reached RMB 197,856, exceeding Wuhan's average of RMB 145,646, ranking second among the seven main urban districts, highlighting its significant economic position in the city. Additionally, the district has a high population density. According to the 2022 *Wuhan Statistical Yearbook*, the average population density in the six streets west of the Third Ring Road is approximately 22,073 people per square kilometer, with 66.7% of streets exceeding the average population density of Wuhan's main urban districts (13,481 people per square kilometer). The population density generally decreases toward the northeast and increases toward the southwest (Figure 2).

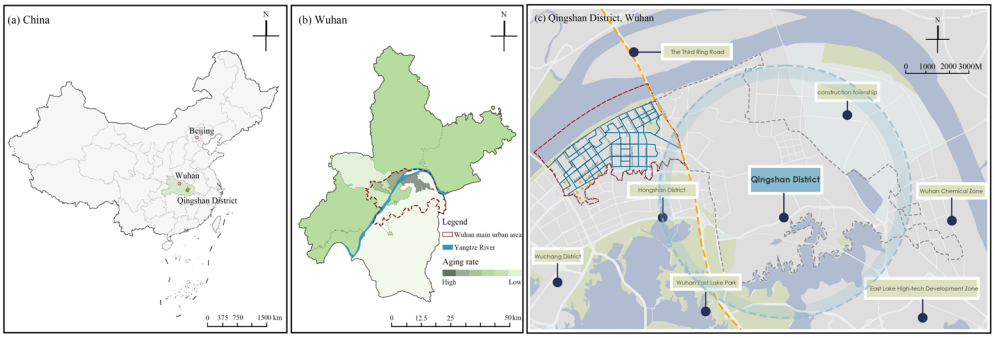


Figure 1. (**a**) The location of Wuhan in China; (**b**) the proportion of the aging population in different administrative districts of Wuhan; (**c**) the location of Qingshan District, Wuhan.

However, the proportion of elderly people aged 60 and above in Qingshan District is as high as 25.22%, the highest among the seven main urban districts. This proportion not only far exceeds the city's average but also reflects the generally poor health status of the elderly and a significant demand for medical care. Further analysis shows that aging is particularly severe in the area west of the Third Ring Road in Qingshan District, with 82%

of neighborhoods classified as aging, and some neighborhoods having aging rates as high as 32% (Figure 3). Additionally, the community green space environment in this area faces certain challenges. Although its greening level ranks among the highest in Wuhan's central urban areas, the construction and renovation of community-level green spaces lag behind. Most community green spaces are courtyard greens, with relatively limited centralized open spaces, resulting in the actual green environment failing to meet the needs of elderly residents. In light of these issues, improving the physical health and quality of life of the elderly in Qingshan District has become a pressing challenge.

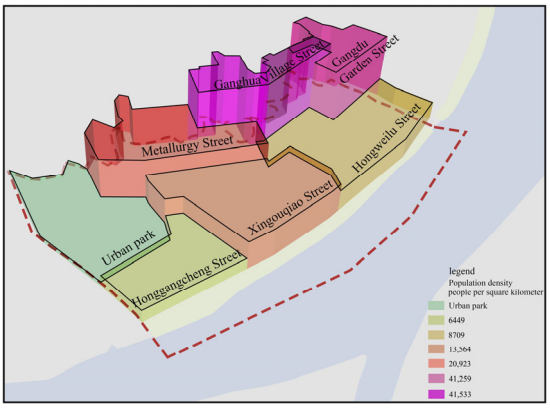


Figure 2. Population density statistics in the area west of the Third Ring Road, Qingshan District.

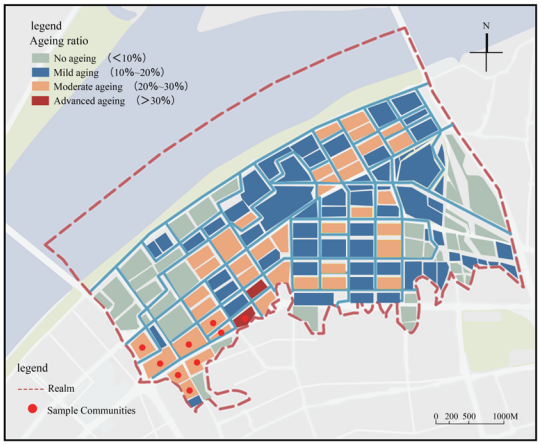


Figure 3. Aging population proportion statistics in the area west of the Third Ring Road, Qingshan District.

We selected nine typical aging communities west of the Third Ring Road in Qingshan District, Wuhan, characterized by a high population density, moderate aging, and lagging development of community green spaces, as research samples. The study focuses on the built environment of community green spaces, primarily referring to green areas within communities designed to provide spaces for recreation, leisure, and social activities. The results can provide references for similar aging and high-density areas, offering significant guidance for preventing and improving chronic diseases, enhancing elderly health levels, and promoting social equity. They also provide effective support for developing appropriate healthy city policies.

2.2. Data

2.2.1. Physical Activity Data

The study was conducted from April to May 2023. Based on the same sampling criteria, cross-sectional data were collected twice through a questionnaire survey in nine

typical, representative aging communities. A total of 2144 elderly individuals aged 60 and above, who were capable of independently performing physical activities and had lived in their residential areas for more than one year, were selected for the questionnaire survey. Ultimately, 1989 valid questionnaires were collected, yielding a response rate of 92.77%. To better reflect the physical activity characteristics of the elderly group, the questionnaire was adapted based on the International Physical Activity Questionnaire (IPAQ). All participants were informed about the purpose of the study and their rights to refuse or withdraw from participation at any point during the research. Informed consent was obtained from all participants.

The questionnaire was carefully designed, taking into account the activity characteristics and actual needs of the elderly in Wuhan. It included activity logs to capture specific details of physical activities and surveyed the elderly's perceptions of factors such as plant richness in community green spaces, road cleanliness and smoothness, and night-time lighting effectiveness, as well as self-reported data on psychological stress and physical health. During the survey process, due to the advanced age of the respondents, they may have encountered difficulties in reading and completing the questionnaire. To help the elderly better understand the questions, the investigators employed one-on-one communication and provided detailed explanations to obtain accurate responses. The main questions included the following four issues:

1. Who do you usually participate in activities with?
2. How often do you visit nearby green spaces on a weekly basis?
3. How long do you stay at the green space each time you visit?
4. What type of physical activity do you engage in most frequently?

Through the questionnaire, we collected data on the intensity, frequency, and average duration of physical activities performed by older people over the course of a week. These were categorized into three intensity levels (low, moderate, and high) based on metabolic equivalent (MET) values. The MET values for different types of activities were calculated according to the values in the Compendium of Physical Activities (CPA) [36], combined with field research and observations. A specific activity's MET level is calculated as follows: MET value of the activity $\times$ frequency of the activity (days per week) $\times$ duration of the activity (minutes per day). Low-intensity activities include sitting, walking, playing chess, and caring for children. Moderate-intensity activities include Tai Chi, table tennis, badminton, and brisk walking. High-intensity activities include using fitness equipment rapidly, jogging, and dancing in public squares (see Table 1).

Table 1. Metabolic equivalent values (METs) for common activities of the elderly in Qingshan District.

Low Intensity METs < 3		**Moderate Intensity 3 $\leq$ METs < 6**		**High Intensity METs $\geq$ 6**	
Activity Type	**METs Value**	**Activity Type**	**METs Value**	**Activity Type**	**METs Value**
Sitting	1.3	Tai Chi	3.0	Kicking Shuttlecock	6.0
Stretching	2.3	Social Dancing	3.0	Fitness Equipment	7.0
Playing Chess	2.3	Table Tennis	4.0	Jogging	7.0
Walking	2.5	Brisk Walking	4.5	Square Dancing	7.3
Babysitting	2.5	Badminton	5.5		

Additionally, the World Health Organization (WHO) recommends that older adults engage in at least 150 min of moderate-intensity exercise and 75 min of high-intensity activity, or a balanced mix of both, per week to achieve health benefits. Physical activity plays an important crucial role in maintaining the health of older people. To ensure the relevance and validity of the questionnaire results, health-related questionnaire data were filtered based on whether the respondents met the WHO's recommended physical activity levels.

2.2.2. Built Environment Variables

This study focuses primarily on the impact of community green space built environment factors on physical activity. First, by reviewing the relevant literature, frequently used green space built environment factors in studies of physical activity among the elderly were identified, and variables with similar meanings or redundancies were eliminated to enhance the scientific validity and representativeness of variable selection. Although factors such as social participation, policy, exercise attitude, self-efficacy, and cognition of activities can influence physical activity, they are not included in this study. A total of 30 candidate factors were initially collected. On this basis, the Delphi method was applied to ensure that the selected factors were highly scientific and practically significant. By combining preliminary expert survey results with quantitative statistical analysis, indicators were classified into two dimensions: internal and external characteristics. These were further categorized into six levels: accessibility, diversity, usability, comfort, functionality, and safety. Ultimately, 18 core environmental indicators were identified as key variables in the regression model for this study (see Table 2 and Figure 4).

2.2.3. Socio-Demographic Variables

Existing studies have found that social attributes such as gender [30,31], age [32], education level [33], and monthly income level [34] have varying degrees of impact on physical activity. This may be due to differences in how social attributes influence individuals' health awareness, disposable time and resources, and their needs and motivations for physical activity.

In this study, the social attribute information of the elderly was obtained through a questionnaire. The age of the elderly was divided into three levels: 60–69 years, 70–79 years, and 80 years and above. Education levels were classified into three categories: junior high school and below, high school or vocational high school, and undergraduate degree and above. Monthly income level was divided into four categories: below CYN 1000, CYN 1000–2999, CYN 3000–4999, and CYN 5000–10,000 (See Table 3).

2.3. Methods

This study takes a health perspective and aims to explore the impact of the green space built environment on physical activity among the elderly. An analytical framework was developed with physical activity among the elderly as the dependent variable, the community green space built environment as the independent variable, and social attributes as covariates. First, Pearson correlation analysis was performed on all variables to ensure the validity of the data and the reliability of the model. At the same time, a stepwise regression method was used to optimize the model and address the issue of multicollinearity among the independent variables, ultimately identifying six key green space built environment indicators. Subsequently, three linear regression models were established for the samples of overall intensity, low-intensity, moderate-intensity, and high-intensity physical activity: Model 1 examines the effect of social attribute variables on physical activity intensity among the elderly; Model 2 investigates the influence of the community green space built environment on physical activity intensity among the elderly; Model 3 simultaneously considers the combined effect of social attributes and the community green space built environment on physical activity intensity among the elderly. All analyses were conducted using IBM SPSS Statistics 26 software. The multicollinearity test showed that the variance inflation factor (VIF) for all variables was less than 5, with the significance level set at $p < 0.05$. This revealed how different built environment and social attribute factors influence physical activity among the elderly, thereby improving their physical health.

Table 2. Definition of community green space built environment indicators.

Dimension	Level	Environmental Indicator	Meaning	Calculation Formula	Data Collection
External Characteristics of Green Spaces	Accessibility	Road Intersection Density	Calculate the number of road centerlines where 3 or more roads intersect within each community	$D = \frac{\sum l_i}{A}$	1. Satellite imagery map 2. ArcGIS 10.8.2 calculation
		Entrance Density	Calculate the number of entrances to concentrated green spaces within the community	$N = \frac{\sum\left(C_i + R_j\right)}{S}$	
		Perceived Accessibility	Perceived evaluation of green space accessibility	Likert Scale	Questionnaire
	Diversity	Medical Facility Density	The number of facilities such as hospitals, clinics, and pharmacies within a 500 m buffer zone	$M = \frac{\sum P_{Mi}}{A}$	1. Gaode (a map) POIs (points of Interest) 2. ArcGIS 10.8.2 calculation
		Convenience Service Facility Density	The number of facilities such as banks, post offices, and activity centers for the elderly within a 500 m buffer zone	$C = \frac{\sum P_{Ci}}{A}$	
		Educational Facility Density	The number of facilities such as kindergartens, primary and secondary schools, and tutoring centers within a 500 m buffer zone	$E = \frac{\sum P_{Ei}}{A}$	
		Commercial Facility Density	The number of facilities such as restaurants, massage centers, barber shops, and fruit shops within a 500 m buffer zone	$L = \frac{\sum P_{Li}}{A}$	
		Transportation Facility Density	The number of facilities such as bus stops and rail transit stations within a 500 m buffer zone	$T = \frac{\sum P_{Ti}}{A}$	
	Usability	Greening Level	The proportion of all types of green spaces within the community	$G = \frac{S_G}{S_T} \times 100\%$	Satellite imagery map
Internal Characteristics of Green Spaces	Comfortably	Green Space Size	The actual size of the green space	Community Centralized Green Space Area	1. Satellite imagery map 2. ArcGIS 10.8.2 calculation
		Green View Index	Green visibility from the perspective of average height, reflecting the visual perception of the elderly more directly	$E_N = \frac{G_N}{S_N} = \frac{\sum_{i=1}^{i} g_i}{\sum_{i=1}^{i} a_i}$	Manually taken photos processed with Photoshop 2020 software
		Plant Richness	Perceived evaluation of plant richness in green spaces	Likert Scale	Questionnaire
		Perceived Green Space Quality	Perceived evaluation of green space quality		
		Road Cleanliness	Perceived evaluation of road cleanliness in green spaces		
	Functionality	Fitness Facilities	Fitness facilities in green spaces, including equipment, ping pong tables, and basketball courts	Number of Various Fitness Facilities	Field measurement
		Recreational Facilities	Recreational facilities in green spaces, including open and shaded resting areas	Number of Various Recreational Facilities	
	Safety	Road Flatness	Perceived evaluation of road flatness in green spaces	Likert Scale	Questionnaire
		Night Lighting Quality	Perceived evaluation of night-time lighting effects in green spaces		



Figure 4. Visualization of accessibility and diversity of community green spaces.

Table 3. Summary of personal attributes of elderly.

Item	Category	Number of People	Proportion
Gender	Male	955	48.01%
	Female	1034	51.99%
Age	60–69 years	896	45.04%
	70–79 years	746	37.51%
	80 years and above	347	17.45%
Education Level	Middle school or below	995	50.02%
	High school (vocational) or junior college	718	36.10%
	Bachelor's degree or above	276	13.88%
Monthly Income	Below CYN 1000	607	30.52%
	CYN 1000–2999	811	40.77%
	CYN 3000–4999	388	19.51%
	CYN 5000–10,000	183	9.20%

3. Results

The model results show that (See Table 4), for the overall intensity of physical activity, education level ($p < 0.05$, Beta = 0.215), income level ($p < 0.05$, Beta = 0.186), health status ($p < 0.01$, Beta = 0.738), companionship ($p < 0.05$, Beta = 0.171), green view index ($p < 0.01$, Beta = 0.618), road cleanliness ($p < 0.01$, Beta = 0.484), and fitness facilities ($p < 0.05$, Beta = 0.274) are all positively correlated with the overall intensity of physical activity in the elderly. Education level, income level, and health status in the socio-demographic attributes play a key role in shaping physical activity behavior, while companionship reflects the facilitating effect of social psychological support on physical activity. Moreover, a good green view index, clean roads, and high-quality fitness facilities can significantly enhance motivation among elderly individuals to engage in physical activity by improving the accessibility and comfort of the exercise environment. Gender ($p < 0.05$, Beta = −0.415), age ($p < 0.01$, Beta = −0.359), self-assessed psychological stress ($p < 0.05$, Beta = −0.430), and road intersection density ($p < 0.05$, Beta = −0.264) are negatively correlated with the overall intensity of physical activity. An increase in age and psychological stress leads to a decrease in the willingness and frequency of elderly individuals engaging in physical activity. Additionally, an increase in road intersection density may fragment the movement paths of the elderly, increasing travel inconvenience and traffic risks, thereby creating a sense of insecurity, which inhibits their willingness to engage in physical activity.

In terms of low-intensity physical activity, companionship ($p < 0.05$, Beta = 0.071), green view index ($p < 0.01$, Beta = 0.355), road cleanliness ($p < 0.05$, Beta = 0.374), and recreational facilities ($p < 0.05$, Beta = 0.177) are positively correlated with it. This result suggests that elderly individuals with companionship are more motivated and willing to participate in low-intensity physical activities, such as walking, which may be related to the emotional support and social interaction provided by their companions. At the same time, improvements in the green view index and road cleanliness encourage elderly individuals to participate more in outdoor low-intensity physical activities by increasing the visual appeal of the natural environment and enhancing environmental comfort. Additionally, the availability of recreational facilities in the community provides elderly individuals with spaces for short breaks during low-intensity physical activities, further reducing the physical strain and uncertainty risks associated with the activity [37–39]. Conversely, gender ($p < 0.05$, Beta = −0.579), income level ($p < 0.01$, Beta = −0.165), and fitness facilities ($p < 0.05$, Beta = −0.269) are negatively correlated with low-intensity physical activity in the elderly. This may be due to high-income elderly individuals having more resources and time to engage in higher-intensity, more structured exercise, and the increase in fitness

facilities may encourage elderly individuals to participate more in high-intensity exercise. As a result, their participation in low-intensity physical activity decreases [40].

In terms of moderate-intensity physical activity, companionship ($p < 0.01$, Beta = 0.02), green view index ($p < 0.01$, Beta = 0.224), and road cleanliness ($p < 0.05$, Beta = 0.359) are positively correlated with it. This suggests that having more social companions can enhance elderly individuals' interest and participation in moderate-intensity physical activities, such as brisk walking or social outdoor activities, where accompanying social support encourages more of such activities [41]. Improvements in the green view index and road cleanliness can attract elderly individuals to engage in more moderate-intensity activities, such as brisk walking and aerobic exercises, in green spaces by optimizing the visual environment. Gender ($p < 0.05$, Beta = −0.242) is negatively correlated with moderate-intensity physical activity.

In terms of high-intensity physical activity, education level ($p < 0.05$, Beta = 0.336) and fitness facilities ($p < 0.01$, Beta = 0.774) are significantly positively correlated with the level of high-intensity activity. This suggests that elderly individuals with higher education levels are more willing to engage in high-intensity activities, possibly due to a stronger awareness of health or a higher tendency for self-motivation [42]. Furthermore, more fitness facilities offer a variety of exercise options and specialized equipment support, enabling elderly individuals to conveniently engage in higher-intensity physical activities. Additionally, gender ($p < 0.05$, Beta = −0.241), psychological stress ($p < 0.05$, Beta = −0.297), and road intersection density ($p < 0.05$, Beta = −0.358) are negatively correlated with high-intensity physical activity. An increase in psychological stress can also lead to mental fatigue and behavioral inhibition, thus reducing elderly individuals' enthusiasm for participating in high-intensity exercise. Additionally, complex road structures reduce the continuity of exercise spaces and increase safety risks, which also suppresses elderly individuals' willingness to participate in high-intensity physical activities [43,44].

Table 4. Regression analysis results of community green space built environment and three levels of physical activity intensity among older people.

Physical Activity Intensity	Variable Type	Variable	Model 1	Model 2	Model 3
Overall Intensity of Physical Activity	Social Attributes	Gender (reference = male)	−0.351 *		−0.415 *
		Age	−0.202 *		−0.359 **
		Education level	0.192 *		0.215 *
		Income level	0.088		0.186 *
		Health status	0.870 *		0.738 **
		Self-assessed psychological stress	−0.756		−0.430 *
		Companionship	0.093 *		0.171 *
	Green Space Built Environment	Road intersection density		−0.323 *	−0.264 *
		Green view index		0.438 **	0.618 **
		Perceived green space satisfaction		0.389	0.382
		Road cleanliness		0.326 *	0.484 **
		Fitness facilities		0.201 *	0.274 *
		Recreational facilities		0.145	0.284
Low-Intensity Physical Activity	Social Attributes	Gender (reference = male)	−0.464 *		−0.579 *
		Age	−0.359		−0.167
		Education level	0.136		0.364
		Income level	−0.231 *		−0.165 *
		Health status	0.331		−0.273
		Self-assessed psychological stress	0.031		0.219
		Companionship	0.039 *		0.071 *
	Green Space Built Environment	Road intersection density		−0.191	−0.267
		Green view index		0.238 **	0.355 **
		Perceived green space satisfaction		0.114	0.073
		Road cleanliness		0.338 *	0.374 *
		Fitness facilities		−0.161 *	−0.269 *
		Recreational facilities		0.049	0.177 *

Table 4. *Cont.*

Physical Activity Intensity	Variable Type	Variable	Model 1	Model 2	Model 3
Moderate-Intensity Physical Activity	Social Attributes	Gender (reference = male)	−0.388 *		−0.242 *
		Age	0.165		0.207
		Education level	0.224		0.544
		Income level	−0.185		−0.076
		Health status	−0.391		−0.225
		Self-assessed psychological stress	0.082		0.097
		Companionship	0.079 *		0.144 **
	Green Space Built Environment	Road intersection density		−0.223	−0.109
		Green view index		0.156 *	0.224 **
		Perceived green space satisfaction		0.243	−0.318
		Road cleanliness		0.278 *	0.359 *
		Fitness facilities		0.322	0.452
		Recreational facilities		−0.137	−0.213
High-Intensity Physical Activity	Social Attributes	Gender (reference = male)	−0.434 *		−0.241 *
		Age	0.636		0.285
		Education level	0.116 *		0.336 *
		Income level	0.215		0.886
		Health status	0.068		0.006
		Self-assessed psychological stress	−0.377 *		−0.297 *
		Companionship	0.196		−0.525
	Green Space Built Environment	Road intersection density		−0.257 *	−0.358 *
		Green view index		0.044	0.029
		Perceived green space satisfaction		0.283	0.249
		Road cleanliness		0.459	0.514
		Fitness facilities		0.542 *	0.774 *
		Recreational facilities		−0.071	−0.097

Note: *: $p < 0.05$; **: $p < 0.01$. If the p-value is less than 0.05 (indicated as * $p < 0.05$), we consider the result to be statistically significant. If the p-value is less than 0.01 (indicated as ** $p < 0.01$), the significance is even greater.

4. Discussion

This research contributes to the study of the connection between green space environments and physical activity in three main aspects. Firstly, most existing research tends to emphasize the influence of urban green space built environments on residents' health at a broader, macro level; however, there is a lack of extensive research on how green space built environments at the community level, the basic unit of cities, affect residents' health. Second, many studies focus on the general population, neglecting older people, a vulnerable group. Because of the deterioration in physical and cognitive abilities, along with reduced mobility and social connections, older people are more susceptible to the influence of their surroundings compared to other groups. Finally, as people age, there are significant differences in physical activity intensity, and built environment features have varying effects on different intensity levels of physical activity. Therefore, this study not only explores the impact of the built environment of community green spaces on the overall intensity of physical activity among the elderly, but also analyzes its effects on low, moderate, and high-intensity physical activities, identifies key influencing factors, and proposes strategies for optimizing community green spaces, providing scientific evidence for the formulation of healthy urban policies.

Our study found that in terms of the overall intensity of physical activity, education level, income level, health status, companionship, green view index, road cleanliness, and fitness facilities are all positively correlated with it, with health status, green view index, and road cleanliness having particularly significant effects.

Improvements in health status not only enhance the physical reserves and self-confidence of older adults but also reduce feelings of fatigue and discomfort during physical activity, thus encouraging more active participation. Through diverse exercise interventions (such as resistance training and aerobic exercises) improve muscle strength and cardiovascular function in older adults, significantly enhancing their mobility and independence while reducing fatigue and discomfort during exercise. This, in turn, further promotes

their involvement in more daily physical activities [45]. The increase in the green view index enhances the visual appeal of the natural environment, making older adults feel greater psychological pleasure and a sense of calm, thereby increasing their willingness to engage in physical activities. A study by Xiao et al. also confirmed that higher visible greenery coverage can significantly improve physical activity among older adults, thereby promoting better health [46]. Improvements in road cleanliness optimize environmental hygiene and the tidiness of paths, significantly reducing concerns about the risk of falls and slips during physical activities. This enhances older adults' sense of control over their environment and their feeling of safety during exercise, motivating them to engage in more outdoor physical activities [47]. A study in the Netherlands found that road cleanliness is a key factor influencing the walkability of streets for older adults. The presence of trash significantly impacts the attractiveness of roads to older adults, thus reducing their willingness to walk and engage in physical activity [48].

Older adults with higher levels of education and income tend to have a better awareness of exercise and health, as well as more disposable resources and a greater financial capacity. This enables them to exhibit greater initiative and self-management in terms of physical activity. Additionally, they have access to higher-quality exercise equipment, venues, and services, allowing them to more flexibly choose and participate in a variety of physical activities. A study in Spain pointed out that socioeconomic factors (such as education and income levels) influence the physical activity levels of older adults. Those with higher education levels and greater economic resources are more likely to have access to fitness resources, offering them more options for exercise and thus promoting healthy behaviors [42]. Companionship and interaction with peers can provide encouragement and motivation, helping older adults overcome feelings of loneliness and boredom during physical activity. They can also offer practical support, such as assisting with walking or providing a sense of security, which is particularly important in promoting older adults' engagement in physical activity [49,50]. The availability of fitness facilities provides older adults with diverse exercise equipment and convenient venues, enabling them to engage in physical activity in a safe and professional environment, which further enhances their enthusiasm and participation.

In addition, age, psychological stress, and intersection density are negatively correlated with the overall intensity of physical activity, with age having the most significant impact. As individuals age, their physical functions gradually decline, and the deterioration in older people's joints, muscles, and cardiovascular functions significantly affects their ability to engage in physical activity. Older adults may find it difficult to engage in moderate-to-high-intensity physical activity [51] and may even experience fatigue and movement disorders in low-intensity activities [52]. At the same time, with the increase in health issues such as chronic diseases, the willingness of older adults to participate in physical activity may further decrease [53]. An increase in psychological stress leads to emotional instability and greater psychological fatigue, thereby reducing their willingness to actively participate in physical activities. Gyasi et al.'s study confirmed that older adults with higher levels of psychological stress tend to have lower levels of physical activity, but those who engage in regular physical activity while receiving adequate social support experience significant improvements in their mental health [54]. An increase in intersection density negatively impacts older adults' physical activity behavior by altering the spatial structure and continuity of pathways in the community. Zang et al.'s research confirmed that intersection density is negatively correlated with older adults' walking activities, as higher intersection density leads to more road separations and path interruptions, obstructing the continuity of walking routes [55].

In terms of low-intensity physical activity, factors such as social companions, green view rate, road cleanliness, and rest facilities are positively correlated with such activities. Specifically, communities with more companions accompanying elderly individuals, higher green view rates, better road cleanliness, and more rest facilities see higher levels of low-intensity physical activity among the elderly. This finding is consistent with previous studies. For instance, Ory et al. found that social support factors, such as the presence of companions and neighborhood cohesion, have a positive impact on older adults' walking activities [38]. Yang et al. demonstrated that higher green view rates significantly increase the walking time of elderly individuals by improving their walking environment and psychological well-being, thereby promoting physical activity [39]. Borst et al.'s research confirmed that road cleanliness significantly affects older adults' walking activities [48]. Rest facilities not only provide elderly individuals with spaces to rest, thereby enhancing the comfort and safety of activities, but also promote social interactions, encouraging longer outdoor activity durations [37].

In contrast, income level and fitness facilities are negatively correlated with low-intensity physical activity in elderly individuals. That is, in communities with more fitness facilities and higher income levels among the elderly, low-intensity physical activity tends to be lower. This may be because existing fitness facilities mainly cater to medium- and high-intensity exercise needs, and higher-income elderly individuals may have access to a wider range of leisure activities, such as cultural events or tourism, which reduces their participation in low-intensity activities [40].

In moderate-intensity physical activity, the presence of companions, greenery visibility, and road cleanliness are positively correlated with activity levels, with the influence of companions and greenery visibility being particularly significant. In this study, moderate-intensity physical activities include Tai Chi, table tennis, badminton, ballroom dancing, and brisk walking. These activities typically have strong interactivity and social elements, and the presence of companions provides emotional support and social motivation for elderly participants during physical activity [41]. Unlike low-intensity physical activities (such as light walking) and high-intensity activities (such as running and strength training), moderate-intensity activities exhibit more noticeable interaction. In such highly interactive activities, the presence of companions significantly enhances an elderly person's willingness, frequency, and duration of participation. Besides the social factor, the improvement in greenery visibility also plays a key environmental role in moderate-intensity physical activity. These activities are often performed in open community parks, squares, and walking paths, where the level of greenery visibility significantly affects an elderly person's experience and emotional perception of the activity. Natural landscapes with high greenery visibility provide a comfortable visual environment, making elderly participants feel relaxed during physical activities and enhancing the sustainability and frequency of their participation [56]. Additionally, road cleanliness also promotes moderate-intensity physical activity. A clean road environment reduces the risk of falls and minimizes uncertainty in the environment, thereby increasing the willingness of elderly individuals to engage in moderate-intensity physical activity [47].

In high-intensity physical activity, education level and fitness facilities are positively correlated with elderly individuals' participation in high-intensity activities. This indicates that education influences health awareness and behavior choices, thereby promoting engagement in high-intensity activities. Elderly individuals with higher educational levels tend to possess greater health knowledge and resources, which makes them more likely to choose a diverse range of health-promoting activities [42]. The research by Zapata-Lamana et al. supports this view, finding that elderly people with higher education and income levels are more likely to engage in high-intensity physical activities [42]. Sufficient fit-

ness facilities in the community (such as outdoor fitness paths, exercise equipment, and public sports venues) provide elderly individuals with diverse scenarios and options for high-intensity physical activities (such as strength training, resistance training, and aerobic exercise). The completeness of these facilities and the convenience of the locations further promote elderly individuals' willingness to engage in high-intensity physical activity.

Additionally, the density of road intersections and psychological stress are negatively correlated with elderly individuals' participation in high-intensity physical activity. High stress affects sleep, mood, and life satisfaction, making elderly individuals less likely to engage in high-intensity activities due to a lack of energy and motivation [43,57]. Higher road intersection density usually indicates a denser road network and more complex community structures, which increase traffic congestion and risk, thereby suppressing high-intensity physical activity [44]. In communities with a higher concentration of elderly individuals, this environment is more likely to reduce their sense of safety and willingness to engage in outdoor activities [58,59]. High-intensity activities often require larger open spaces or specialized tracks to reduce safety hazards like vehicle conflicts. However, areas with high road intersection density lack continuous open paths. For activities such as jogging, this breaks the rhythm and forces joggers to frequently adjust their pace, which affects their exercise experience and sense of safety, thus limiting the development of such activities. Moreover, there may be a nonlinear relationship between road intersection density and high-intensity physical activity, exhibiting a threshold effect. Moderate intersection density helps enhance traffic connectivity and increases the diversity of jogging routes, thus promoting high-intensity physical activity. However, when the intersection density exceeds 85/km^2, this positive effect gradually weakens and turns negative, likely due to increased traffic congestion and excessive pedestrian flow, which negatively affects joggers' experience and safety [60].

Finally, we found that elderly women tend to engage in various levels of physical activities less than men do, which may be related to sociocultural backgrounds, gender role expectations, and physiological differences. First, from the perspective of sociocultural factors and gender roles, many elderly women bear the primary responsibility for household duties, which compresses their leisure time and space, making it difficult for them to find time for physical activities in their daily lives [61,62]. Additionally, gender role expectations may limit women's willingness to engage in higher-intensity activities because traditional views often expect women to engage in gentler or home-based activities. From a physiological standpoint, women generally have less muscle mass and lower bone density than men, which presents more physical and safety challenges when participating in moderate- to high-intensity physical activities [63]. These physiological limitations not only affect the duration and intensity of the activities but may also influence the types of activities chosen. Therefore, the lower participation of women in high-intensity physical activities may be associated with these physical characteristics.

The comprehensive analysis of this study indicates that the design of community green spaces should aim to increase greenery coverage, maintain clean and flat road environments, and provide appropriate social support and safety assurance. Additionally, it is essential to consider the needs of the elderly during different intensities of physical activity. For instance, increasing the provision of rest facilities can enhance the comfort and safety of activities, thereby encouraging elderly individuals to engage more actively in low-intensity physical activities. By rationally planning the community road network to reduce intersection density and improving the configuration of fitness facilities, older adults can be encouraged to participate in more high-intensity physical activities. This comprehensive design strategy not only meets the specific needs of the elderly but also

contributes to improving the overall quality of life and the health of the entire community's residents.

5. Conclusions

This study, using the typical aging city of Wuhan, China, as a case, examined how the built environment of community green spaces influences the physical activity levels of older adults and confirmed the significant correlation between the community green space built environment and different levels of physical activity among older people. We employed Pearson correlation analysis and linear regression models and found that the community green space built environment has different effects on various intensity levels of physical activity among older people.

Research data indicate that education level, income level, health status, companionship, greenery visibility, road cleanliness, and fitness facilities are positively correlated with the overall intensity of physical activity, while gender, age, psychological stress, and intersection density are negatively correlated with it. Companionship, greenery visibility, road cleanliness, and rest facilities are positively correlated with low-intensity physical activity among the elderly, while gender, income level, and fitness facilities are negatively correlated with it. Companionship, greenery visibility, and road cleanliness are positively correlated with moderate-intensity physical activity among the elderly, while gender is negatively correlated with it. For high-intensity activities, education level and fitness facilities are positively correlated with them, while gender, psychological stress, and intersection density are negatively correlated with them. These findings highlight the important role that the community green space built environment and social attributes play in promoting physical activity among older people. Urban planning and public health policies should take into account various environmental and social factors and develop differentiated strategies based on activity intensity to more effectively promote the health and well-being of older people.

This study also has certain limitations. First, as a cross-sectional study, it failed to establish a causal relationship between the community green space built environment and physical activity in older adults. Second, this study only considered the impact of the built environment and social attributes on physical activity among the elderly. However, the factors influencing physical activity are complex, and aspects such as social participation, policy, exercise attitudes, self-efficacy, and perceptions of activities were not included. Finally, while the International Physical Activity Questionnaire (IPAQ) has undergone validation for both reliability and validity, its subjectivity may lead to respondents misunderstanding physical activity or inaccurately recalling their activity, thus affecting the accuracy of the data and the scientific validity of the study results.

Therefore, future studies, given sufficient time and funding, should expand the scope of research and the sample size to collect more statistical data to analyze the relationship between the characteristics of green space built environments and physical activity. Meanwhile, adopting a longitudinal research design would help more accurately distinguish causal relationships. Secondly, future research should consider more factors influencing physical activity, such as social participation, policy, exercise attitudes, self-efficacy, and perceptions of activities. These social and psychosocial factors may play a crucial role in participation in physical activities; thus, including these variables would make the research results more comprehensive and accurate. Additionally, future studies could adopt more objective methods to measure physical activity, such as combining Global Positioning Systems (GPSs) and accelerometers to record the elderly's activity levels and paths in real time, reducing biases caused by subjective measurements. GPSs can provide the spatiotemporal characteristics of activities, while accelerometers can accurately record activity intensity.

The combination of these tools can improve the accuracy and scientific validity of research results. Through these improvements, future research will be able to provide more accurate and comprehensive evidence to support community green space construction and public health policy development.

Author Contributions: Conceptualization, J.S.; methodology, J.S. and J.F.; software, J.F. and X.X.; validation, J.S., S.W. and J.F.; formal analysis, J.F.; investigation, Y.F.; resources, J.S.; data curation, S.W. and X.X.; writing—original draft preparation, J.F.; writing—review and editing, J.S., J.F. and Z.L.; visualization, X.X. and S.X.; supervision, J.S.; project administration, J.S.; funding acquisition, J.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Hubei Construction Science and Technology project, grant number JK2024098, and the National Natural Science Foundation of China, grant number 52278075.

Institutional Review Board Statement: This study was conducted in accordance with the Declaration of Helsinki and approved by the School of Urban Construction, Wuhan University of Science and Technology.

Informed Consent Statement: Informed consent was obtained from all subjects involved in this study.

Data Availability Statement: All data and models used during this study appear in the submitted article.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. World Health Organization. Available online: https://www.who.int/health-topics/ageing (accessed on 28 August 2024).
2. World Health Organization. *China Country Assessment Report on Ageing and Health*; World Health Organization: Geneva, Switzerland, 2015; ISBN 978-92-4-150931-2.
3. World Health Organization. Global Recommendations on Physical Activity for Health. *Recomm. Mond. Sur L'activité Phys. Pour La Santé* **2010**, *58*. Available online: https://iris.who.int/handle/10665/44399 (accessed on 17 October 2024).
4. Ho, E.C.; Hawkley, L.; Dale, W.; Waite, L.; Huisingh-Scheetz, M. Social Capital Predicts Accelerometry-Measured Physical Activity among Older Adults in the U.S.: A Cross-Sectional Study in the National Social Life, Health, and Aging Project. *BMC Public Health* **2018**, *18*, 804. [CrossRef]
5. Bray, I.; Reece, R.; Sinnett, D.; Martin, F.; Hayward, R. Exploring the Role of Exposure to Green and Blue Spaces in Preventing Anxiety and Depression among Young People Aged 14–24 Years Living in Urban Settings: A Systematic Review and Conceptual Framework. *Environ. Res.* **2022**, *214*, 114081. [CrossRef] [PubMed]
6. Song, S.; Yap, W.; Hou, Y.; Yuen, B. Neighbourhood Built Environment, Physical Activity, and Physical Health among Older Adults in Singapore: A Simultaneous Equations Approach. *J. Transp. Health* **2020**, *18*, 100881. [CrossRef]
7. Tao, Y.; Ma, J.; Shen, Y.; Chai, Y. Neighborhood Effects on Health: A Multilevel Analysis of Neighborhood Environment, Physical Activity and Public Health in Suburban Shanghai. *Cities* **2022**, *129*, 103847. [CrossRef]
8. Zahrt, O.H.; Crum, A.J. Effects of Physical Activity Recommendations on Mindset, Behavior and Perceived Health. *Prev. Med. Rep.* **2020**, *17*, 101027. [CrossRef]
9. He, H.; Lin, X.; Yang, Y.; Lu, Y. Association of Street Greenery and Physical Activity in Older Adults: A Novel Study Using Pedestrian-Centered Photographs. *Urban For. Urban Green.* **2020**, *55*, 126789. [CrossRef]
10. Liu, Z.; Kemperman, A.; Timmermans, H. Influence of Neighborhood Characteristics on Physical Activity, Health, and Quality of Life of Older Adults: A Path Analysis. *Front. Public Health* **2021**, *9*, 783510. [CrossRef] [PubMed]
11. James, P.; Kioumourtzoglou, M.-A.; Hart, J.E.; Banay, R.F.; Kloog, I.; Laden, F. Interrelationships Between Walkability, Air Pollution, Greenness, and Body Mass Index. *Epidemiology* **2017**, *28*, 780–788. [CrossRef] [PubMed]
12. Markevych, I.; Schoierer, J.; Hartig, T.; Chudnovsky, A.; Hystad, P.; Dzhambov, A.M.; De Vries, S.; Triguero-Mas, M.; Brauer, M.; Nieuwenhuijsen, M.J.; et al. Exploring Pathways Linking Greenspace to Health: Theoretical and Methodological Guidance. *Environ. Res.* **2017**, *158*, 301–317. [CrossRef] [PubMed]

13. Heynen, N.; Perkins, H.A.; Roy, P. The Political Ecology of Uneven Urban Green Space: The Impact of Political Economy on Race and Ethnicity in Producing Environmental Inequality in Milwaukee. *Urban Aff. Rev.* **2006**, *42*, 3–25. [CrossRef]
14. Abercrombie, L.C.; Sallis, J.F.; Conway, T.L.; Frank, L.D.; Saelens, B.E.; Chapman, J.E. Income and Racial Disparities in Access to Public Parks and Private Recreation Facilities. *Am. J. Prev. Med.* **2008**, *34*, 9–15. [CrossRef] [PubMed]
15. Wolch, J.R.; Byrne, J.; Newell, J.P. Urban Green Space, Public Health, and Environmental Justice: The Challenge of Making Cities 'Just Green Enough'. *Landsc. Urban Plan.* **2014**, *125*, 234–244. [CrossRef]
16. Marquet, O.; Hirsch, J.A.; Kerr, J.; Jankowska, M.M.; Mitchell, J.; Hart, J.E.; Laden, F.; Hipp, J.A.; James, P. GPS-Based Activity Space Exposure to Greenness and Walkability Is Associated with Increased Accelerometer-Based Physical Activity. *Environ. Int.* **2022**, *165*, 107317. [CrossRef]
17. Dong, W.; Zhu, X.; Zhao, X. Association between Built Environment Characteristics of Community Greenways and Physical Activity Intensity: A Case Study of Shenzhen, China. *Landsc. Archit.* **2021**, *28*, 93–99. [CrossRef]
18. Lee, A.C.K.; Maheswaran, R. The Health Benefits of Urban Green Spaces: A Review of the Evidence. *J. Public Health* **2011**, *33*, 212–222. [CrossRef]
19. Reyes-Riveros, R.; Altamirano, A.; De La Barrera, F.; Rozas-Vásquez, D.; Vieli, L.; Meli, P. Linking Public Urban Green Spaces and Human Well-Being: A Systematic Review. *Urban For. Urban Green.* **2021**, *61*, 127105. [CrossRef]
20. Venter, Z.S.; Barton, D.N.; Gundersen, V.; Figari, H.; Nowell, M.S. Back to Nature: Norwegians Sustain Increased Recreational Use of Urban Green Space Months after the COVID-19 Outbreak. *Landsc. Urban Plan.* **2021**, *214*, 104175. [CrossRef]
21. Han, K.-T. The Effect of Nature and Physical Activity on Emotions and Attention While Engaging in Green Exercise. *Urban For. Urban Green.* **2017**, *24*, 5–13. [CrossRef]
22. Gavin, R.M. Neighbourhood Built Environment Characteristics Associated with Different Types of Physical Activity in Canadian Adults. *Health Promot. Chronic Dis. Prev. Can.* **2017**, *37*, 175–185.
23. Seo, S.; Choi, S.; Kim, K.; Kim, S.M.; Park, S.M. Association between Urban Green Space and the Risk of Cardiovascular Disease: A Longitudinal Study in Seven Korean Metropolitan Areas. *Environ. Int.* **2019**, *125*, 51–57. [CrossRef]
24. Palliwoda, J.; Priess, J.A. What Do People Value in Urban Green? Linking Characteristics of Urban Green Spaces to Users' Perceptions of Nature Benefits, Disturbances, and Disservices. *Ecol. Soc.* **2021**, *26*, 28. [CrossRef]
25. Slater, S.J.; Christiana, R.W.; Gustat, J. Recommendations for Keeping Parks and Green Space Accessible for Mental and Physical Health During COVID-19 and Other Pandemics. *Prev. Chronic Dis.* **2020**, *17*, E59. [CrossRef] [PubMed]
26. Rantakokko, M.; Iwarsson, S.; Portegijs, E.; Viljanen, A.; Rantanen, T. Associations Between Environmental Characteristics and Life-Space Mobility in Community-Dwelling Older People. *J. Aging Health* **2015**, *27*, 606–621. [CrossRef] [PubMed]
27. Bauer, J.E. Health Behavior and Health Education: Theory, Research, and Practice (3rd Edn.). *Educ. Health* **2004**, *17*, 399–400.
28. Sallis, J.F.; Owen, N.; Fisher, E.B. Ecological Models of Health Behavior. In *Health Behavior and Health Education: Theory, Research, and Practice*, 4th ed.; Jossey-Bass: San Francisco, CA, USA, 2008; pp. 465–485, ISBN 978-0-7879-9614-7.
29. Oyeyemi, A.L.; Kasoma, S.S.; Onywera, V.O.; Assah, F.; Adedoyin, R.A.; Conway, T.L.; Moss, S.J.; Ocansey, R.; Kolbe-Alexander, T.L.; Akinroye, K.K.; et al. NEWS for Africa: Adaptation and Reliability of a Built Environment Questionnaire for Physical Activity in Seven African Countries. *Int. J. Behav. Nutr. Phys. Act.* **2016**, *13*, 33. [CrossRef]
30. Liao, Y.-H.; Kao, T.-W.; Peng, T.-C.; Chang, Y.-W. Gender Differences in the Association between Physical Activity and Health-Related Quality of Life among Community-Dwelling Elders. *Aging Clin. Exp. Res.* **2021**, *33*, 901–908. [CrossRef] [PubMed]
31. van Uffelen, J.G.Z.; Khan, A.; Burton, N.W. Gender Differences in Physical Activity Motivators and Context Preferences: A Population-Based Study in People in Their Sixties. *BMC Public Health* **2017**, *17*, 624. [CrossRef] [PubMed]
32. Hamer, M.; Kivimaki, M.; Steptoe, A. Longitudinal Patterns in Physical Activity and Sedentary Behaviour from Mid-Life to Early Old Age: A Substudy of the Whitehall II Cohort. *J. Epidemiol. Community Health* **2012**, *66*, 1110–1115. [CrossRef] [PubMed]
33. Sander, S.E.; Johansen, R.F.; Caunt, S.; Søndergaard, E.; Rolver, M.G.; Sandbæk, A.; Heller, S.; Kristensen, P.L.; Molsted, S. A Cross-Sectional Study on the Impact of Educational Status on Physical Activity Level in Danish and English Adults With Type 1 Diabetes. *Can. J. Diabetes* **2024**, *48*, 204–210.e1. [CrossRef]
34. Stalling, I.; Albrecht, B.M.; Foettinger, L.; Recke, C.; Bammann, K. Associations between Socioeconomic Status and Physical Activity among Older Adults: Cross-Sectional Results from the OUTDOOR ACTIVE Study. *BMC Geriatr* **2022**, *22*, 396. [CrossRef]
35. Oizumi, K.; Kajiwara, H.; Aratame, N. Facing up to the Problem of Population Aging in Developing Countries: New Perspectives for Assistance and Cooperation. Available online: https://www.google.com.sg/url?sa=t&source=web&rct=j&opi=89978449&url=https://openjicareport.jica.go.jp/pdf/11844420.pdf&ved=2ahUKEwjYx9CAnLCKAxWDZ_UHHbyjJ3AQFnoECBcQAQ&usg=AOvVaw1QWw_k0mcAwaR8lLDg68zE (accessed on 28 August 2024).
36. Ainsworth, B.E.; Haskell, W.L.; Leon, A.S.; Jacobs, D.R.; Montoye, H.J.; Sallis, J.F.; Paffenbarger, R.S. Compendium of Physical Activities: Classification of Energy Costs of Human Physical Activities. *Med. Sci. Sports Exerc.* **1993**, *25*, 71–80. [CrossRef]
37. Pramitasari, D.; Sahril, U.; Sarwadi, A. The Role of Outdoor Seating Facilities for the Elderly in Dense Settlements at Ngampilan Village, Yogyakarta. *ARTEKS J. Tek. Arsit.* **2021**, *6*, 35–44. [CrossRef]

38. Ory, M.G.; Towne, S.D.; Won, J.; Forjuoh, S.N.; Lee, C. Social and Environmental Predictors of Walking among Older Adults. *BMC Geriatr* **2016**, *16*, 155. [CrossRef] [PubMed]
39. Yang, L.; Liu, J.; Liang, Y.; Lu, Y.; Yang, H. Spatially Varying Effects of Street Greenery on Walking Time of Older Adults. *ISPRS Int. J. Geo-Inf.* **2021**, *10*, 596. [CrossRef]
40. Liu, Z.; Kemperman, A.; Timmermans, H.; Yang, D. Heterogeneity in Physical Activity Participation of Older Adults: A Latent Class Analysis. *J. Transp. Geogr.* **2021**, *92*, 102999. [CrossRef]
41. Huang, W.-Y.; Huang, H.; Wu, C.-E. Physical Activity and Social Support to Promote a Health-Promoting Lifestyle in Older Adults: An Intervention Study. *Int. J. Environ. Res. Public Health* **2022**, *19*, 14382. [CrossRef] [PubMed]
42. Zapata-Lamana, R.; Poblete-Valderrama, F.; Cigarroa, I.; Parra-Rizo, M.A. The Practice of Vigorous Physical Activity Is Related to a Higher Educational Level and Income in Older Women. *Int. J. Environ. Res. Public Health* **2021**, *18*, 10815. [CrossRef] [PubMed]
43. Figueira, H.A.; Figueira, O.A.; Figueira, A.A.; Figueira, J.A.; Polo-Ledesma, R.E.; Lyra Da Silva, C.R.; Dantas, E.H.M. Impact of Physical Activity on Anxiety, Depression, Stress and Quality of Life of the Older People in Brazil. *Int. J. Environ. Res. Public Health* **2023**, *20*, 1127. [CrossRef] [PubMed]
44. Yang, W.; Hu, J.; Liu, Y.; Guo, W. Examining the Influence of Neighborhood and Street-Level Built Environment on Fitness Jogging in Chengdu, China: A Massive GPS Trajectory Data Analysis. *J. Transp. Geogr.* **2023**, *108*, 103575. [CrossRef]
45. Izquierdo, M.; Merchant, R.A.; Morley, J.E.; Anker, S.D.; Aprahamian, I.; Arai, H.; Aubertin-Leheudre, M.; Bernabei, R.; Cadore, E.L.; Cesari, M.; et al. International Exercise Recommendations in Older Adults (ICFSR): Expert Consensus Guidelines. *J. Nutr. Health Aging* **2021**, *25*, 824–853. [CrossRef]
46. Xiao, Y.; Miao, S.; Zhang, Y.; Xie, B.; Wu, W. Exploring the Associations between Neighborhood Greenness and Level of Physical Activity of Older Adults in Shanghai. *J. Transp. Health* **2022**, *24*, 101312. [CrossRef]
47. Atalay, A.; Perkumiene, D.; Aleinikovas, M.; Škėma, M. Clean and Sustainable Environment Problems in Forested Areas Related to Recreational Activities: Case of Lithuania and Turkey. *Front. Sports Act. Living* **2024**, *6*, 1224932. [CrossRef] [PubMed]
48. Borst, H.C.; Miedema, H.M.E.; de Vries, S.I.; Graham, J.M.A.; van Dongen, J.E.F. Relationships between Street Characteristics and Perceived Attractiveness for Walking Reported by Elderly People. *J. Environ. Psychol.* **2008**, *28*, 353–361. [CrossRef]
49. Creighton, R.M.; Paradis, K.F.; Blackburn, N.E.; Tully, M.A. Group-Based Physical Activity Interventions Targeting Enjoyment in Older Adults: A Systematic Review. *J. Ageing Longev.* **2022**, *2*, 113–129. [CrossRef]
50. Beselt, L.J.; McDonough, M.H.; Hewson, J.; Din, C. Social Support and Social Barriers for Participating in Group Physical Activity among Older Women Living Alone. *Qual. Res. Sport Exerc. Health* **2023**, *15*, 819–834. [CrossRef]
51. Bethancourt, H.J.; Rosenberg, D.E.; Beatty, T.; Arterburn, D.E. Barriers to and Facilitators of Physical Activity Program Use Among Older Adults. *Clin. Med. Res.* **2014**, *12*, 10–20. [CrossRef] [PubMed]
52. McPhee, J.S.; French, D.P.; Jackson, D.; Nazroo, J.; Pendleton, N.; Degens, H. Physical Activity in Older Age: Perspectives for Healthy Ageing and Frailty. *Biogerontology* **2016**, *17*, 567–580. [CrossRef] [PubMed]
53. Chen, Y.-M. Perceived Barriers to Physical Activity among Older Adults Residing in Long-Term Care Institutions. *J. Clin. Nurs.* **2010**, *19*, 432–439. [CrossRef] [PubMed]
54. Gyasi, R.M. Social Support, Physical Activity and Psychological Distress among Community-Dwelling Older Ghanaians. *Arch. Gerontol. Geriatr.* **2019**, *81*, 142–148. [CrossRef]
55. Zang, P.; Qiu, H.; Xian, F.; Zhou, X.; Ma, S.; Zhao, Y. Research on the Difference Between Recreational Walking and Transport Walking Among the Elderly in Mega Cities With Different Density Zones: The Case of Guangzhou City. *Front. Public Health* **2021**, *9*, 775103. [CrossRef] [PubMed]
56. Miao, S.; Xiao, Y. Exploring the Spatial Trade-off Effects of Green Space on Older People's Physical Inactivity: Evidence from Shanghai. *Landsc. Urban Plan.* **2024**, *251*, 105155. [CrossRef]
57. Ginis, K.A.M.; van der Ploeg, H.P.; Foster, C.; Lai, B.; McBride, C.B.; Ng, K.; Pratt, M.; Shirazipour, C.H.; Smith, B.; Vásquez, P.M.; et al. Participation of People Living with Disabilities in Physical Activity: A Global Perspective. *Lancet* **2021**, *398*, 443–455. [CrossRef] [PubMed]
58. Lord, S.; Cloutier, M.-S.; Garnier, B.; Christoforou, Z. Crossing Road Intersections in Old Age—With or without Risks? Perceptions of Risk and Crossing Behaviours among the Elderly. *Transp. Res. Part F Traffic Psychol. Behav.* **2018**, *55*, 282–296. [CrossRef]
59. Zhang, R.; Liu, S.; Li, M.; He, X.; Zhou, C. The Effect of High-Density Built Environments on Elderly Individuals' Physical Health: A Cross-Sectional Study in Guangzhou, China. *Int. J. Environ. Res. Public Health* **2021**, *18*, 10250. [CrossRef] [PubMed]
60. Yang, W.; Li, Y.; Liu, Y.; Fan, P.; Yue, W. Environmental Factors for Outdoor Jogging in Beijing: Insights from Using Explainable Spatial Machine Learning and Massive Trajectory Data. *Landsc. Urban Plan.* **2024**, *243*, 104969. [CrossRef]
61. Adisa, T.A.; Aiyenitaju, O.; Adekoya, O.D. The Work–Family Balance of British Working Women during the COVID-19 Pandemic. *J. Work-Appl. Manag.* **2021**, *13*, 241–260. [CrossRef]

62. Uddin, M. Addressing Work-Life Balance Challenges of Working Women During COVID-19 in Bangladesh. *Int. Soc. Sci. J.* **2021**, *71*, 7–20. [CrossRef]
63. Lu, M.; Li, M.; Yi, L.; Li, F.; Feng, L.; Ji, T.; Zang, Y.; Qiu, J. Effects of 8-Week High-Intensity Interval Training and Moderate-Intensity Continuous Training on Bone Metabolism in Sedentary Young Females. *J. Exerc. Sci. Fit.* **2022**, *20*, 77–83. [CrossRef] [PubMed]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.