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Towards a Communication Ecology in the Life of Rural Senior Citizens: How Rural Public Spaces Influence Community Engagement

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Abstract: The dilemma of weak participation and non-participation of rural communities is a universal topic of global development. The rural public space is an important field for local residents to interact, communicate, and engage with each other, and is an important place for the sustainable development of rural areas. However, previous studies have neglected to understand the intrinsic connection between rural public space and community participation from the perspective of community communication ecology. Based on the concept of age-friendly communities, this study's fieldwork in rural Shanghai, China, using the methodology of grounded theory, found that physical, social, and psychological factors all have an impact on community engagement among rural residents. Specifically, environmental quality, facility support, community networks, social participation, call to action, place attachment, spatial perception, and self-transformation are identified as the core elements that significantly influence community engagement among rural residents. This study further reveals that the multiple factors influencing community engagement among rural residents are complex and interdependent rather than operating independently. Spatial support, communicative triggers, and symbolic identification, respectively, operate at the technological level (physical–social factors), social level (social–psychological factors), and discursive level (psychological–physical factors) to promote community engagement among older adults in Chinese rural areas. Through this research, we hope to further the realization of rural civic engagement and the sustainability of local communities and to provide scholarly insights into the promotion of more equitable community life.



Citation: Feng, Z.; Li, L.; Zhang, J.; Feng, X. Towards a Communication Ecology in the Life of Rural Senior Citizens: How Rural Public Spaces Influence Community Engagement. *Sustainability* **2024**, *16*, 4256. <https://doi.org/10.3390/su16104256>

Academic Editor: Keshav

Lall Maharjan

Received: 17 April 2024

Revised: 7 May 2024

Accepted: 16 May 2024

Published: 18 May 2024



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1. Introduction

According to the disclosed data in the Bulletin of the Seventh National Population Census of China, as of 11 May 2021, the population aged 60 and above in the country was 264,018,766, accounting for 18.70% of the total population. Among them, the population aged 65 and above was 190,635,280, accounting for 13.50% of the total population. These figures indicate that China has entered a rapidly accelerating stage of population aging. The aging population has exacerbated the socio-economic pressure in China, leading to a series of issues that are expected to persist. Furthermore, the process of urbanization in China has resulted in a massive flow of labor force, causing a continuous decline in the rural population, while the youthful population has flocked to cities in search of greater employment opportunities. The decreasing proportion of the rural youth population, coupled with a disproportionately high proportion of the elderly population in rural areas, affects the sustainable development of rural regions. Over time, the issue of population aging in

China has become increasingly severe, exerting profound impacts at social, economic, and policy levels.

With the increasing proportion of the elderly population in rural areas, the demand for elderly care services has shown a rapid growth trend. Compared to urban areas, rural regions have relatively insufficient public service facilities in areas such as healthcare, elderly care, and entertainment. The government and various sectors of society need to take measures to provide more elderly care facilities and resources to meet the needs of the aging population. Although some progress has been made in rural development since the reform and opening up, there still exists a significant gap compared to urban areas [1], and the construction of outdoor environments in rural areas continues to be neglected. Despite the overall improvement in infrastructure construction and living environment of villages through the current development approach, it has also led to negative consequences such as excessive urbanization and rural homogenization [2]. The urbanization trend of rural spatial form has brought about issues such as homogenized design and lack of attention to the genuine needs of local residents in the construction of many new types of rural activity spaces [3], leading to problems such as population outflow, idle land, environmental pollution, and cultural decline [2,4]. Furthermore, the tourism industry has brought new opportunities and challenges to rural development, and the construction of rural areas needs to meet the needs of urban tourists. However, this has undermined the rural authenticity.

The quality of life for elderly individuals in rural areas is influenced by housing, outdoor spaces, social engagement, and public transportation [5]. Changes in the rural environment directly impact the quality of life for local elderly residents, with rural outdoor spaces playing a significant role as carriers of rural living. In 2002, the World Health Organization (WHO) introduced the concept of active aging, emphasizing that older adults can be contributors to society while enjoying better health, safety, and engagement [6]. Active aging encourages older adults to incorporate physical activities into their daily lives, such as walking, transportation, exercise, or leisure activities. In 2005, the concept of Age-Friendly Communities (AFCs) was introduced by the WHO and promoted through projects worldwide. In 2007, the WHO published the "Global Age-Friendly Cities: A Guide" handbook, providing guidance for the implementation of age-friendly communities. The construction of age-friendly communities needs to be tailored to local conditions. Therefore, the Rural Revitalization Plan issued by China in 2018 proposed the development of a multi-level rural elderly care system based on home-based care, community support, and supplementary elderly care institutions [7]. Furthermore, China's "14th Five-Year Plan" (2021–2025) points out that as the demands of Chinese elderly individuals change, basic life security needs have been met, and improving the quality of life has become a new focus.

As mentioned, the rural population loss caused by China's urbanization process has led to smaller population sizes and a higher degree of population aging in rural communities [8]. However, it is not surprising that urban communities in China are more age-friendly compared to rural villages [9]. Numerous studies have demonstrated that community engagement has positive effects on the physical and psychological well-being of older adults, and participating in social activities significantly enhances cognitive function among the elderly [10]. Nevertheless, the willingness of the elderly population to engage in public space activities is often low, as research indicates that older individuals are less likely to interact socially with other groups or explore public open spaces compared to younger people [11]. The decline in public spaces in rural areas and the limited participation of the elderly in community activities pose challenges to the design of public spaces in rural communities. Ensuring active and voluntary participation of elderly residents in community activities is crucial for achieving active aging [12].

Under the combined influence of the age-friendly community concept, rural revitalization efforts, and elderly care policies, the construction of age-friendly communities in rural areas has emerged as a valuable research topic that warrants further investigation [13]. This study aims to utilize the grounded theory approach to examine the outdoor public

space design factors that influence the level of community engagement among rural elderly individuals and explore the interactive relationships among these factors.

The research intends to address the following questions:

1. What are the key factors for achieving active aging and promoting community engagement among rural elderly individuals? By investigating these factors, practical measures and strategies could be identified to encourage active integration of older residents into community life, thereby improving their quality of life and well-being.
2. What are the mechanisms of interaction among these factors? While exploring the factors influencing community engagement among elderly residents, it is essential to gain a deeper understanding of the interplay and mechanisms of influence among these factors. By constructing relevant theoretical models, the interconnectedness of these factors could be better comprehended, providing a scientific basis and guidance for designing age-friendly communities.

2. Literature Review

2.1. Existing Theoretical Framework: Age-Friendly Communities

The term “age-friendly city” was first coined by the WHO in 2005 with the launch of the Global Age-Friendly Cities Project [14]. The Canadian Government, which played a significant role in the project, adopted this model more widely and used the term “age-friendly community” in various policy documents [15]. In the United States, however, the term “livable community” is more commonly used [16–18]. In the UK, policymakers use the term “lifetime neighborhood” to refer to the construction of an environment that is favorable for older citizens [19–21]. Lifetime neighborhoods encompass the built and natural environment, as well as the social networks of the local community [21]. When it comes to building age-friendly rural communities, it is important to consider the unique characteristics of different districts instead of adopting standardized planning guidelines for all areas. The planning and design of public open spaces for the elderly should take into account the specific needs and preferences of the local community. This approach ensures that the design of rural public spaces effectively promotes active aging and enhances the quality of life for older residents. This requires developing design strategies tailored to the specific characteristics of each region to meet the needs of local residents [22,23]. Furthermore, rural communities may face different challenges compared to urban areas, and the challenges in rural areas may be exacerbated due to the often poor or lacking existing physical infrastructure and services [24].

The concept of the age-friendly community proposed by the World Health Organization (WHO) includes social services and a physical environment that supports active aging, and it is composed of eight domains of assessment which include outdoor spaces and buildings, transportation, housing, social participation, respect and inclusion, civic participation and employment, communication and information, community support, and health services. To date, research on age-friendly communities (AFCs) has predominantly focused on urban public spaces and the design of age-friendly housing. It is recognized that older adults’ attachment to their communities often leads to unique social structures, highlighting the importance of establishing strong community connections [25]. A study conducted in rural communities in Quebec, Canada, assessed community engagement from three perspectives: personal factors, the social environment, and the physical environment, especially in regard to transportation, information, adapted activities, assistance, and accessibility, which will ultimately foster their social participation [26]. In another scoping review study, rural-dwelling older adults and their pets were examined in terms of their engagement in volunteer and community activities, as well as their ability to maintain their homes and care for their pets [27].

2.2. Age-Friendliness in the Built Environment

The physical environment aspect of the built environment includes buildings and their surroundings, activity spaces, road systems, infrastructure, and landscape greening [28].

The design emphasis for the indoor environment of buildings is on improving ventilation and air quality rather than temperature regulation [29]. Public buildings should be connected to the external spaces to facilitate older adults' access to external information and prevent them from developing negative emotions such as depression due to a closed environment [30]. Outdoor spaces are cited as age-friendly features in house design [31]. In a study conducted in Hong Kong on urban outdoor spaces, it was found that older adults considered "social and recreational activities", "community facilities and services", "social networks", and "clean and pleasant environment" to be their most important needs [32]. Public spaces serve as important platforms for hosting various activities. Providing more active facilities in public recreational spaces can better promote social interaction, well-being, and active aging among older adults [22]. Transforming vacant spaces in rural areas into active spaces [33] and creating inviting social spaces for older adults to linger can enhance their social engagement [5,34]. Improving walkability within the community can facilitate older adults' mobility [35] and enable easier access to public services [14]. Planting trees along major roads can provide a pleasant activity space for older adults [33], as they are often inclined to engage in activities near green areas, especially along major walking routes connecting homes and bus stops [36]. Access to transportation is crucial for older adults, and the absence of a suitable public transportation system can significantly impact their willingness to travel [37]. In rural areas, bus stops are limited, and the distance between residents' homes and the nearest bus stop is often twice as long as in urban areas [36]. The presence of seats and shelter facilities in public spaces has a positive effect on the vitality of residents [38].

2.3. Social Factors Enhancing Community Engagement

Progress has been made in the research of various aspects of the social environment such as informatization, community engagement, respect, and a sense of belonging, as well as intergenerational integration. Information and communication technologies, through enhanced physical, social, and community connections, have the potential to support age-friendly urban environments [39]. Policies that address respect and discrimination prevention can contribute to the effectiveness of isolation prevention initiatives [40]. The openness and proximity of spaces create joyful leisure and work environments, fostering inclusivity, interaction, and networking [41]. Strong social networks encourage older adults to reside in their local communities, enabling successful aging in place [42]. Maintaining connections with family and the community is essential for seniors to facilitate aging in place [43]. Older individuals with smaller social support networks, less support, and limited regular contact with others reported lower quality of life [44].

In addition, the development of a combined leisure–work lifestyle demonstrates active aging within the tension between rural traditions and modernity, distinct from active aging in urban and Western contexts [41]. Some old adults have highlighted their busy farming schedules as a hindrance to engaging in additional physical activities, while also considering farming work itself as a form of physical activity [33]. A study revealed that older adults are actively engaged in income-generating activities, communal activities, and caregiving within their family and village networks [45].

2.4. The Influence of Environmental Perception and Mental State on Older Adults

The utilization of outdoor public spaces should take into consideration the perceptual systems and psychological states of older adults. Environment mental perception refers to the immediate and direct response of individuals or groups to environmental information. As external stimuli, the environment consists of both built and natural elements. Environmental psychology suggests that the human perceptual system encompasses vision, hearing, olfaction, touch, and proprioception, and a decline in certain sensory abilities can occur in older adults due to physiological or psychological reasons. In an environment, different sensory modalities can compensate for each other, for example, if visual information is diminished, other sensory information can potentially take its place. When various mate-

rial and social resources within a community are easily accessible, older adults can maintain their cognitive levels through more extensive and frequent perceptual activities [46].

Additionally, it is necessary to minimize confusion and inconvenience in the visual perception of older adults during their usage by employing strong colors and contrasts [47]. Moreover, as these individuals may have limitations in participating in physically demanding activities, they tend to gather information through observation. On the other hand, as their cognitive abilities gradually decline, their ability to perceive spatial and color information also decreases. Therefore, incorporating rich colors and forms can better stimulate their cognitive abilities and capture their attention [3]. Pleasant sounds are also considered to have a positive impact on the perceptual behavior of older individuals [48].

At the level of psychological well-being, with the progression of aging, many older adults face the loss of loved ones, which can affect their mental state and increase their desire to participate in social activities [3]. Residents with poorer health conditions tend to prefer activity spaces that provide a sense of security, such as those with a certain level of enclosure. A good perception of safety can enhance older adults' willingness to engage in outdoor activities [49].

2.5. Concerning the Sustainable Development of Social, Physical, and Cultural Aspects of Rural Public Spaces

The sustainable development of the rural environment is related to the quality of life of local residents, and the physical and social environments of the countryside, the individual residents, and the rural culture that they form together are difficult to maintain under the impact of urbanization. A considerable volume of scholarly literature currently converges on the development of age-friendly communities in urban settings, while research pertaining to age-friendly communities in rural areas remains deficient, particularly in terms of the design principles governing outdoor environments in rural contexts. The framework provided by the World Health Organization (WHO) exhibits a level of abstraction and generality, neglecting the distinctive political and geographic characteristics of rural China. Alternative assessment approaches exhibit pronounced regional biases, rendering their applicability to the chosen rural environment in this study challenging. The disproportionate urban–rural development in China underscores the pressing need for heightened attention toward fostering age-friendly rural communities [9]. The outdoor public spaces in rural areas are closely linked to the development of age-friendly communities as they directly impact the quality of life of local elderly residents. These spaces play a crucial role in integrating the village population [50] and can have a positive influence on the psychological well-being and social participation of elderly women [51]. The factors influencing the outdoor public spaces in age-friendly communities can be interpreted through the lens of both the physical environment and the social environment, and these two dimensions should be combined to support active aging [52].

In previous studies, scholars have primarily focused on the impact of the built environment and social environment on older adults, while paying less attention to their psychological environment. However, in rural public spaces, older adults' community engagement is shaped by a combination of various factors, including social and cultural aspects, the physical environment, and individual psychology. To achieve this goal, it is necessary to consider the unique needs and psychological states of older adults. Older adults often face physiological and psychological challenges such as declining physical function, social isolation, and psychological stress. Therefore, these issues need to be taken into account in the design of communities, and appropriate solutions should be provided.

It is worth noting that the suitability of evaluation structures and theoretical frameworks developed for Western rural communities needs further validation in the context of Chinese rural society. As this study is rooted in the rural areas surrounding Shanghai, which exhibit significant differences in geographical and social environments compared to Western rural regions, the level of rural development will influence the willingness of local elderly individuals to participate in public spaces. This necessitates in-depth research and

analysis in various rural areas, focusing on identifying the factors that affect local public spaces and social engagement. Ultimately, this will lead to conclusions that align with local realities. Therefore, this study employs a grounded theory research approach with the aim of constructing a design framework for an age-friendly community suitable for the local context, specifically exploring the community engagement of older adults in rural public spaces.

3. Methodology

A systematic and comprehensive literature review was conducted to identify relevant studies and establish the foundation for the research. The literature review served as a background for the study and yielded a list of design criteria that were shortlisted for the purpose of designing rural public spaces (Figure 1). Subsequently, focus groups were conducted in the local community to gather information on the social needs of the elderly population regarding the utilization of public spaces. The aim of these focus groups was to elicit valuable insights and perspectives from the participants. The social needs expressed by the elderly participants during the focus groups were then compared to the list of design criteria identified from the literature review. This comparative analysis enabled the determination of the criteria that are applicable to the specific rural public space, particularly within the context of the Chinese rural community. The research methodology involved qualitative analysis, which combined a comprehensive literature review and focus group interviews. NVivo 10 was used as the qualitative data analysis software.

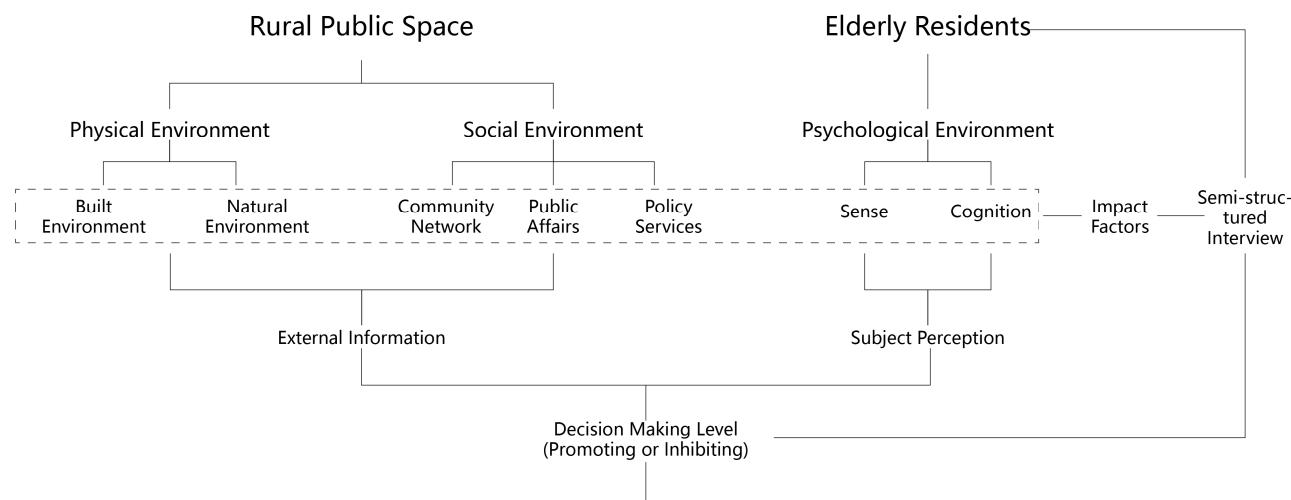


Figure 1. The research framework.

3.1. Field Research

Located in the Jinshan District, Xiafang Village is a rural area situated on the outskirts of Shanghai. The village is characterized by a significant and continually increasing elderly population, which has been residing in the local community for an extended period. According to data from the “2022 Statistics on demographics and programs of senior citizens in Shanghai”, individuals aged 60 and above in Jinshan District account for 35.6% of the total population in the region. Furthermore, the proportion of elderly people aged 65 and over account for 27.9% of the region’s total population, while those aged 80 and over account for 15.6%. These statistics place Jinshan District in the first position among all districts in Shanghai in terms of both indicators. These findings highlight the gradual and rapid growth of the elderly population in Jinshan District. Consequently, Xiafang Village, located in Jinshan District, was selected as the research area for this study (Figure 2).



Figure 2. Location of Xiafang village.

Xiafang Village is situated in the southeastern part of Fengjing Town, covering a total area of 3.185 square kilometers. This area includes approximately 184.60 hectares of cultivated land. The village is surrounded by densely built-up urban areas. Shanghai city center is merely 50 km away from the site, exerting a significant influence on the surrounding region. In the northwest direction is Suzhou City, while Jiaxing City lies to the southwest. Although the surrounding areas are highly developed urban regions, Xiafang Village itself has not undergone extensive development. It remains in a rural area with a low-density population. Currently, there are 595 registered families in the village, totaling 1923 residents. The majority of the population in this area consists of individuals aged 50 and above.

Based on previous literature analysis and field investigation of Xiafang Village, this study reveals a significant gap between the current design of public spaces in Xiafang Village and the advocated standards of age-friendly communities in the literature (Figure 3). This gap is mainly manifested in the following aspects: abandoned land and buildings, the decline of public space, the singleness of entertainment options, lack of facilities and amenities, neglect of the universal design, and loss of rural aesthetics and culture.

Xiafang Village has abandoned land and buildings, which not only wastes land resources but also contributes to a reduction in public spaces. This can potentially have negative impacts on the community life of older adults, as they require sufficient public spaces for activities and social interactions. Insufficient quantity and quality of public facilities such as squares and community centers may restrict the scope of activities for older adults and weaken their community engagement (Figure 4). Furthermore, public amenities and conveniences in Xiafang Village are limited. For instance, the scarcity of public restrooms, seating areas, and shaded spots may impede outdoor activities for older adults. Universal design, which considers the needs of all users, including older adults and individuals with disabilities, is often overlooked in the public spaces of Xiafang Village. This oversight can pose challenges for older adults' mobility and engagement in activities. On the aspect of local culture, the rapid development of new rural construction neglects architectural culture and rural aesthetics. By imitating urban development patterns, the rural environment tends to become more urbanized, losing its original characteristics. Whether these issues impact the community engagement of the local elderly population should be further validated through subsequent interview processes.

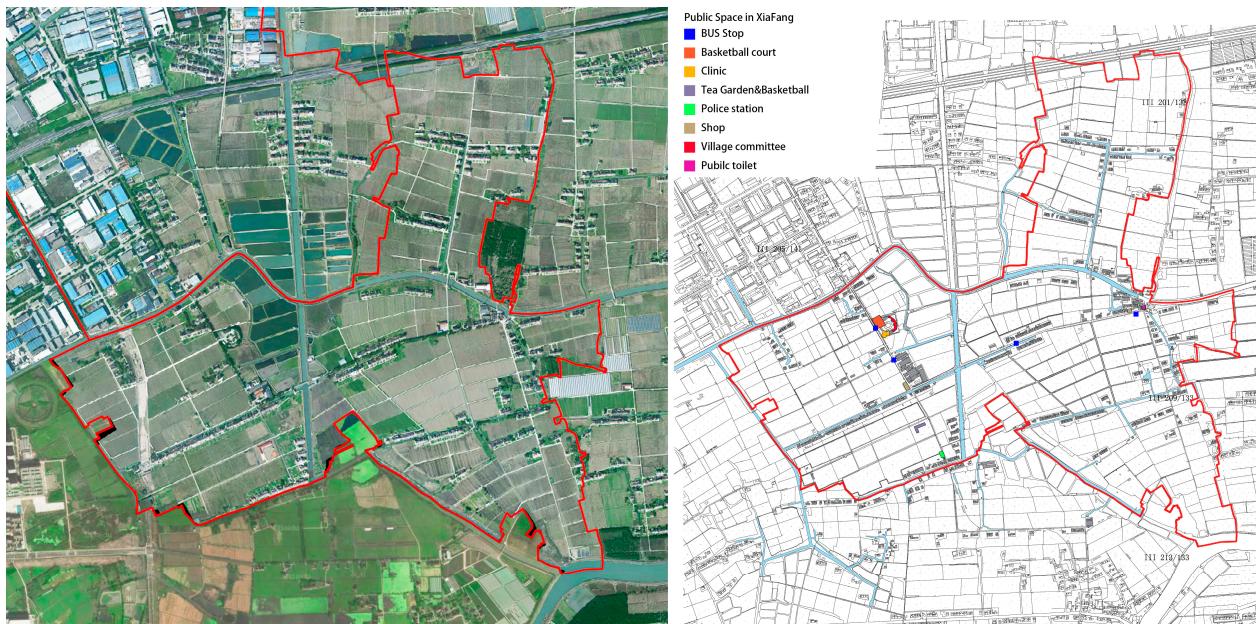


Figure 3. Current distribution status of public spaces in Xiafang.

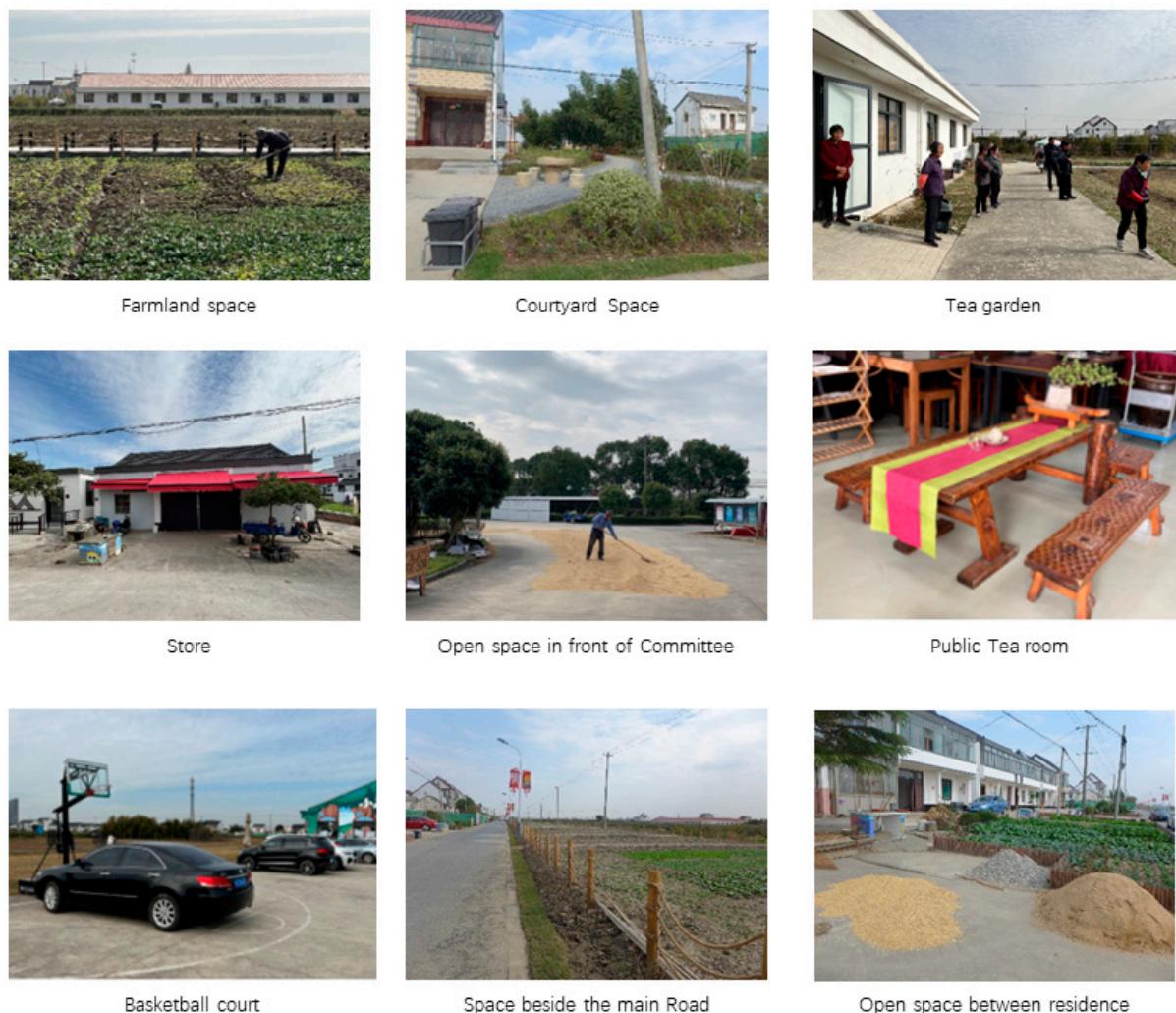


Figure 4. Types of rural public spaces in Xiafang.

3.2. Semi-Structured Interviews

The focus group interviews were conducted at the Elderly Activity Center in Xiafang Village, located in Jinshan District. The age range of the interviewees was between 51 and 90 years. The participants were local residents who have been living in the area for a minimum of five years, which has given them a deep understanding and experience of the local culture and community. Their experiences and feedback were crucial to this study as they could provide profound insights and understanding of the local community. Additionally, they could share their experiences and stories, which were highly valuable to the researchers. Their participation helped the researchers gain a better understanding of the needs and challenges of the local community and provided useful recommendations and guidance for its development.

The design of the focus group interviews consisted of two parts. The first part focused on gathering basic information about the participants, including their gender, age, education level, and frequency of visits to outdoor public spaces within a week. The second part comprised six open-ended questions that were posed to the interviewees. These questions were derived from the literature review conducted earlier and covered various aspects such as the physical environment, the social environment, and the psychological environment.

Physical environment factors encompassed two questions: What types of outdoor spaces do you prefer for engaging in activities? What factors in the outdoor environment impede your ability to go outdoors?

Social environment factors encompassed the following questions: What are your specific social needs? What types of social activities do you frequently engage in, such as socializing, pursuing interests, education, or work-related activities?

Psychological environment factors included the following: What negative emotions and feelings arise in your daily life? What obstacles and difficulties do you encounter in your life?

4. Results

The focus group interviews were conducted by the researchers over three sessions between October 2022 and March 2023. The interviews took place at the Elderly Activity Center in Xiafang Village. A total of 41 individuals participated in the interviews, out of which 5 were deemed invalid as they did not submit their answers to the interviewer; thus, there were 36 valid participants. The personal information of these 36 participants was collected and documented in a spreadsheet. These details served as the basis for further analysis and research. Table 1 shows the personal characteristics of the focus group participants:

Table 1. Personal characteristics of the focus group participants.

Gender	
Male	23
Female	13
Age	
51–60	13
61–70	15
71–80	6
81–90	2
Education level	
Elementary school and below	12
Middle School	19
High School	5
University and above	0
Frequency of going out to public spaces within the village	
Will go often (more than 5 times in a week)	26
Occasionally go (3–5 times in a week)	7
Seldom go (less than 3 times in a week)	3
Never go	0
Total respondents	36

The results of the three focus group sessions were recorded, transcribed, and reviewed prior to being coded by NVivo. Transcription of the interviews imported into NVivo was performed manually. In the NVivo tool, frequently occurring words from each interviewee's material were extracted and used to form nodes. Each node was distinguished from each other without redundancy, and these nodes had corresponding frequencies of occurrence in the interviewees' responses. These nodes were then categorized into three themes in Table 2: (1) physical environment, (2) social environment, and (3) psychological environment.

Table 2. Common answers from the elderly to each question (as indicated in representative statements).

Framework	Main Category	Subcategory	Representative Statements
Physical Environment	Environmental Quality	Environmental Safety	A02: Some areas accumulate water on rainy days, so you need to be careful when riding an electric scooter. A08: I always carry a flashlight when going out at night, otherwise, it's hard to see the road.
		Ecological Environment	A05: The village organizes a river protection team that helps clean up the garbage in the canal. A02: I hope the environment in the village becomes more beautiful to improve the quality of life.
	Facility Support	Recreational Facilities	A05: Previously, the canal next to my house used to emit a foul smell, and I couldn't fetch water from it to wash clothes. Now it's cleaner than before. A10: I'm getting old, and I usually have nothing to do, so I play cards to pass the time.
		Convenience Facilities	A09: I planted flowers in my own yard and received praise from the village leaders. Many neighbors come to visit me. A14: Since I retired, I have too much time on my hands, and I don't like anything else, so I enjoy playing Mahjong.
	Community Networks	Service Facilities	A07: I come here every day to play cards. My friends come at fixed times. A11: Besides the activity room in the village, there is nowhere else to spend time.
		Neighborhood Interactions	A14: During the rainy season in Shanghai, when it rains continuously, I don't feel like going out. The rainy weather gives a gloomy and humid feeling, with slippery roads and a gray sky, which makes me tired and uncomfortable. A03: When I go out in the evening, I bring a chair and chat with neighbors by the riverside.
Social Environment	Community Integration		A16: I cook for myself every day. I wish there was a canteen in the village that could provide meals for us. A20: I need someone to take care of me and help me with daily life issues.
			A19: I have a good relationship with my neighbors. They often share the vegetables they grow with me. A24: When cooking, we wash vegetables together in the open space in front of our houses and chat.
	Social Participation		A17: I am familiar with the people around me, and everyone is willing to help each other when there is something to do. A13: Sometimes when I meet people on the road, I stop and chat.
		Agricultural Production	A15: If I have nothing to do in the afternoon, I go outside and sit, observing what others are doing. A23: When I go to the grocery store to buy things, I chat with the shop owner. A07: Besides the activity room in the village, there is nowhere else to spend time.
			A16: I often help pick tea leaves in the village tea garden. I have gotten used to it, and it's boring to stay at home without anything to do. A13: I can grow my own vegetables in the space in front of my house. The vegetables bought from outside are all sprayed with pesticides, so I prefer to grow my own for peace of mind. A18: I dry rice on the square in front of the village committee. I also sell it to earn some money. A24: If my health allows, I would love to continue doing this. If I can't manage it anymore, then I won't.

Table 2. Cont.

Framework	Main Category	Subcategory	Representative Statements
Social Environment	Call To Action	Social Participation	Participation In Affairs A28: The village committee organizes activities, and party members are expected to take the lead in participating. A05: I join the river cleaning team to make my living environment more enriched.
		Physical Media	A10: Community staff come to our homes to promote activities and encourage us to participate.
		Virtual Media	A32: When I see many people gathering together, I want to go and see what's happening. A32: We receive notifications in our mobile group chat.
		Emotional Belonging	A29: The public account shows the latest community activities, and after seeing them for a while, I feel motivated to participate. A32: I often go for walks outside, helping my daughter take care of her children.
	Place Attachment	Psychological Dependence	A27: My son wants me to move to the city, but I don't know anyone there, and I don't know if there are people to play cards with. I'm used to living here. A24: When I go to the grocery store to buy things, I chat with the shop owner.
		Information Acquisition	A34: Young people are busy, but they occasionally come to visit me. I always feel happy when they come.
		Behavioral Preferences	A26: Now the village committee invites us to their place for activities. A27: Using a mobile phone is convenient. I look at it, watch short videos, and find it interesting. A17: Occasionally, I watch TV news.
		Skill Learning	A25: I can't read, and I don't like reading newspapers. A18: I have difficulty walking, so I go out less and rest at home. A31: We don't have much education, so living an ordinary life is enough. I don't want to bother anymore. Now I just enjoy my retirement. A23: Occasionally, there are open classes on gardening and art-related topics in the village. I think learning something new can enrich my life. A20: I don't know how to use a mobile phone now, and I face many difficulties in daily life.
Psychological Environment	Environmental Perception	Improving Quality of Life	A18: I want to grow some vegetables myself. In case the market closes and I can't buy vegetables, I can still eat what I grow. A16: Other people have renovated their walls, and I feel like I should also renovate mine to make it look newer.

This study employed a grounded analysis of the elderly population in Xiafang Village, Shanghai, to explore the factors influencing community engagement in rural public spaces and develop a corresponding theoretical model. The research identified eight main categories and 17 sub-categories that together contribute to the impact of rural public spaces on the community engagement behavior of older adults. These categories are as follows: Physical environment, including environmental quality and facility support. Social environment, including community networks, social engagement, and call to action. Psychological environment, including place attachment, environmental perception, and self-transformation.

Based on the aforementioned findings, this study conducted an in-depth analysis of the underlying logic among the three major influencing factors. By retracing the research theme and interview data, a model of influences on community engagement among rural elderly populations was established (Figure 5). The subsequent analysis focused on elucidating the sub-factors within the dimensions of the physical environment, social environment, and psychological environment. Furthermore, it investigated how these three dimensions interact and collectively encourage the willingness of older adults to participate in community activities.

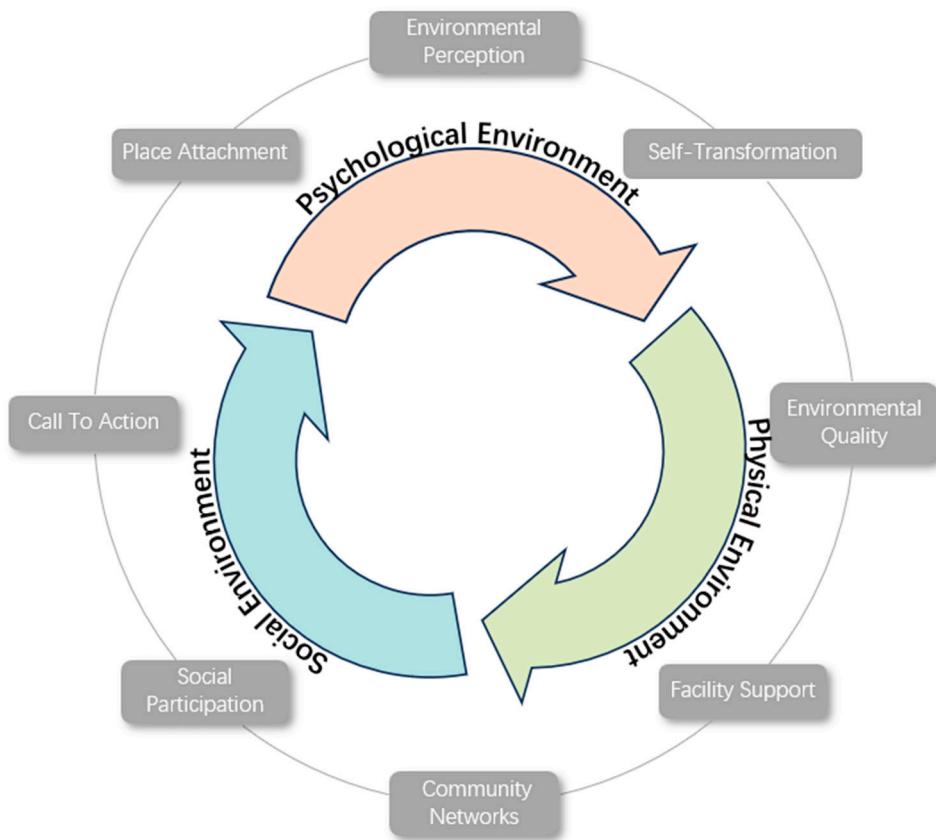


Figure 5. Model of influences on community engagement among rural elderly populations.

4.1. Generating a Model of Rural Community Engagement—An Ecological Perspective

Communicative ecologies encompass a holistic perspective on communication within and between groups, rather than focusing solely on individuals or single communication channels. The use of the term “ecology” aims to understand the interactive dynamics of interconnected populations in a broader communication domain. Therefore, the research perspective of communicative ecology theory does not limit its analytical scope to traditional print, broadcast, and telecommunication media. It also includes social networking applications used for peer-to-peer communication, transportation infrastructure enabling face-to-face interactions, and public and private spaces where people meet, chat, and engage in informal conversations.

According to Hearn and Foth, communicative ecologies consist of three levels. The technological layer comprises devices and media technologies that enable communication and interaction. The social layer encompasses people and social patterns, describing the social relationships of diverse participants and the social institutions and structures that connect them, including informal groups, formal community organizations or companies, and legal entities. The discursive layer pertains to the actual content of communication and interaction among humans, between humans and their environment, and among individuals, reflected in narratives, understandings, beliefs, and symbols manifested in concrete practices [53].

In the field of user psychology, Fogg's model provides a specific expression of communicative ecology. According to Fogg's model, for individuals to engage in a target behavior, they must be sufficiently motivated, possess the ability to perform the behavior, and be triggered to do so [54]. Motivation provides a reason for people to engage in specific behaviors. Motivation can be intrinsic, such as a sense of accomplishment, or extrinsic, such as receiving a material reward. To increase the frequency of a particular user behavior, in addition to having the motivation to complete the task, you need to make sure that the user is capable enough to do it; the whole process can be complex, but each part needs

to be simple and easy to follow. Increased motivation and ability can only increase the likelihood of the user producing the behavior; whether the user's behavior will eventually really happen also depends on whether the appropriate trigger conditions are provided. This can be a push, a message alert red dot, or an advertisement. Fogg's model focuses on strategies to encourage people to adopt desired behaviors [55]. In the case of older adults, age-related physical decline can significantly impact their ability to maintain optimal behavioral capabilities and reduce their willingness to engage in travel [35]. Tasks that may be straightforward for younger individuals can become challenging for older adults due to these physical limitations. Additionally, illnesses can further diminish older adults' independent mobility. When the ability of individuals to perform a behavior falls below expectations, the physical and social environment should provide them with adequate support.

This research combined the concept of an age-friendly community from the WHO to further deepen and develop Quebec's research model by using the psychological, physical, and social environments as the basis of the study. It was linked to communication ecology through fieldwork and interviews to deduce that community engagement is a complex process influenced by integrated environmental factors. The study found that the physical, social, and psychological environments in rural areas are intertwined, and the community engagement of rural residents, particularly the elderly, is a complex process formed by the interplay of various communication factors. In addressing the topic of community engagement among elderly populations in rural areas, building upon the identified main categories from previous discussions, this study extended further by adopting a communicative ecology approach. It combined the technological layer, social layer, and discursive layer with the categories selected through field surveys, establishing a physical–social–psychological composite environment where spatial support, communicative triggers, and symbolic identification interact and mutually influence each other. The study developed an influence model of the composite environment on community engagement for the elderly, with the physical, social, and psychological dimensions as the foundation (Figure 6).

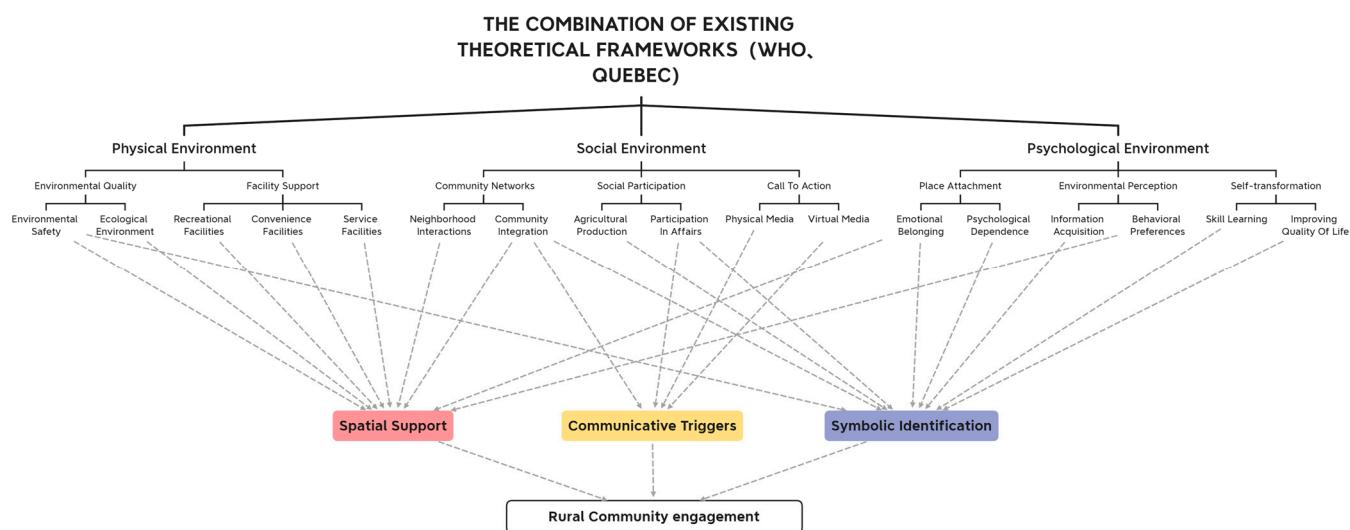


Figure 6. Physical–social–psychological composite environment.

Spatial support: Ensuring that rural older adults have the physical infrastructure and resources necessary for participating in community activities, enhancing their capacity to engage in specific behaviors. This can include providing easily accessible venues, convenient transportation options, and necessary facilities and equipment, as well as reducing or eliminating physical barriers in the environment to help them enhance their ability to participate in community activities.

Communicative triggers: Constructing community networks and interpersonal connections at the social level to create triggering factors that stimulate rural older adults' engagement in community activities. Triggers can take various forms, such as verbal invitations, visual cues, advertising, etc., to attract people's attention and stimulate their interest. This can involve regularly organizing community events, sending invitations or notifications, providing personalized invitations and reminders, as well as establishing social connections and interactions to make individuals feel invited and encouraged to participate.

Symbolic identification: Establishing symbolic identification among community residents through slogans, stories, beliefs, culture, and ideas in the discursive layer of the rural community. Symbolic identification plays a crucial role in inspiring and sustaining people's motivation to participate and can contribute to enhancing the willingness of the older population to engage in community activities.

Indeed, it is important to note that there is a reciprocal relationship between spatial support, communicative triggers, and symbolic identification. Symbolic identification can influence individuals' perception of and need for the behavioral capacities and social resources required for specific activities, thereby influencing their demand for spatial support and communicative triggers. Spatial support can trigger participation by providing physical spaces and facilitating conditions, while communicative triggers can stimulate individuals' willingness to participate by providing information and opportunities that align with their identification. The interplay among these three factors provides support and impetus to individuals' motivations, facilitating the implementation of specific behaviors and ultimately contributing to the construction of a composite environment for community participation.

4.2. Spatial Support: Localized Physical Infrastructure as a Guarantee for Community Engagement

Spatial support refers to the idea that having appropriate physical infrastructure in a specific locality can serve as a foundation for fostering community involvement and participation. The physical environment and infrastructure within a community play important roles in rural life. It includes facilities, amenities, and resources that are localized and readily accessible to community members. These resources are strategically placed within the community, considering the needs and preferences of its residents. The infrastructure is designed to be easily accessible, convenient, and relevant to the community's characteristics and aspirations. Having localized physical infrastructure, the community is provided with opportunities and platforms for engagement and interaction. When residents have access to essential facilities and resources within their immediate surroundings, it becomes easier for them to participate in community activities, collaborate with fellow residents, and contribute to the overall well-being of the community.

The construction of the new countryside greatly improves the physical environment of the countryside, and the construction of various infrastructures can meet the daily living needs of the villagers. For the elderly population in rural areas, the construction of infrastructure has become the foundation of spatial support. Various service facilities can encourage the elderly to leave their homes and participate in various community affairs and activities. Our research found that rural construction sacrifices the local ecological environment to a certain extent, and the quality of the built environment still needs to be improved; among them, environmental safety and ecological environment are the two most important factors.

In built environments, the safety of elderly people's travel is particularly important and requires the environment they use to provide safe protection for the various activities they engage in, such as walking, chatting, gathering, etc. Walking is an important part of the daily life of the elderly, and it is of great significance for their physical health and social participation [35]. The paving of sidewalks is directly associated with pedestrian road safety, as worn-out or narrow sidewalks can attract pedestrians to walk off the sidewalks and on the lanes [56]. In regions with aging populations, pedestrians experience an increase

in perceptual and response time due to the deteriorating physical conditions associated with aging [57]. Factors such as road gradient, road surface material, and lighting facilities have the potential to influence the safety and comfort of walking for older adults.

Following municipal engineering projects such as road and river hardening, the ecological environment in rural areas has experienced a certain degree of degradation. Nevertheless, research indicates that the preservation of river green spaces makes a positive contribution to the quality of life for rural communities and the local elderly population [58]. The reduction in river green spaces has led to a weakening of the natural purification capacity that was originally present in the rural environment. People living in rural areas have traditionally relied on rivers or well water for activities such as washing vegetables or doing laundry. However, the current ecological conditions have forced them to adapt their lifestyles.

The physical environment in rural China serves as the foundation for social life, and community engagement among elderly residents is predominantly manifested through informal daily practices. These practices include socializing, gathering for discussions, and participating in collective recreational activities. The elderly are often drawn to social activities occurring within the physical space, which in turn sparks their interest and encourages their active participation. This social engagement has partially positive effects on the interaction between the elderly and their environment, contributing to an enhanced quality of life for this demographic [59]. The interaction between the physical environment and the social environment has become crucial. However, existing designs of public spaces often overlook the specific needs of older adults, making it difficult to facilitate positive social interactions. These factors can significantly impact the social activities of the elderly, thereby affecting their community engagement and quality of life.

Furthermore, recreational activities can offer a diverse range of choices for older adults. It is important to establish recreational facilities in rural areas to provide them with a more enriching leisure life. This can alleviate potential psychological health issues among the elderly and foster a sense of community and neighborliness.

Having localized physical infrastructure can foster a sense of place and belonging, as well as encourage social interaction and cohesion. It allows community members to come together, share experiences, build relationships, and collectively address local issues and concerns. Additionally, such infrastructure can serve as a catalyst for organizing events, workshops, and programs that promote community engagement, learning, and cultural exchange. The spatial support highlights the significance of having well-planned and localized physical infrastructure as a means to ensure community engagement and active participation. By providing the necessary resources and spaces, communities can strengthen their social fabric and create an environment that encourages collaboration, empowerment, and a sense of ownership among its members.

4.3. Communicative Triggers: Community Support Networks Reshaping Community Cohesion

Communicative triggers refer to the concept of utilizing effective communication strategies and support networks within a community to enhance and transform the overall sense of togetherness and unity among its members. In this context, communicative triggers are the various forms of communication, such as verbal or written messages, actions, or events that initiate or prompt a response or interaction within the community. These triggers can be intentional or unintentional and play a crucial role in shaping community dynamics. By leveraging effective communicative triggers and utilizing community support networks, the aim is to foster a greater sense of unity, cooperation, and mutual support among community members. This can lead to increased social integration, improved problem-solving capabilities, and a shared responsibility for the well-being of the community as a whole.

China's rural areas, as unique social units, are characterized by a pattern of close-knit relationships known as the rural acquaintance network, which collectively forms the rural community [60]. However, under the guidance of China's new urbanization

policy agenda, rural areas are encountering the “machine age”, with a large influx of factories, warehouses, logistics, and other industries penetrating deep into the countryside. Additionally, migrant workers from outside the villages are also pouring into rural areas. These developments have gradually eroded the once stable social connections among villagers, thereby posing significant challenges to the psychological understanding of the rural community. In the context of the modernization and transformation of rural society, it is crucial to pay attention to the new opportunities for community reconstruction through community support networks amidst the changing social and psychological environment. This includes community networks, social participation, and a call to action.

Firstly, neighborly interactions are crucial for mutual communication and cooperation among community residents, forming the essential fabric of the community. For the elderly population, neighborly interactions serve as important avenues for establishing community connections and integrating into the community network. Social interaction is beneficial for the elderly as it helps decrease the impact of loneliness and depression [61]. Neighborly interactions provide opportunities for socializing and engaging in activities in daily life, fostering social interactions, strengthening social support networks, and enhancing overall quality of life and well-being.

The elderly typically have deep social networks and close interpersonal relationships that provide them with emotional support and fulfillment. Rural areas need to provide public spaces to promote interpersonal interactions and support the elderly in gaining a sense of belonging and identity within the familiar rural environment. The results illustrate the importance of social connections and familiarity for the elderly in rural communities. Creating opportunities for social interactions and fostering a sense of community can contribute to their well-being and provide a support system within their local environment.

Secondly, information access and mobilization of action within the community serve as triggers for community engagement. Invitations from friends or neighbors increase the likelihood of older adults participating in activities [62]. The widespread adoption of mobile internet and digital technology enables older adults to easily access various types of information, including news, entertainment, and health knowledge. Rural areas should provide multimedia devices and accessible channels for older adults to read, watch, and listen to information. This helps them stay updated, understand social dynamics, and better adapt to and comprehend the current era.

Community actions also play a significant role in triggering citizen participation. For example, gardening helps older adults maintain physical health while promoting neighborhood relationships [63]. Social participation encompasses agricultural production and public affairs. Agriculture, as one of the traditional industries in rural areas, still holds a crucial position in contemporary rural society. In the psychological understanding of older adults, agricultural cultivation is seen as a part of their lives, with vegetable gardens and yards behind their houses where they grow vegetables. Even though standardized farming practices are now implemented, it is a continuation of their lifestyle habits.

Communicative triggers highlight the importance of effective communication and the role of support networks in bringing about positive change and enhancing community cohesion. By actively engaging in communication and leveraging available resources, communities can create a stronger sense of belonging, collaboration, and cohesion.

4.4. Symbolic Identification: Environmental Perception and Symbolic Identification Facilitate Community Integration

The way individuals perceive and identify with their environment plays a significant role in promoting community integration and a sense of belonging. Symbolic identification refers to the process through which individuals establish a connection and affinity with their surroundings based on symbolic meanings and associations. It involves the interpretation of physical spaces, landmarks, cultural elements, and shared symbols within the community.

With the accelerating process of urbanization in China, the urbanization and atomization of rural residents have become challenges for community participation in rural

communities. Place attachment, environmental perception, and self-transformation are crucial for establishing psychological identification of the elderly population with physical spaces.

Emotional needs, such as a sense of belonging and attachment, are fundamental psychological requirements that are manifested within familiar physical environments. Place attachment is particularly significant for older individuals and can contribute to their longevity [64]. The physical spaces in rural areas hold their life stories and memories.

At the perceptual level, older adults can perceive environmental changes through convenient information channels. Their perception of the environment can influence their behavioral preferences and health status. Specifically, older adults have reported worse health statuses when they hold more negative perceptions of water and soil environments in their communities [65]. The cognitive abilities of older adults tend to decline with age. In public spaces, a higher density of community activity centers (providing opportunities for entertainment and social activities), proximity to public transportation, and well-maintained public spaces in affluent communities can improve older adults' cognitive functioning or slow down cognitive decline [66]. When various material and social resources within the community are easily accessible, older adults can maintain their cognitive levels through more extensive and frequent perceptual activities [46]. Additionally, reducing visual confusion and inconvenience during usage can be achieved through the use of strong colors and contrasts for the elderly [47]. Pleasant sounds are also believed to have a positive impact on the perceptual behavior of older adults [48].

At the level of self-enhancement, older adults can achieve positive aging goals by learning new skills. In rural communities today, various initiatives have been implemented to support older adults in learning new skills, including literacy classes, calligraphy, painting, and other courses. These programs aim to help older adults broaden their interests, enrich their retirement lives, and promote active aging. It is worth mentioning that older adults in rural areas tend to take spontaneous actions to transform their living environment in order to enhance their quality of life. For example, they may decorate their gardens, paint walls, or build sheds to improve their living conditions.

Symbolic identification suggests that when individuals have a positive and meaningful perception of their environment and can symbolically identify with it, community integration is facilitated. When people perceive their surroundings as attractive, welcoming, and representative of their values and aspirations, they are more likely to engage with their community and form social connections. Symbolic identification and environmental perception contribute to community integration by fostering a shared sense of identity, pride, and ownership among community members. When individuals feel a sense of belonging and attachment to their environment, they are more motivated to actively participate in community life, collaborate with others, and contribute to the overall well-being of the community.

5. Discussion and Conclusions

Community engagement is an essential component of civil society. In the face of the widespread issue of weak participation in rural communities, this study re-examines the factors influencing community engagement from the perspective of age-friendly design. Based on a field survey conducted in rural areas of Shanghai, China, employing the research methodology of grounded theory, the results reveal that physical, social, and psychological factors all have an impact on community engagement among rural residents. Specifically, environmental quality, facility support, community networks, social participation, call to action, place attachment, spatial perception, and self-transformation are identified as the core elements that significantly influence community engagement among rural residents. From the theoretical perspective of communication ecology, our study further reveals that the multiple factors influencing community engagement among rural residents are complex and interdependent rather than operating independently. Physical and social factors intertwine to form the technological level, where spatial support serves as the

infrastructure guarantee for community engagement. Social and psychological factors intertwine to form the social level, where communicative triggers manifest as the promotion of community relationships through supportive networks. Psychological and physical factors intertwine to form the discursive level, where symbolic identification acts as a discursive factor influencing community integration.

According to research-based evidence on age-friendly communities [67,68], these findings emphasize the importance of age-friendly ecosystems designed to meet the needs and preferences of older adults. It is evident that when ecosystems are designed to be inclusive, participatory, and collaborative for older adults, they can enhance their community engagement. However, there is still a lack of a comprehensive understanding of citizen community engagement from the perspective of communication ecology. This study, through the analysis grounded in theory, discovered the influence of physical, social, and psychological factors on community engagement. To some extent, communities may become more elder-friendly by making thoughtful use of existing resources. This aligns with the emphasis on environmental quality and facility support as physical factors in this study. The relationship between environmental issues and aging has become an important domain in the design of age-friendly environments [69]. Furthermore, a sense of community belonging is an emotional state of individual integration into the community, and attachment to the physical place plays a significant role as an emotional motivation for community engagement. Additionally, social factors such as social relationship networks reflect the social support for older adults' community engagement. Previous research has indicated that living in a community environment characterized by weak social relationships and distrust hinders community engagement by community members [70].

Building on previous research, this study further advances our understanding by revealing that the factors influencing community engagement actually interact in a complex and intertwined manner. The factors of community engagement effects cannot be comprehended on their own while disregarding the influence of other factors. Spatial support, communicative triggers, and symbolic identification, respectively, operate at the technological level (physical–social factors), social level (social–psychological factors), and discursive level (psychological–physical factors) to promote community engagement among older adults.

Citizen participation is an important indicator of community cohesion. However, this behavior is the result of multiple factors working together. Understanding community issues from the perspective of communication ecology has been applied in various studies on older adult health and hygiene, emphasizing the role of the community's physical, social, and digital environments, as well as their supportive infrastructure, in active aging [71–73]. In the context of active aging, we believe it is necessary to connect the discussion with the concept of "communicative villages" by breaking down the isolation between the physical, social, and psychological environments. By gaining a deeper understanding of the diverse needs of rural older adults that have been obscured, and by understanding the forms of social participation to achieve inclusive civic life, it is crucial to take the next steps of linking environmental, social, technological, and symbolic identification practices together to create a holistic system that supports the quality of life of older adult citizens. This calls for further interdisciplinary research and exploration.

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

Funding: Supported by the Chenguang Program of Shanghai Education Development Foundation and Shanghai Municipal Education Commission, grant number 23CGA27.

Institutional Review Board Statement: For the questionnaire survey and interview included in this research, the Ethics Committee or Institutional Review Board approval is not required under the

national laws. According to the Chinese laws, only the human biomedical research should be proved by Committee of Medical Ethics Experts at local or national levels. "Ethical Review of Biomedical Research Involving People" promulgated by National health and family planning commission in China can be regarded as the reference. In this research, all participants are fully aware that anonymity is assured, the reason why the research is conducted, how their data will be used and there are not any known risks associated. Participants' consent to take part in the research has been obtained prior to the commencement of the study.

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

Data Availability Statement: Data are contained within the article.

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

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