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Research on Urban Furniture Design in Communities from a Health Promotion Perspective

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Abstract

Objective: This research applies the conception of health promotion to the design of urban furniture for communities, which provides specific research methodologies for future urban furniture design. **Methods:** This paper uses the hierarchical analysis method to study the elements of urban furniture design in communities from a health promotion perspective, and establishes an indicator system consisting of three criteria and eleven sub-criteria based on previous research findings from both domestic and international sources. **Result:** The highest weighting of the criteria tier was given to "Physiological Health Needs" at 42.806%, followed by "Mental Health Needs" at 29.276% and "Social Health Needs" at 27.913%. Under the respective criteria, "Physical Exercise Function" for Physiological Health Needs, "Stable Structure of Facilities" for Mental Health Needs, and "Communication Sitting Facilities" for Social Health Needs were the most critical indicators. Their weighting was 12.284%, 11.121%, and 11.747%, respectively. **Conclusion:** Based on the study's findings, a proprietary urban furniture health promotion model has been developed to help enhance and optimize urban furniture design in communities.

Keywords

Health Promotion, Community, Urban Furniture, Hierarchical Analysis

1. Background

The report of the 20th National Congress of the Communist Party of China in 2022 called for giving development strategic priority to protecting the life and health of individuals. In 2016, the Central Committee of the Communist Party of China and the State Council put forward a strategy to develop the whole people's lives and health and to promote the construction of a healthy China in Tutorial for Outline of the Healthy China 2030 Plan, reflecting the great concern of the country for the health of its people. In the process of urbanization, people have gradually developed a lifestyle of gathering as a community. As a result, communities and the interaction networks that exist within communities have a significant impact on human health.

The acceleration of industrialization and marketization, coupled with the development of cities, has led to an increase in the urban population and expansion of urban land. Within this particular context, communities are additionally subject to various issues, including but not limited to inadequate public space, a scarcity of green areas for leisure activities, and a dearth of facilities for convenient services, which have a notable impact on residents' physical and mental well-being. Communities consist of numerous interconnected and interdependent units that interact with one another. Urban furniture plays a crucial role in the provision of services within the public space of a community, either as a standalone feature or in combination with other amenities, forming an interconnected network (Hu Ying & Huang Kangmin, 2020). Urban furniture plays a role in enhancing the quality of community spaces, shaping their vitality, and stimulating people's behavior and activities at a relatively low cost (Zhan Hua-

shan, 2021), so it is necessary to study urban furniture design in communities from a health-promoting perspective.

2. Conceptual Discernment

2.1 Health Promotion

2.1.1 Timeline of Development

The concept of health promotion was first introduced by Winslow in 1920 (WINSLOW, 1920) advocating health education and policies to counteract disadvantages and promote a healthy standard of living. Since then, until 1970, health promotion was mainly applied within the realm of public health as a primary and complementary tool to the medical process, including "disease prevention," "disease recovery," and "health maintenance." Between the 1970s and the 1980s, health promotion was separated from disease treatment and gradually developed into the field of behavioral science. Research has shown that health can be promoted by improving behavior and lifestyle during this time. From the 1980s to the 2000s, health promotion evolved to the social and natural environment domain stage, suggesting that the synergistic improvement of the natural and social environment is conducive to health promotion. Research related to health promotion has begun to concentrate on the dynamic balance of concepts since the twenty-first century, and its exploration has shifted from policy theory to action implementation and practice (Zhang ZC & Liu R, 2023). The complete development timeline is shown in Figure 1.

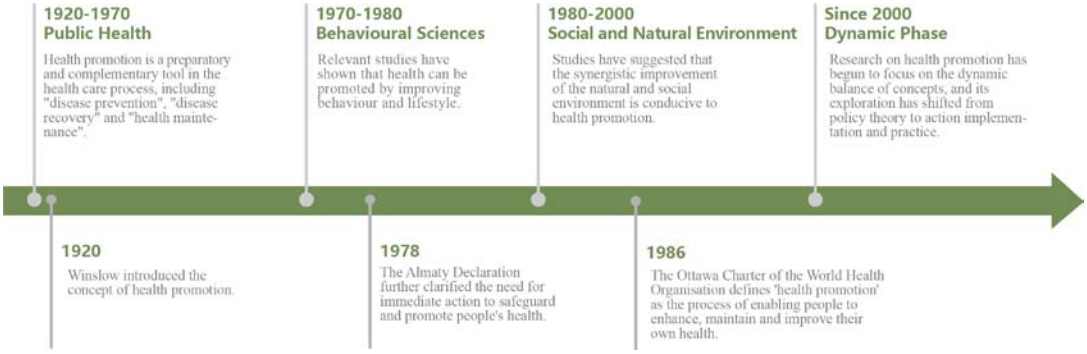

Figure 1. Timeline of Health Promotion Theory Development.

2.1.2 Health Promotion Strategies

The city of Ottawa hosted the inaugural international conference on health promotion on November 21, 1986. According to the Ottawa Charter of the World Health Organization, health promotion is defined as the process of enhancing individuals' capacity to manage their health. Health promotion is a process of enhancing, maintaining, and improving one's health to achieve physical, mental, and social well-being. In addition, the Ottawa Charter proposes specific measures for health promotion from different actors of implementation (including government, communities, families, and individuals): developing healthy public policies, creating supportive environments, strengthening community activities, developing individual skills, and reorienting health services. As shown in Figure 2. Among these, the creation of a supportive environment refers to the construction of an excellent social and natural environment, a physical environment, and the construction of a good social environment to achieve population health promotion, as well as strategies and measures that enable the design disciplines to achieve interventions to promote population health.

2.2 Urban Furniture

2.2.1 Overview of Urban Furniture

Urban furniture originated in Europe and is known as public amenities, street furniture, etc. It refers to the various types of 'furniture' placed in the 'urban living room,' i.e., the public space, including public seating, street lights, bus stops, signage, and litter bins. Urban furniture is an essential link between people and outdoor space and is a crucial point of contact with outdoor space. Its primary function is to provide usable facilities and enhance the comfort of being in an outdoor space, while its secondary function is to decorate the public space. At the same time, urban furniture constitutes a specific way for people to engage with public space - facilitating socialization and enabling a comprehensive utilization and experience thereof. Urban furniture can be divided into six significant

systems according to their functions: public services, public transport, information services, paving, public lighting, and traffic management (Bao Shidu & Shi Miao, 2019). Urban furniture is one of the most critical elements of the city that cannot be ignored. It not only features outdoor public spaces that bring convenience to everyday life but also facilitates people's social behavior and social activities in a specific way.

Figure 2. Health Promotion Strategies Proposed by the Ottawa Charter.

2.2.2 Existing Problems of Urban Furniture

Urban furniture is also evolving with the gradual development of cities, and this development is uneven in different countries. Due to the late start of industrialization in China, the current design and application of existing community public facilities must be improved. The urban furniture in communities, as urban furniture under a specific scope, usage scenario, and local population, is often added to the public space afterward, so there are some mismatches in the health perspective as well. Firstly, the facilities must inspire community residents to engage in healthy behaviors due to a mismatch between supply and demand, single forms, old functionality, and inappropriate size design. Secondly, the community's urban furniture cannot meet residents' individualized and diverse communication needs in the new era, which is not conducive to maintaining good interpersonal relationships between individuals and others and realizing their social roles. Thirdly, most of the urban furniture in the community is a mass-produced, mechanized product, and the different types of urban furniture need more relevance and lack artistry in terms of shape, structure, and color, and do not blend in with the community environment (Cai Yuchao & Zhang Jie, 2021).

3. Relationship between Health Promotion and Urban Furniture in Communities

3.1 The Inherent Logical Link

There is a particular logical relationship based on the aforementioned qualitative research of the theoretical evolution of health promotion and community's urban furniture and its relevance that was done above: health promotion is the design approach and research perspective of this paper to introduce public health research into community space and to achieve improved and optimized. Since ancient times, people have developed a way of life in which they live and move around in communities. Communities and community interaction networks have a certain influence on human health. Urban furniture is an essential component of communities and can contribute to health promotion by stimulating people's behavior and activities at a relatively small cost. The logical link between health promotion, urban furniture, and community is shown in Figure 3.

3.2 Related Studies

In previous studies on health promotion, urban furniture, and community, Tian Li, et al., proposed that at the community level, accessibility to public facilities is a decisive factor in the "urban health model" (Tian Li, Li Jingwei, & Ouyang Wei, 2021). Liu Ruirui et al. proposed the design of public facilities under the concept of health from four design influencing factors: the nature of urban green space, the behavioral characteristics of recreationists, the level of technology and economic development (Liu Ruirui, Wang Fengzhen, & Wang Shuangquan, 2020). Zhong Lei, et al., proposed the design of public facilities under the concept of health from three aspects: safety,

interactivity and identity of public facilities based on the social needs of different groups of people with current case studies (Zhong Lei & Ma Kaixuan, 2022). Li Chunju, et al., proposed that the improvement of community health can be achieved by creating various types of spaces that support the occurrence of physical activities (Li Chunju, Wang Canyuan, & Jiang Shanni, 2022). These studies enriched the research on the community's urban furniture design from a health promotion perspective but needed more qualitative research. In addition, in recent years, most studies related to health perspectives have focused on the general direction of regional planning. However, there need to be more design studies that have been conducted in a concrete and in-depth direction for urban public facilities.

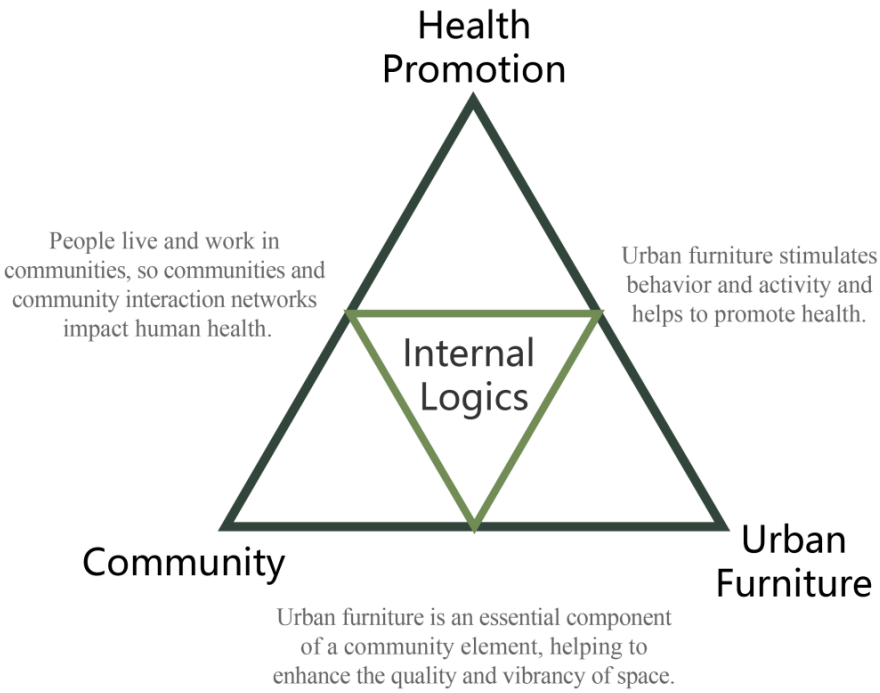

Figure 3. Logical Link between Health Promotion, Urban Furniture, and Community.

4. Methods

4.1 Connotations of Hierarchical Analysis

This study uses the hierarchical analysis method (AHP). Hierarchical analysis is a research method that enables complex decisions to be systematized. It can transform a multi-factor decision into a multi-level single-factor problem. The hierarchical analysis allows for a qualitative to quantitative transformation in problem-solving by analyzing and calculating the weights of different levels and elements and prioritizing them. It can be used to study the unstructured and multi-objective systematic evaluation of "user preferences for urban furniture design in communities from a health promotion perspective," to establish an evaluation system, and to specify the weighting of each demand preference characteristic to provide a basis for subsequent decision-making.

4.2 User Requirements Research and Analysis

The existing literature on community public facilities was analyzed and reviewed. Through a comprehensive analysis of the existing experience of using community public facilities from a health perspective, user interviews, field research, and brainstorming was conducted to understand user satisfaction with the community's urban furniture and the primary user needs for its design. After initial screening, removing the unreasonable ones and grouping the ones with similar content into large groups, the user needs were finally summarized using the KJ method, and all user needs could be roughly classified into three categories, namely physiological health, psychological health, and social health, with their specific user requirements and the way they work for health promotion summarized as shown in Figure 4.

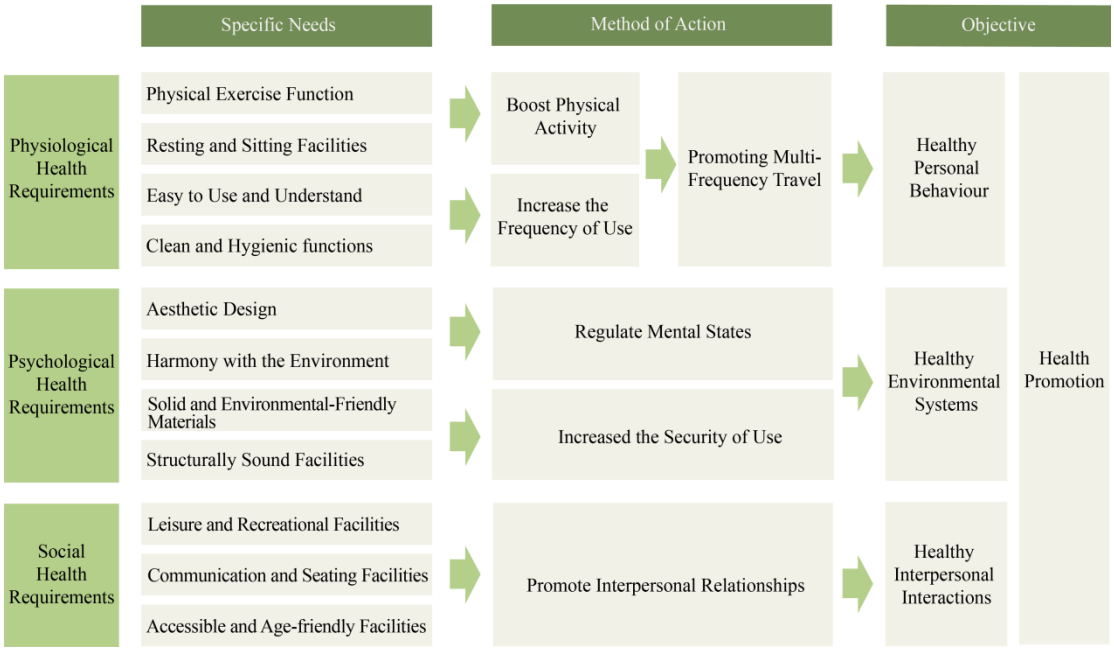

Figure 4. User Requirements from a Health Promotion Perspective.

4.3 The Hierarchy Model

With the hierarchical analysis method, the comprehensive needs of the research subjects were statistically and analytically analyzed. The results were transformed into a hierarchical model by combining the literature research with the following construction process: (1) the research objective - "Urban furniture in communities design from the perspective of health promotion," was set as the objective layer. (2) The categories of needs from the health promotion perspective - "Physiological health needs," "mental health needs," and "social health needs" - are set as the criterion layer, denoted by A_1, A_2, and A_3, respectively. (3) The specific user needs - "Physical exercise function," "Resting and sitting facilities," "Easy to use and understand," "Clean and hygienic functions," "Aesthetic design," "Harmony with the environment," "Solid environmental-friendly materials," "Stable Structure of Facilities," "Leisure and recreational facilities," "Communication and seating facilities," "Accessible and age-friendly facilities." are set as sub-criteria levels, which are represented by A_{11}, A_{12}, A_{13}, A_{14}, A_{21}, A_{22}, A_{23}, A_{24}, A_{31}, A_{32}, and A_{33} respectively. The construction of the hierarchical model was completed according to the above steps, which can be seen in Table 1.

Table 1. Hierarchy Table

Objective Layer	Criterion Layer	Sub-Criterion Layer
A Urban furniture in communities design from the perspective of health promotion	A_1 Physiological health needs	A_{11} Physical exercise function
		A_{12} Resting and sitting facilities
		A_{13} Easy to use and understand
		A_{14} Clean and hygienic functions
	A_2 Psychological health needs	A_{21} Aesthetic design
		A_{22} Harmony with the environment
		A_{23} Solid and environmental-friendly materials
		A_{24} Structural stability of facilities
	A_3 Social health needs	A_{31} Leisure and recreational facilities
		A_{32} Communication and seating facilities
		A_{33} Accessible and age-friendly facilities

4.4 Weight calculation and consistency test

Table 2. Scale of 9 Levels

Scale	Definition (compare indicator m with indicator n)
1	demonstrates that indicator m is as crucial as indicator n.
3	demonstrates that indicator m is slightly more crucial than indicator n.
5	demonstrates that indicator m is more crucial than indicator n.
7	demonstrates that indicator m is strongly more crucial than indicator n.
9	demonstrates that indicator m is absolutely more crucial than indicator n.
2, 4, 6, 8	The median of two adjacent judgments.
Countdown	Indicates that the scale value of indicator m compared to indicator n is equal to the inverse of the scale value of indicator n compared to indicator m.

In order to determine the importance ranking of each criterion level and sub-criterion level indicators to the overall objective, this study invites experts in the relevant fields to make a two-by-two comparison of the importance level of each indicator, assigning a score and constructing a judgment matrix depending on the AHP method's procedure. The scoring will be based on a nine-level scale in the hierarchical analysis method, see Table 2. Four judgment matrices will be constructed for each expert's scoring: I, II, III, and IV. I indicates the importance scale of criterion level A_i relative to target A. II, III, and IV indicate the importance scale of criterion level A_{ij} relative to target A_i. The constructed judgment matrix is normalized, the sum-product method is used to calculate the weight values for all the indicators concerning the overall objective, and a consistency test is carried out. If the CR < 0.10 passes the test, the data is reasonable. If not, it means the data is unreasonable and needs to delete. The results of the experts will be assembled using the calculation of the results, i.e., the judgment matrix of each expert will be calculated to obtain the ranking weights of each judgment matrix. Finally, use the average arithmetic method to calculate the total ranking weights.

$$\lambda_{\max} = \sum_{i=1}^{n} \frac{(AW)_i}{nW_i} \tag{1}$$

$$CI = \frac{\lambda_{\max} - n}{n-1} \tag{2}$$

$$CR = \frac{CI}{RI} \tag{3}$$

In the formula above, CI stands for the judgment matrix's consistency indicator; n stands for the judgment matrix's order, and $\lambda_{\max}$ is the judgment matrix's largest eigenvalue, RI stands for average random consistency indicator. Table 3 displays the values for the random consistency indicators.

Table 3. Average Random Consistency Index Values

Order	1	2	3	4	5	6	7	8	9
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45

5. Result

5.1 Sub-Criterion Layer Weighting

The above screening and calculations resulted in a summary of the weight values and priority ranking of the 11 indicators of "community urban furniture design in line with user expectations," as shown in Table 5. The highest weight in the guideline level is given to "A_1 physical health needs", with a weight of 42.806%; followed by "A_2 mental health needs", with a weight of 29.276%; followed by "A_3 social This indicates that in the design of community furniture for quick-fit cities from a health promotion perspective, the design criteria and elements of physi-

ological health, psychological health, and social health should be fully considered, but more often the design should be based on physiological health needs.

In the sub-criteria layer, physical exercise function > communication sitting facilities > ease of use and understanding > rest and sitting facilities > structural stability of facilities > accessibility and aging-friendly facilities > leisure and recreation facilities > cleanliness and hygiene functions > harmony with the environment > solid and environmentally friendly materials > aesthetic design. Under the respective criteria, "physical exercise function" for physical health needs, "structural stability of facilities" for mental health needs, and "communication sitting facilities" for social health needs are the most crucial demand indicators, with weightings of 12.284%, 11.121%, and 11.747% respectively, need to be considered in the actual design process. Secondly, the physical health needs of 'ease of use and understanding' and 'rest and sitting facilities,' with a weighting of 11.471% and 11.362%, respectively, should also be taken into account in the design process.

Table 4. Ranking of Evaluation Indicators Relative to the Overall Objective

Objective Layer	Criterion Layer		Sub-Criterion Layer		Weighting to the objective	Ranking
	Criterion	Weighting	Sub-Criterion	Weighting		
Urban furniture in communities design from the perspective of health promotion A	A_1 Physiological health needs	42.806%	A_{11} Physical exercise function	28.698%	12.284%	1
			A_{12} Resting and sitting facilities	26.544%	11.362%	4
			A_{13} Easy to use and understand	26.797%	11.471%	3
			A_{14} Clean and hygienic functions	17.961%	7.688%	8
	A_2 Psychological health needs	29.276%	A_{21} Aesthetic design	13.641%	3.993%	11
			A_{22} Harmony with the environment	24.619%	7.208%	9
			A_{23} Solid and environmental-friendly materials	23.752%	6.954%	10
			A_{24} Structural stability of facilities	37.988%	11.121%	5
	A_3 Social health needs	27.913%	A_{31} Leisure and recreational facilities	27.993%	7.814%	7
			A_{32} Communication and seating facilities	42.084%	11.747%	2
			A_{33} Accessible and age-friendly facilities	29.923%	8.353%	6

5.2 Classification of Indicators

According to the total weighting of the overall objectives by program level in the above table, they can be divided into three categories according to their importance: important indicators (≥0.1), sub-important indicators (0.07-0.1), and general indicators (≤0.06). As shown in Figure 5, the different colors represent different classifications. Of the 11 indicators, there are five important indicators: Physical exercise function, Communication and sitting facilities, Ease of use and understanding, Rest and sitting facilities, and Structural stability of facilities, with a total weighting of 57.985%. There are four sub-important indicators, namely Accessibility and elderly-friendly facilities, Leisure and recreation facilities, Clean and hygienic functions, and Harmony with the environment, with a total weight of 31.062%. There are two general indicators, namely solid and environmentally friendly materials and Aesthetic design, with a total weight of 10.947%.

5.3 Design strategies

From the above weights and classification results, the following design strategies can be obtained:

(1) Among the user needs from a health perspective, the design must pay particular attention to the user's physiological health requirements.

(2) When it comes to physiological health needs, the design needs to pay extra attention to the physical exercise function and resting facilities. Additionally, the design needs to take into account the ease and comfort of use as well as the hygiene and cleaning functions.

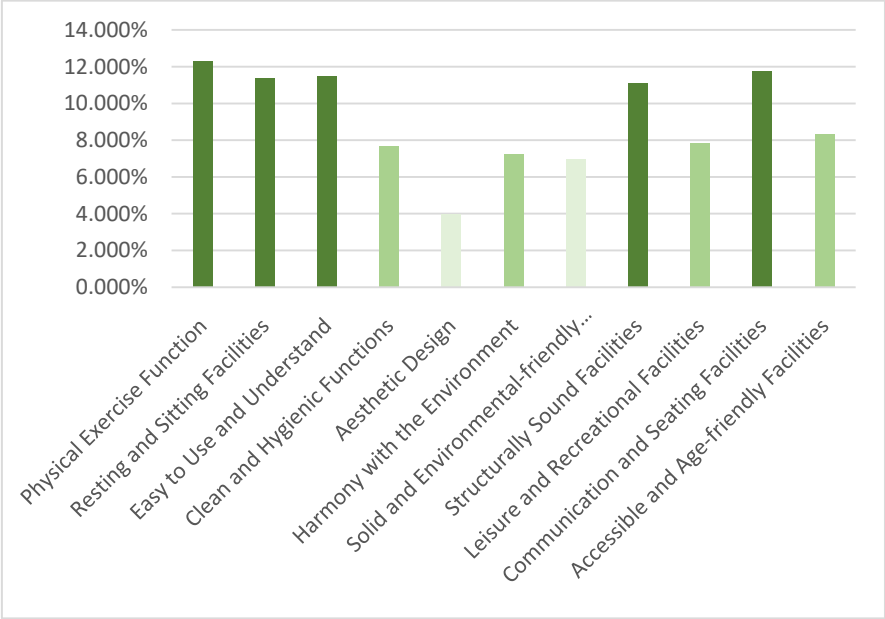

Figure 5. Classification of the Importance of Demand Indicators.

(3) When it comes to psychological health needs, structural stability is essential. Furthermore, environmental harmony is a sub-important factor, so further research is needed. Aesthetic design and Solid and environmental-friendly materials are general indicators, which is a fundamental strategy in design.

(4) When it comes to social health needs, study participants place a higher priority on communication and seating facilities than on age-friendly and recreational facilities. However, these factors are still crucial to consider.

5.4 Health Promotion Model

This paper constructs a health promotion model for urban furniture design by referring to the general model of population health and health promotion proposed by Hamilton (Hamilton N & Bhatti T, 2006) and refining it based on the above research findings. The model uses a cube as the framework of the model, with the front side representing health promotion determinants; the side representing health promotion strategies and corresponding to health determinants; and the top side representing the different levels of implementing interventions, indicating that health promotion requires the joint efforts of individuals, designers, communities, relevant sectors, and society.

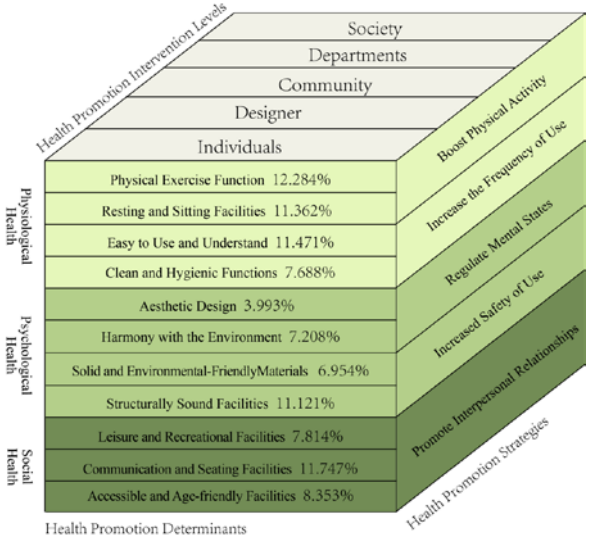

Figure 6. Urban Furniture in Communities Design Health Promotion Model.

6. Conclusion

As one of the constituent elements of a community, the community's urban furniture plays a role in stimulating people's behavior and activities, and the community and community interaction networks have an irreplaceable impact on human health. This study examines the community's urban furniture design elements from a health promotion perspective. It establishes a hierarchy of design needs consisting of three criteria and eleven sub-criteria layers, resulting in five important indicators, four sub-important indicators, and two general indicators, suggesting that future urban community furniture design should focus on physical exercise functions, communication seating facilities, ease of use and understanding, resting and sitting facilities, and facility structure. However, certain things could be improved in this paper. For example, indicators' interaction and feedback processes need to be considered. Therefore, it is recommended to undertake additional investigations utilizing network analysis to comprehensively account for the interdependencies and reciprocal connections among the indicator components of every plan in the context of designing urban furniture for the community.

References

Bao Shidu, Shi Miao. (2019). A study of urban furniture theory in China [J]. Decoration, 2019, (7): 12-16.

Cai Yuchao, Zhang Jie. (2021). Review of domestic and international research on urban furniture design since the 21st century [C]//Spatial governance for high-quality development - Proceedings of the 2021 China Urban Planning Annual Conference (07 Urban Design): China Construction Industry Press, 2021: 1268-1279.

Hamilton N, Bhatti T. (2006). Population health promotion: An integrated model of population health and health promotion [R].

Hu Ying, Huang Kangmin. (2020). Research on the evaluation of street furniture design based on hierarchical analysis [J]. Packaging Engineering, 2020, 41(22): 330-334.

Li Chunju, Wang Canyuan, Jiang Shanni. (2022). Research community planning strategies from the perspective of a healthy city [J]. Building Science, 2022, 38(6): 233-239.

Liu Ruirui, Wang Fengzhen, Wang Shuangquan. (2020). Research on the design of public facilities in urban green areas under the concept of health [J]. Packaging Engineering, 2020, 41(12): 330-336.

Tian Li, Li Jingwei, Ouyang Wei. (2021). Urban planning and ergonomics in the perspective of public health [J]. World Architecture, 2021, (3): 58-61, 125.

WINSLOW, CEA. (1920). The untilled field of public health [J]. Sci, 1920, 51(1306):23-33.

Zhan Huashan. (2021). Research on the design of shared urban furniture under micro-renewal [J]. Packaging Engineering, 2021, 42(14): 321-328.

Zhang ZC, Liu R. (2023). Research on university campus design from the health promotion perspective [J]. Southern Architecture, 2023, (3): 81-89.

Zhong Lei, Ma Kaixuan. (2022). Research on the healthy design of urban outdoor public facilities [J]. Art and Design (Theory), 2022, 2(2): 95-97.