The Study of Healthy Benefits and Design Strategy of Urban Residential Green Space

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Abstract. The outbreak of COVID-19 in 2020 has made the health of urban populations as a key research issue in various disciplines. Residential green space as one of the most basic units of urban ecological environment has potential benefits to people’s health. Based on the analysis of affecting factors of urban residents’ health, this paper discusses the benefits of residential green space on people's health and its working mechanism through literature research, and at last, proposes the design strategy of residential green space based on improving residents' health. In conclusion, to activate the healthy benefits of residential green space, it should be planned reasonably, and the greening rate and amenity facility of residential green space need to be improved too.

1. Introduction
Modern society is operating under high load and the pressure of people’s life is increasing gradually, which lead the physical and mental health problems to human beings. People living in the concrete urgently need to contact the nature and relax their tired body and mind. Residential green space (RGS) is the most convenient site for urban residents to contact with nature, and its potential benefits on people's physical and mental health cannot be ignored. At present, relevant researches have shown that green space has positive effects on promoting people's healthy status[1]. Through literature research, this paper analyzes improving effects of RGS on people’s health and its mechanism, and then proposes healthy design strategy for RGS. The research could provide a basis for formulating RGS design strategies that are beneficial to residents’ health, and is of great significance urban planning and green space construction in the future.

2. Influential factor of people health
There are three affecting factors of people’s health, which include personal factors, social factors and environmental factors. Personal factors generally involve unhealthy lifestyles such as high-calorie diet and low-exercise transportation model. Social factors mainly include high-intensity work stress and low-frequency social activities. And the environmental factors mainly include the continuous deterioration of the urban natural environment and the poor quality of living environment.

3. Healthy benefits of RGS

3.1. Physical health benefits
Studies have shown that whether residents are exposed to natural or semi-natural environments for a long time or for a short time, they could produce certain health promotion benefits[2]. It is well known
that green plants have strong ecological benefits. Many external factors of physical effects such as barrier, suction and reflection adopted by plants and biochemical effects such as plant purification, absorption and transformation have improved the green environment of residential areas. For example, green plants planted in RGS could absorb harmful substances, reduce atmospheric particulate matter, and effectively purify air[3]. At the same time, the shade formed by the plant canopy could regulate temperature, humidity, screen and prevent noise pollution, forming a liveable green environment[3]. In addition, RGS attracts people to actively participate in sports activities by providing relatively perfect sports facilities and green venues.

3.2. Mental health benefits
Research by Swedish scholars has shown that green space is more closely related to stress-related diseases, the more frequent and time green space is used, the fewer self-reported stress-related diseases[4]. According to a survey conducted by the State of Wisconsin, the mental health of residents living near green space is more healthy. In addition, while controlling for differences in personal and neighborhood characteristics, green space is still closely related to mental health[5]. Green space has a strong effect on stress, depression, and mental health. For example, the stress, depression, and anxiety of twins living in different green space are negatively correlated with these negative emotions, especially in reducing depression[4]. Green field activities have been shown to increase self-esteem and emotions. Some activities such as walking, fishing, cycling, boating, can improve self-esteem[4], and emotions, like anger, confusion, depression, and anxiety are reduced[5].

4. Mechanism of healthy benefits of RGS
The mechanism of RGS promoting people's health mainly includes encouraging physical activity, relieving mental pressure and improving social cohesion.

4.1. Encourage physical activity
Currently, most studies have found a positive association between green space and physical activity whether by subjective assessment or objective measurement[6]. Scholars have found that residents who living near green areas are more active in physical activity, and that physical activity in natural environments, especially in green areas, is more beneficial to physical and mental health than activities in other environments. Even a small increase in the level of physical activity can have a significant beneficial effect on public health[6]. Relevant scholars found the green space could provide users with opportunities for physical activity and increase their enthusiasm for physical activity. Meanwhile, green space with a high level of afforestation could extend users' time for outdoor activities and increase the usage frequency of green space, thus encourage people to take balanced physical activity and form healthy lifestyle[6]. Appropriate amount of physical activity could keep people cheerful and relaxed their body and mind. As a result, many studies have focused on physical activity as an important aspect of the relationship between green space and health promotion.

4.2. Relieve mental pressure
Reducing stress and restoring attention is an important way to promote health in RGS which has been confirmed[7]. It mainly involves two theories: the theory of psychological evolution and the theory of attention restoration. Among them, the former argues that when people are under stress, getting close to nature would produces a rapid positive response, which blocks negative thoughts, relieves depression, and restores positive emotions and attitudes. It is naturally formed in the course of human being evolution, rather than learning and accumulation[7]. The latter holds that when people maintain a high concentration over a long period of time, they tend to overuse their central nervous system inhibition, causing attention fatigue. However, when people are in a natural environment, the state is relaxed, which can unconsciously eliminate attention fatigue, reducing the occupation of oriented attention, and then restore mental and physical strength[7].
4.3. Improve social cohesion
RGS can provide residents with social places and increase residents' communication opportunities[8]. Studies have shown that there is a positive correlation between green space and social interaction, which improve individual health and social health[8]. By providing opportunities for activities and promoting social contacts and exchanges, green spaces enhance the sense of belonging in the community and improve the harmony and cohesion of the community[8]. Through active communication and social activities and expanding interpersonal communication, people broaden their minds, feel sufficient social security, trust and motivation, and enhance their confidence in life. Regarding this point, neuroscience research has given a certain explanation from the side: the neuronal processing of place constitutes an important dimension of human health: the "sense of place" and "place identity"[8].

5. Design strategy of RGS
According to the mechanism of RGS to improve the health of residents, the design of RGS should focus on the following three aspects.

5.1. Reasonable planning of RGS
When constructing RGS, it is necessary to ensure the rationality of the layout and optimize the quality of green space to meet ecological requirements. More species of different species should be deployed to enrich the species diversity of RGS, so that residents can live in a healthier ecological environment. Plant configuration also needs to consider diversity, and the creation of a seasonal landscape of plants should be considered too. A multi-level structure of lawns, shrubs, and trees need to be formed to increase the three-dimensional green volume of the residential area[6]. The last one is the diversity of green space function. RGS needs to be mixed with multiple functions, so that people have more areas to choose, such as recreation and viewing, exchange and entertainment, sports and fitness, history and culture, etc.

5.2. Improve greening rate of RGS
In the design of RGS, it can effectively improve the green experience of residents by appropriately increasing the configuration of arbor and shrub, controlling the proportion of lawn, improving vertical greening, encouraging three-dimensional greening and balcony greening. In order to improve the health benefits of green space in residential areas, it is recommended to introduce an indicator of green viewing rate per household in the residential area control plan[5], such as increasing the green space visible in the window view of the residents in the residential area. Studies have shown that, the same is the residential building window, with tree combination of high green rate of households than monotony lawn low green rate of households showed stronger emotional regulation ability, while the attention and other cognitive ability significantly improved.

5.3. Construct facilities of RGS
In order to increase the amount of activity of residents, it is necessary to rationally construct the leisure and entertainment facilities within RGS. The construction of a friendly and open green space can increase the attractiveness of RGS and improve its service efficiency. The design should be combined with the natural environment, local humanities and history, and regional culture, and the aesthetic value should be emphasized as well.

6. Conclusion
By encouraging physical activity, relieving mental pressure and improving social cohesion, RGS has positive effect to people’s physical and mental health. Therefore, as one of potential way to improve urban residents’ health, urban designer and manager should pay attention to healthy benefit of RGS and it should be planned reasonably. The greening rate and amenity facilities of RGS need to be improved too.
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