Suitability analyses between exercise patterns of morning exercise and green space characteristics: A case study of Zhaolin park, China

Xiaolong Zhao\textsuperscript{a,b,*}, Yunjing Hou\textsuperscript{a,b}, Jiajun Lv\textsuperscript{a,b}

\textsuperscript{a} School of Architecture Harbin Institute of Technology, 66 Xidazhi Steet 150001, China
\textsuperscript{b} Heilongjiang Cold Region Landscape Science Key Laboratory, 66 Xidazhi Steet 150001, China

Abstract

While chronic diseases have been primary type of diseases and intimately linked with mortality, regular physical activities could reduce the risk of chronic disease. Morning exercise is one of the most common and preventable patterns of behavior of citizens. This paper focuses on three impact factors, including spatial configurational characteristic, spatial form characteristic and spatial facility characteristic, as applied to Zhaolin park in China, to reveal the suitability between patterns of morning exercise and green space characteristics. It draws on a combination of spatial syntax, sky view factor (SVF) and GIS behaviour mapping supported techniques of quantitative research and spatial annotation and visualization, to analyse the target area. We sum up three physical activity patterns of morning exercise in Zhaolin park, including square dance, martial art and kicking Jianzi. Correlation analysis reveals that square dance is frequently linked to high levels of connectivity value and control value, low levels of SVP value; martial art has non-significant relevance with connectivity value and control value, and is highly related to SVP value; all patterns of morning exercise require facilities to rest and put personal belongings. In case of kicking the Jianzi, another morning exercise pattern, which demands vigorous amount of exertion from the participants, the requirement for such facilities is even more significant. The aim of this article is to help designers to build exercise-friendly environment, thereby improving the health and wellbeing of citizens, and is an important addition for re-connecting the fields of low carbon life and sustainable landscape architecture.

Keywords: Exercise pattern; green space characteristics; suitability analysis; sky view factor; GIS behaviour mapping

* Corresponding author. Tel.: +86-0451-86281083.
E-mail address: 943439654@qq.com
1. Introduction

In a report of the fifth China sanitation service survey: chronic diseases are primary pattern of diseases and intimately link with mortality, which has increased medical expenses and difficulty of prevention and treatment. In the fourth BRICS ministers of health meeting, Chinese public health official indicated: ‘The strategies should be formulated to reduce risking factors—lacking physical activity, tobacco, unhealthy diet and alcohol—of chronic diseases, thereby achieving the plan of global actions against chronic disease in 2013-2020 proposing by WHO’. In contrast, lacking physical activity is the primary risking factor. It is obvious that the focus of government is slowly shifting to health care and adding physical activities as top priority. Park can facilitate a wider range of physical activities than other green space. The availability and accessibility of park are some of the environmental factors that are linked to increased levels of physical activity, which play a key role in sustainable landscape architecture and low carbon life.

In recent years, there are more and more fitness square and exercise space in urban park of China. As the empirical basis for much design decision-making is lacking, designers have no confident that a green space designed for certain patterns of physical activity will serve its users’ needs well. Even if GIS has been a tool which nowadays is irreplaceable in spatial analysis and planning processes for urban regions, it has been little used for more detailed mapping of open space use[1]. This paper focuses on three impact factors, including spatial organization characteristic, spatial form characteristic and spatial facility characteristic, as applied to Zhaolin park in China, to reveal the suitability between patterns of morning exercise and green space characteristics. It draws on a combination of spatial syntax, sky view factor(SVF) and GIS behaviour mapping supported techniques of quantitative research and spatial annotation and visualization, to analyse the target area.

2. Background literature

Many scholars had researched on the relationship between health behavior and the low carbon life. Lan Guo-bin analyzed the theoretical needs for and realistic conflicts in fitness exercising under the conception of low carbon life, and guide the masses to fully utilize existing conditions around to achieve the fitness goal during fitness exercising. Dividing movement space into sports, fit-keeping and auxiliary elements, Jin Guang-jun[2] analyzed the spatial relationship between each factors, the proportion and the corresponding elements of space combination pattern. Jin Hexian[3] reviewed the psychological needs, behavior characteristics, leisure behaviors, environmental requirement and barrier-free environment of elder people in the outdoor environment, after which she pointed out that high quality environment can promote the elderly’s outdoor physical activity which leads to increase happiness. According to Schipperijn’s research in Denmark, he indicated there’s a positive correlation between urban greenspace with walk path, rich vegetation, water element and the movements according to the citizens’ self-description. Brown[5] concluded that the linear greenspace can help promote physical activity from the perspective of greenspace patterns the most. However, most of the researches are less involved in the specific classification of exercise behavior and characteristics of urban greenspace landscape details of quantitative description.

3. Methods

3.1. Study area

Zhaolin park was built in 1906, covering an area of 8.4 hectares, located in a traditional urban area, Dao Li district, Harbin. Zhaolin park is the largest city park not situated in the scope of the coastline of the Song Hua river in the district’s administration area. Taking 500m service radius as standard, Dao Li district’s service area ratio was 25.08% (average 13.67% in Harbin); when it comes to 1000 m service radius as standard, the service area ratio was 42.41% (average 28.99% in Harbin), which took the first place among all districts [6].

Zhaolin park have rich landscape space features that meet the demand of the citizens’ variety needs. Through preliminary previewing selection, 19 landscape spaces which can carry on all kinds of morning exercise behavior and more than 50m² are chosen as study area. The spaces are numbered from south to north by A - S in order to do landscape suitability analysis focused on morning health behavior (figure 1). Due to the high demand of running
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