

A Study on the Suitability of the Assessment Standard for Healthy Building to Kindergartens: Take Assessment Standard for Healthy Building (T/ASC 02--2021) as an Example

Jiejing Xu^{1, 2, a}, Kai Liu^{1, 2, *}

¹School of Architecture & Urban Planning, Huazhong University of Science and Technology, Wuhan, China

²Hubei Engineering and Technology Research Center of Urbanization, Wuhan, China

*Corresponding Author Email: lk89@163.com, ^ajiejingxu@qq.com

Abstract. As a special building, the kindergarten has limitations to use the assessment standard for the healthy building (T/ASC 02—2021) to evaluate. Firstly, the standard assessment index system lacks environmental construction technology for children's needs. Secondly, some assessment indexes do not match the building characteristics of kindergartens. The accuracy of the kindergarten assessment results will be affected by the assessment index system. Therefore, it is necessary to break through the limitations of kindergarten health performance assessment and build a health performance assessment index system for kindergartens. The assessment index system of healthy kindergarten should meet the health performance characteristics of the kindergarten, and its health performance assessment focuses on the activity space quality of the kindergarten.

Keywords: Healthy building; Kindergarten; Assessment index; Healthy kindergarten; Health performance; Activity space.

1. Introduction

With the development of the economy and the emergence of haze weather, drinking water safety, and food safety, people pay more and more attention to the quality of human settlements' environment [1]. The unhealthy factors caused by the development of buildings such as indoor air pollution, poor comfort of the building environment, and lack of exchange activity sites are increasingly prominent, which seriously affect people's life and physical and mental health. These problems can be alleviated through healthy buildings [2]. The outline of the "healthy China 2030" plan puts forward that promoting healthy China Construction [3], the construction environment quality is an integral part of healthy China, so healthy building is the demand of the "healthy China" strategy and an important development direction in China's construction field [4]. The Well Building Standard issued by the United States was the first health-related building assessment standard in the world in 2014. The standard was originally aimed at office, and then expanded to more types of buildings, including housing, education, and commerce [5]. The assessment contents include air, light, water, nutrition, fitness, comfort, and spirit. China introduced the Well Building Standard in 2015. China promulgated and implemented the healthy building assessment standard (T/ASC 02-2016) in 2017 [6], which refers to the method of the Well Building Standard, which applies to the assessment of health performance of civil buildings [7]. The assessment objects include a single building and fully decorated building groups [8]. The assessment content includes air, water, comfort, fitness, humanities, and services, involving physiology mental, and social health factors [9]. The healthy building assessment standard (T/ASC 02-2016) provides a method for implementing the "Health China strategy" in the construction field [10]. The new crown epidemic situation makes people put forward higher demands for living and working learning environment, and health buildings in China are facing new challenges and opportunities [11]. The healthy building assessment standard (T/ASC 02-2021) was issued in 2021 (hereinafter referred to as standard) [12]. The standard emphasizes the people-oriented concept, integrates the experience of epidemic prevention and control, optimizes the assessment index system, and constructs a relatively complete system. However, the standard is not

targeted for some special buildings, and the assessment index system cannot fully evaluate the health performance of buildings [13]. In addition to ordinary civil buildings such as offices and residences, there are special building types such as gymnasias, nursing homes, and kindergartens. These buildings are quite different from ordinary civil buildings in terms of main users, building space, and environmental needs. The standard is mainly formulated for ordinary civil buildings. Its assessment index system is difficult to identify the health performance of these special buildings. Therefore, the standard has limitations on the health performance assessment of special buildings. This study first analyzes the particularity of kindergarten buildings, then points out the limitations of the standard for evaluating kindergarten buildings, and finally puts forward the necessity of constructing the assessment index system for healthy kindergartens. The assessment index system of healthy kindergartens should focus on the activity space quality of kindergartens. The assessment indexes include the physical environment, spatial scale, game activities, communication activities, environmental safety, morning check-up and health care, sleep comfort, and so on.

2. Explore the particularity of health kindergarten in the field of Construction Engineering

Kindergartens are buildings for the care, and education of children aged 3 to 6. They are preschool institutions for children to carry out physical, intellectual, and moral education [14]. Whether children can grow up healthily in body and mind has a significant impact on the future development of society. According to the national statistical bulletin on education development in 2020, there are more than three hundred thousand kindergartens in China, and the number of children in kindergartens is forty-eight million [15]. As the environmental carrier of children's growth, kindergarten has a special social status, and its infrastructure and environmental conditions have a direct impact on children's healthy growth.

2.1 Special users

The Standard defines a healthy building as a building that can provide people with a healthier environment, facilities, and services, promote users' physical, mental and social health, and improve health performance based on meeting building functions. Besides the definition of healthy building, a healthy kindergarten should meet the needs of children's physical and mental health and promote the development of intelligence. Kindergarten is a special building, and the assessment of the standard will produce the applicability of assessment indicators. The kindergarten building is small in scale, its spatial environment quality is easily ignored, and the main users are children. The cognitive ability of things is relatively weak, so it is difficult to judge the quality of the kindergarten environment. In the field of construction engineering, the importance of special buildings such as kindergartens is often ignored [16]. The space environment of healthy kindergartens should be conducive to the overall growth of children's physical, intellectual, and moral.

2.2 Special function of the space environment

Children are in a period of rapid growth, which is different from adults in physiology, psychology, and behavior, and they have special needs for the space environment. Therefore, the construction of a kindergarten space environment should be in line with the characteristics of children's physical and mental development. Kindergarten should meet the different needs of children's growth, including the demand for spatial scale, psychological development, and game activities. Kindergarten is a building that provides children with various functions such as activity, diet, and sleep, especially the activity function. Children can achieve the goal of physical and mental health growth through the interaction of environment and behavior. Physical activities can promote the healthy development of children. Therefore, providing activity space for children is the key point of the construction of healthy kindergarten.

3. Breaking through the limitation of the standard in evaluating kindergarten buildings

Health kindergarten needs to provide a healthy environment, facilities, and services for children based on meeting the functions of conservation and education, promoting their physical and mental development, and improving the health performance of buildings. Through the analysis and comparison of the assessment index system of the standard and the requirements of kindergarten construction, we can find that the standard has limitations for the assessment of kindergarten buildings.

3.1 Lack of environmental construction method for children's needs in the assessment index of the standard

3.1.1. The physical environment needs.

The physical environment of kindergarten should meet the needs of children's physiology, psychology, and behavior. The children's needs for sound, light, and heat environments are different from adults. The physical environment characteristics that meet the physiological and psychological needs of children should be taken as assessment indicators [17].

3.1.2. The demand for space scale.

Children are in an important stage of sensory development. The design of kindergarten should be based on vision, touch, smell, hearing, and taste, to enrich children's five senses of environment experience. The scale and layout of space, the shape, size, material, and color of facilities will affect children's perception of the environment. These elements should be used as assessment indicators.

3.1.3. Behavior and promote children's physical and mental development.

Game activities can support children to complete the "experiential" and "process" experiences. The game activity space includes indoor and outdoor parts. The outdoor activity space shall have good sunshine, ventilation, sun shading, and rain shielding facilities, as well as landscape elements such as vegetation, soil, sand, and a water pool. The indoor activity space shall be bright, with sufficient sunshine and natural lighting. In the design of game activity space is easy to ignore the actual needs of children. Therefore, it is necessary to take game activity space as an assessment index.

3.1.4. The need for communication activities.

Modern early childhood education theory emphasizes that the development of children's sound minds and the cultivation of social ability can be realized through communication activities. Through the cross-class communication space layout, children of different ages can increase the time of simultaneous activities, to meet the communication needs of children. Therefore, the design requirements of open space should be reflected in the assessment indicators.

3.1.5. Environmental security needs.

A safety guarantee is very important for children. Children's physical development is immature, their awareness of protection is poor, their actions are uncoordinated, their curiosity is strong, and their attention is weak, which is easy to cause safety accidents. In addition to conventional safety problems such as doors, windows, and stairs, kindergarten safety also involves video security monitoring systems, intrusion alarm systems, etc. It is necessary to list the unique safety technology of kindergarten as the assessment index.

3.1.6. Morning check-up health care needs.

Children need to have a morning check-up every day and go to the health observation room for treatment after finding the disease. The morning examination room and health observation room play an important role in ensuring children's health. The morning check-up room should be conducive to monitoring children entering the park to ensure that children do not enter the park and avoid infectious diseases. The health observation room should be close to the entrance to facilitate simple diagnosis

and treatment of children. These are the unique needs of kindergartens and should be set as assessment indicators.

3.1.7. The need for comfortable sleep.

A good bedroom environment can not only ensure children's sleep, but also promote children's normal sleep behavior. The dormitories are arranged in a full berth, which can not ensure the quiet sleep of children and is easy to infect diseases. Bunk beds are arranged in the dormitory, and children are easy to fall. These design points should be reflected in the assessment index.

Although some indicators related to the above needs are involved in the standard, such as indoor and outdoor physical environment, ergonomics, indoor and outdoor fitness, age-friendly, etc., the needs of kindergarten construction do not match the assessment contents of these indicators, which will lead to deviation in the assessment results.

3.2 Some indicators in the index system of the standard do not apply to the assessment of kindergarten buildings

If there are contents not related to the functional needs of kindergartens in the assessment index system, the accuracy of the assessment results will be reduced. By analyzing the index contents in the standard, it can be found that some contents do not apply to the assessment of kindergartens (Table 1). Firstly, according to the GB 50016-2014 code for fire protection design of buildings, the number of floors of kindergartens is no more than three, the building scale is relatively small, and there are great differences between kindergartens and other civil buildings in terms of building equipment. Secondly, children have high requirements for spatial comfort, and the indoor and outdoor physical environment and spatial scale have a great impact on children's growth and development. To ensure children's safety and physical and mental health, the size of furniture and facilities for general civil buildings should not be used in kindergarten buildings. Finally, physical activities play an important role in the healthy growth of children. The activity venues and facilities should be designed according to the characteristics of children, which can not be the same as the design of adult fitness activity venues. Therefore, the kindergarten buildings are not suitable to adopt the assessment indicators related to fitness. At the same time, the development stage of children's bodies is not enough to actively participate in the regulation of emotion, so it is not necessary to set up a space for autonomous emotion regulation and psychological decompression.

4. The necessity of constructing the assessment index system for healthy kindergartens

As one of the types of healthy buildings, health kindergarten belongs to special buildings. Its particularity is reflected in that the users of kindergarten are mainly young children. The physical and mental development of this group is greatly affected by the space environment and has special needs for the space environment. Creating a good kindergarten space environment is an important means to promote the healthy growth of children.

4.1 Establishing a special assessment index system is the basis for improving building health performance

The characteristics of the assessment object should be "sufficient and necessary", the assessment index system should include all the characteristics of the assessment object, the content of the assessment index should be comprehensive, and there is no content irrelevant to the characteristics of the assessment object. When there is a missing item in the assessment index, which is "insufficient", the assessment result will be one-sided. When more than one item in the assessment index is "unnecessary", irrelevant indexes will interfere with the assessment results. The index system of the standard has "unnecessary" index items for the health performance of kindergarten buildings, and there is no corresponding content in the assessment index system of the standard on the special

physical environment, ergonomics, and indoor and outdoor activities of kindergarten buildings, so the index system is "insufficient". Therefore, the assessment index system of the standard is neither "sufficient" nor "necessary" for kindergarten buildings. To accurately evaluate the building health performance of kindergartens, it is necessary to establish an assessment index system for healthy kindergartens. By constructing the assessment index system of healthy kindergartens, the needs of children for a space environment and the functional requirements of kindergartens are reflected in the assessment index system of healthy kindergartens. According to the index guidance design, the assessment index system of healthy kindergartens is taken as an important means to improve the health performance of kindergartens.

Table 1. The assessment indicators in the standard do not apply to kindergartens.

Classification	Number	Items	The reason of inapplicable
Water	5.2.2	Set up a direct drinking water system or facilities	According to JGJ 39-2016 code for architectural design of nurseries and kindergartens, kindergartens shall not be equipped with a piped direct drinking water system
	6.2.17	Accessory furniture and facilities meet the requirements of comfort and efficiency	The scoring content of this article is only for the furniture facilities in residential buildings and office buildings, and there is no relevant content for the assessment of furniture facilities according to the physiological scale of young children
7.1.1		There shall be a fitness ground with an area of not less than 0.3% of the total land area and not less than 60m ²	The main users of kindergartens are young children. The fitness venues can only be used for teaching staff. The scale of kindergartens is relatively small, and the area of fitness venues is not suitable for kindergartens
	7.1.3	A fitness trail with a width of not less than 1.25 m and a length of not less than 1 / 4 of the perimeter of the land boundary line and not less than 100 m shall be set.	The setting size of the fitness trail does not meet the physical development status of children, so this index does not apply to kindergartens
7.2.1		There is an outdoor fitness venue	The scale of kindergarten is relatively small, and the fitness venues are mainly used by teachers and staff. The setting standard of venue area in the scoring item of this article does not apply to the construction scale of kindergarten
	7.2.2	Reasonably set up outdoor ball game venues. There are basketball, tennis, table tennis, badminton, football, and other outdoor medium-sized ball venues within a radius of 1000m	Children's physical development is difficult to carry out medium-sized ball games, and there is no need to set up outdoor medium-sized ball venues. Therefore, this index does not apply to kindergartens
7.2.4		Reasonably set up activity venues for the elderly	The users of kindergarten buildings do not include the elderly, and there is no need to set up an activity site for the elderly
	7.2.5	Set up a special fitness trail with a width of no less than 1.25 m, and set up fitness guidance signs.	The setting size of the fitness trail does not meet the physical development status of children, so this index does not apply to kindergartens
7.2.6		Green travel mode combining guidance and fitness	This article is graded according to bicycle and pedestrian traffic mode. Generally, children will not take bicycle travel mode, which does not meet the actual situation of children's life
	7.2.7	Well ventilated indoor sports and fitness space	The kindergarten is relatively small, and the use of fitness venues is mainly for teachers and workers. The standard for setting the building area in the scoring item of this article does not apply to the construction scale for kindergarten
7.2.10		Private space for fitness in the building	This article is mainly for the users in residential buildings and offices, and the kindergarten is relatively small. The private space for fitness does not apply to kindergarten buildings
	8.2.2	The building shall reasonably arrange the communication space and provide the network service platform for users to communicate with each other	The scoring content of this article is for the users of residential buildings and offices, and the communication mode of adults is evaluated, and the assessment is not made for the communication characteristics of children
8.2.6		Set up the space for self-regulation and psychological decompression, including the coffee bar, and table game room, catharsis room,	Children are the main body of kindergarten. In the stage of physical and mental development, it is unnecessary to set up the space of independent emotion regulation and psychological decompression

	relaxation room, meditation room, psychological consulting room, etc	
9.1.3	Smoking should be prohibited in public areas	According to the management requirements, domestic kindergartens are generally prohibited from smoking in kindergartens. This indicator does not apply to kindergartens
Service	Scientific standards for operation and management of direct drinking water system or facilities,	According to JGJ 39-2016 "design code for nursery and kindergarten buildings", the kindergarten should not set up a direct drinking water system with pipes
9.1.6	maintenance management system, and water quality monitoring management system shall be formulated, and the operation status is good	

4.2 The health performance assessment of kindergartens focuses on the activity space quality of kindergartens

Firstly, the impact of the building's physical and health functions on the health of the human body, including the building's physical and environmental health. The second is the impact of architecture on human mental health and social adaptation, including humanities and services, that is, the function of the environment to promote psychosocially. To make the health performance assessment of civil buildings universal, the index setting of the standard takes into account the elements of the environment promoting the three health dimensions of physiology, psychology, and society. The physical and mental development stages of children and adults are different. The activity space is the main use area for children. The health performance assessment of kindergartens focuses on the quality of the activity space in kindergartens. The activity space should meet the special physiological, psychological, and social health needs of children, and the relevant environment construction technology should be reflected in the assessment index system.

5. Conclusions

Kindergarten is an important place for children to carry out childcare and education, which has a special social status, which is related to the future of the country and the development of the city. It is one of the important measures to promote the physical and mental development of children by improving the environmental quality of kindergarten and improving its health performance. The problems of the assessment objects can be found by establishing the assessment index system, and then the performance can be optimized by implementing the corresponding strategies. When the assessment index system does not meet the use function and spatial characteristics of the assessment object, the problems existing in the assessment object cannot be found, which will reduce the performance of the building. As a special building type, kindergartens should break through the limitations of health building assessment standards and build a special health kindergarten assessment index system to make the assessment targeted. The assessment index system of healthy kindergartens should be a "sufficient and necessary" index set to meet the health performance of kindergartens. The health performance assessment of kindergartens focuses on the activity space quality of kindergartens. Physical environment, spatial scale, game activities, communication activities, environmental safety, morning check-up, health care, sleep comfort, and other contents should be taken as assessment indicators.

Acknowledgments

This work was financially supported by the National Natural Science Foundation of China (52078226), the Science and Technology Planning Project of Wuhan Urban-Rural Development Bureau (202015), and the Fundamental Research Funds for the Central Universities (2021JYCXJJ008).

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