Application of Architectural Decoration Materials to Space Design of Rehabilitation Center for Autistic Children

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Abstract: Architectural decoration materials play an irreplaceable role in indoor design, landscape design and decoration design. A suitable decoration material can elevate the aesthetics and comfort of the overall space. There are numerous cases of ecological protection and aesthetic comfort achieved through rational use of architectural decoration materials in contemporary Chinese design; however, the indoor space design of rehabilitation center for autistic children is still out of step. This paper is to discuss the architectural decoration materials suitable for children’s rehabilitation from the perspective of particularity of autistic children, in order to provide a design blueprint for creating a safe and comfortable indoor space for autistic children, maximizing the treatment effect and improving their abnormal behaviors as well.

1. Introduction

According to the statistics of the World Health Organization, there will be an autistic child every 20 minutes in the whole world. The United Nations General Assembly has designated April 2 as the World Autism Day since 2008. [1] According to the Statistical Communique on the Development of Programs for the Disabled in 2019 published on April 2, 2020, there are 2238 rehabilitation centers for autistic children already across the nation by the end of 2019. However, the existing rehabilitation center can not meet the growing needs for children’s rehabilitation based on the consistent increase of autistic children. At the same time, most rehabilitation organizations for autistic children are private, whose construction standards and industry norms are hard to unify. They usually pay attention to medical equipment purchase rather than decoration design of indoor spatial environment, or only provide parents with an indoor space for nursing. In addition, most rehabilitation centers for autistic children have the decoration problems of no outdoor activity sites, single color in indoor and outdoor walls, lack of protection in the space, no green indoor decoration materials and so on. So in addition to the medical means for autistic children’s rehabilitation, it is vital to design the spatial environment according to the mental and physiological needs of children to maximum extent.

This paper discusses the selection of architectural decoration materials in rehabilitation center for autistic children, in order to provide some reference materials for other scholars and enable more and more people to help autistic children.

2. Effect of Rational Use of Architectural Decoration Materials on Environmental Intervention and Rehabilitation for Autistic Children

Autistic children’s rehabilitation center is a spatial environment integrating living, rehabilitation, education and other aspects, etc., and spatial decoration environment will imperceptibly affect...
recovery of the children. Therefore it is necessary to use spatial decoration materials reasonably to bring positive intervention treatment for autistic children.

2.1 Intrinsic influence
A benign spatial environment can make children keep a comfortable and safe state all the time so as to relax their vigilance. In this way, it will have twice the result with half the effort in carrying out routine rehabilitation training for children. By creating an outside spatial environment, the sensory information can be converted into physiological electrical signals to enter the sensory cortex, so as to use the spatial environment for intervention treatment. Meanwhile, children exposed to such environment for a long time will have associative memory and emotion, release pressure and build a good spiritual world, and then stimulate perception and curiosity, and have an active learning psychology as well, which is vital for autistic children’s rehabilitation.

2.2 Extrinsic influence
In China, quantity and quality of rehabilitation centers for autistic children are not enough for the present and even the future development. Modern medical treatment can not cure the autism thoroughly, however, autistic children can improve their abnormal behaviors and adapt to the social life well only by different degrees of rehabilitation training. And only by benign indoor and outdoor space can the autistic children’s rehabilitation produce positive treatment effects, can more and more rehabilitation centers be willing to make changes, can more and more people pay attention to this group and listen to the real needs of autistic children.

3. Selection of Architectural Decoration Materials in Rehabilitation Center for Autistic Children
In the decoration, we should guide the expression form of the object spatial environment based on the needs of subject perception, so as to display the comprehension and humanization of design. Due to the perceptual abnormalities of autistic children, it is necessary to select materials that cater to mental needs of autistic children. The following aspects need to be noticed:

3.1 Environmental protection
The materials selected should accord with national standard of no toxin and pollution. Children aged from 0 to 14 are the main group of patients with autism, whose resistance is weak, and the harmful components in decoration materials can damage children’s immune system, then cause other complications so as to cause secondary harm to children.

3.2 Safety
The materials selected for indoor space should be featured by fire resistance, high temperature resistance, wear resistance, collision resistance and so on. And the behaviors of autistic children are usually accompanied by anxious, irritable characteristics, they do not know how to control or express their emotions, leading to the phenomenon of self-attack always. However, good decoration materials can leave more time to solve emergency caused by children’s behavioral disorders.

3.3 Stain resistance and easy to clean
In addition to communication barriers and special behaviors, some autistic children may have gastroenteritis, epilepsy and other symptoms meanwhile. For autistic children are younger, it is hard to control their activity range and emergency, decoration materials which are stain resistant and easy to clean can save solving time greatly, and keep the beauty of the overall space.

3.4 Stability
The materials selected for indoor space should be waterproof, insulated and moisture proof and sound insulated, they also should have the features of longer service time and convenient disassembly. The rehabilitation center is a long-lived coordinate, whose decoration materials’ durability can save cost well, and the materials convenient to disassemble can also save time in case of maintenance problems. All in all, the principle to select materials is to affect children’s normal daily life and
treatment to minimum degree.

3.5 Particularity

According to the mental and physiological particularity of autistic children, the rehabilitation center could select more natural and comfortable materials such as wood, bamboo, plastic, cotton and linen, while select little materials with strong reflective properties such as metal, in order to reduce spatial sensory stimulation or cold feeling of children and enhance their sense of safety with warm materials. Besides, the color preference test records of autistic children (see Table 1) shows, decoration materials with high color purity and gorgeous color should be avoided, blue and green should be selected as the main tone in space. Helping children soothe mood and adapting to the spatial environment have a promoting effect on rehabilitation.

| Account    | Color of Oil Painting Stick | Total |
|------------|-----------------------------|-------|
| Color      | Red | Orange | Yellow | Green | Blue | Purple | Brown | Black | White | Proportion |
|            | 2.67% | 2.67% | 3.33% | 28.00% | 48.00% | 1.33% | 4.67% | 8.00% | 1.33% | 100.00% |
| Using times| 4   | 4     | 5     | 42    | 72    | 2     | 7     | 12    | 2     | 150       |

Table 1 Color Preference Test Records of Autistic Children

4. Application of Architectural Decoration Materials to Rehabilitation Center for Autistic Children

4.1 Decoration paint

Selection of adhesives in decoration paint is very important and preference for adhesives with less formaldehyde and benzene content should be given. It is advised to select glutinous rice glue, starch glue or imported barrel glue. Harmful gas has an extreme harm to children, which can damage the respiratory tract, even damage the liver function and immune system more or less. Thus the wall paint in indoor space can adopt diatom mud, which is natural and pollution-free, and can adjust the humidity in the air and absorb formaldehyde at the same time; it also has strong decorative function and easy construction process. These materials can be used in both activity room and rehabilitation training room. However, the paint in outdoor walls must select materials with high weather resistance, high stain resistance, high color retention and low toxicity, such as nano-composite paint, which is characterized by aging resistance, radiation resistance and light resistance.
4.2 Texture of floor

Texture of floor is significantly important. Bamboo floor, composite floor as well as PVC floor all can be selected for space indoor. Bamboo floor is a new architectural materials in the 21st century, which is wear and press resistant, moisture proof and flame retardant, comfortable and environmentally protective, it also has little formaldehyde content (see Figure 1), which can be used for children's bedroom and activity room; while composite floor has good wear resistance, simple maintenance, moderate price and small thermal conductivity, under which floor heating can be installed (see Figure 2); then PVC floor is made of PVC, a green ecological renewable resource, and it has the effect of movement buffer protection. Composite floor and PVC floor all can be applied to the rehabilitation training room or other highly active room floor of the rehabilitation center.

Vitrified tiles with strong anti-slip ability can be selected for kitchen and bathroom’s grounds, for it has bright and clean surface and strong performance of stain resistance apart from the traditional polishing tiles’ basic features of strong wear resistance, soft light and no light pollution. Autistic children have difficulty in learning toilet, so a narrow bathroom spatial environment will make them anxious and restless easily compared to other indoor space. Therefore we could put some interesting stickers on the floor to guide relaxation for autistic children.

4.3 Texture of wall

In addition to the diatom mud mentioned in the section on decoration paint, water based paint or decoration cloths can also be used on the walls. Compared to decoration wallpaper, decoration cloths has the advantages of strong color fixation ability, easy cleaning, sound absorption, heat insulation, no toxin and pollution, and saving construction time as well, besides, it can achieve harmony on color, texture and pattern. What is more, interesting spatial environment can be created by mastering the features of materials and applying original means to match the space with materials. Wallpaper is cheap in market price, but its texture fades easily, as a result it has a short use life in some strong activity areas of rehabilitation center.

Because autistic children may appear special behaviors such as self-attack, it is suitable to select relatively soft decoration materials to ensure certain protective measures under 1.2m of the wall decoration; at the same time, some soft materials with sound insulation, anti-static, anti-impact should be selected for the strong active indoor space, and the design aesthetics of the overall space should be noticed in decoration process. Then, some sound-absorbing materials can be installed in children’s bedroom and training room, such as zumu acoustic board, polyester fiber decorative acoustic board, which have the advantages of safety, heat preservation and flame retardant. By this way, the disturbance and stimulation in the training or rest can be reduced greatly.

Texture of walls in bathroom and kitchen should be easy to clean and with strong stain resistance. The walls can be paved with resin type artificial stone of low decoration cost, strong stain resistance, no radioactive substances and environmental protection. And the walls also can adopt new waterproof
paper, whose material is environmentally protective PVC with performance of waterproof, moisture-proof and mildew resistance.

4.4 Texture of facility

According to the physical performance contrast of common aluminum and bridge-cutoff aluminum alloy (see Table 2), it is recommended to use bridge-cutoff aluminum alloy windows for the rehabilitation space. Aluminum alloy is of light weight, high strength and good tightness, while the bridge-cutoff aluminum alloy also has PA66 nylon strip, whose heat transfer and dissipation is comparatively fast, producing the effect of heat insulation, heat preservation, energy saving, sound insulation, waterproof and so on. And there are a variety of colors can be used according to specific need.

| Coefficient of thermal conductivity | Sound insulation | Price |
|------------------------------------|-----------------|-------|
| Bridge-cutoff aluminum alloy window | 3.2-3.4/m²K     | 30dp  | 800-2500/m² |
| Common aluminum alloy window       | 3.5-3.6/m²K     | 26dp  | 400-2000/m² |

Table 2 Comparison of Physical Performance of Two Aluminum Windows

PVB laminated glass or reinforced glass is available for indoor or window glass. From the perspective of new materials of energy saving and environmental protection, PVB laminated glass can be selected for its high transparency, great intensity of blocking ultraviolet, high melting point, but poor water resistance. While reinforced glass has high safety coefficient, but is hard to cut. Glass can be selected according to the specific space.

Furniture should be selected reasonably according to age features and teaching needs of autistic children, it should comply with national standards, such as green materials. In order to prevent children from hurt in activity, the infrastructure should include non-slip and moisture-proof mats, and some areas prone to danger such as bathroom and stairs should install handrails and other safety facilities. In addition, the corners of furniture can be decorated with soft materials with environmental protection, such as sponge, cotton cloth or rubber. And stair corners or other sharp parts should be covered with cedar board or glue to prevent collision. In a word, safety is the first principle in the case of insufficient decoration materials aesthetics.

Autistic children are difficult in learning toilet, so a narrow bathroom spatial environment will make them anxious and restless easily compared to other indoor space. Despite of the selection of materials, some color is needed at the same time to guide relax so as to cater to the psychological characteristics of autistic children maximally. Take toilet selection for example, acrylic toilet could be suitable for its material is green and recyclable. The most important thing is that different colors can be customized according to children’s preferences, so as to improve the ease and use of children toileting.

5. Prospects of the Application of New Architectural Materials to Rehabilitation Center

With the development of science and technology, more and more new decoration materials have been available in the market, and some new materials with high technology are superior to traditional architectural materials in terms of price, performance and functions. The new wall materials including brick, block and plate, replace the traditional solid brick material usually appeared as green materials, and they have preservation and insulation, sound insulation effects. And the new waterproof architectural materials can better extend the service life of the building, improve the quality of the building, and enhance the anti-penetration performance of the building. Such as asphalt felt, synthetic polymer waterproof coiled material and others. Besides, there are also a great deal of super-new architectural materials still being invented, such as special glass that is warm in winter and cool in summer, or sheds water and so on. The super-new architectural materials has a great significance for
the future development, which is worthy of our expectations.

Rehabilitation center for autistic children aims at rehabilitation, but the design of indoor environment decoration is also to achieve better rehabilitation effect. If we make good use of diverse forms of artistic connotation and cultural infiltration of rehabilitation center with the development trend of local unique culture to create a spatial environment with more cultural value, it can not only sublimate the overall space, but also help autistic children feel the cultural atmosphere well. On the other hand, using new decoration materials and processing methods usually bring more creative breakthroughs and design techniques, so as to improve the design effect on architectural decoration of rehabilitation center.[6]

Rehabilitation center for autistic children can not only be decorated in white and simply meet the needs of basic facilities ceramic tile and meet the basic needs of facilities only. In other words, the overall space should meet the needs of autistic children, make the overall architectural decoration more targeted, and can really help autistic children improve their abnormal behaviors and adapt to social life imperceptibly through a long time environmental intervention, so as to achieve the ideal results of treatment effect. The final purpose is to appeal more and more people to value and help autistic children, the “children of stars”.

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