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# INTERIOR DESIGN OF CHILD-FRIENDLY DENTAL PRACTICE FOR MULTI-SENSORY EXPERIENCES

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**Abstract. Purpose.** The integration of multisensory experiences into the interior design of a child-friendly dental clinic meets the physical and psychological needs of children and provides a reference for optimising the oral healthcare environment. This article sorts out the relevant concepts and current situation, analyses the levels of multisensory experiences to construct a theoretical framework, and proposes a multi-dimensional design strategy based on the critical period of child development to help create an environment conducive to children's oral treatment and physical and mental development, and continue to optimise it.

**Methodology.** The integration of multisensory experiences and the interior design of child-friendly dental clinics is explored through theoretical research, case studies, experience summaries and the formulation of multidimensional design strategies.

**Results.** A multi-sensory experience is important for the design of a child-friendly dental clinic. The study identifies four levels of multisensory experience: basic sensations, interaction, education and emotions, each with its own aspects of development. Cases of the implementation of multi-sensory interior design of a children's dental clinic are studied and summarized, considering the four levels indicated. A multidimensional design strategy for the interior design of a child-friendly dental clinic is proposed.

**Scientific novelty.** Theoretical and practical approaches to the interior design of child-friendly dental clinics have been summarized, based on the theory of child development, considering multi-sensory experience.

**Practical relevance.** Enhance the interior design of children's oral treatment facilities, optimise the quality of oral healthcare services. Provide guidance for dental clinic design and promote industry development.

**Keywords:** environmental design, interior design, furniture and equipment design, multi-sensory design, child-friendly design, experiential design, participatory design.

## INTRODUCTION

Oral health is of great significance in a child's development, and the design and service concept of a child-friendly dental clinic can have a profound impact on a child's experience of the

clinic and their perception of oral health [7]. With the development of multidisciplinary theories, the key role of multi-sensory experiences in children's physical and mental development has become increasingly prominent [21].

Multi-sensory experiences emphasise the collaboration of various senses, helping children to perceive things in a comprehensive way [2]. Incorporating multi-sensory experiences into the design and operation of child-friendly dental clinics not only conforms to the characteristics of children's intellectual development through multi-sensory perception but also conforms to the trend of humanisation and quality improvement of modern medical services [9]. At present, both theoretical research on multi-sensory experiences and the design and practice of child-friendly dental clinics have achieved results. However, in-depth research is still needed on how to closely integrate the different levels of multi-sensory experiences with the interior design of the clinic to meet the physical and psychological needs of children at different stages of development. This paper aims to sort out the concept, analyse the levels of multisensory experience, and propose strategies for improving the interior design of child-friendly dental clinics based on this, in order to provide a reference for optimising the oral healthcare environment for children.

## ANALYSIS OF PREVIOUS RESEARCH

Humans have multiple sensory organs, each with specific functions to collect different types of external stimulus information [15]. For example, the eyes perceive light through the photoreceptor cells on the retina, and the ears use the hair cells in the inner ear to perceive the frequency, intensity and direction of sound. The human sensory systems are not independent of each other, but an interrelated and interactive whole [16]. Every experience begins with the stimulation of the senses by external stimuli, and then different sensations are superimposed and fused to produce perception [1]. The brain then recognises, analyses and interprets this perceptual information, which ultimately forms cognition, arouses people's behaviour and is ultimately transformed into memory [8] (Fig. 1). It is precisely through multimodal sensory experiences that the brain continues to create, eliminate, retain and deepen neural circuits, thus gradually maturing [4]. Therefore, multi-sensory experiences are not just one-dimensional experiences, but deeper and more comprehensive experiences [19] (Fig. 2).

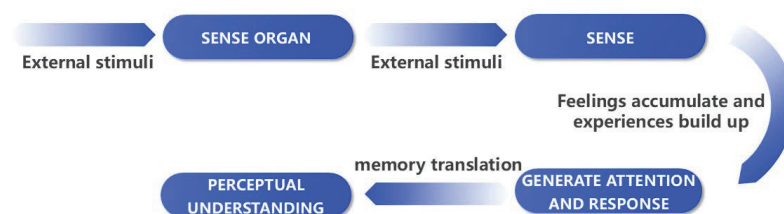


Fig. 1 Multi-sensory perception

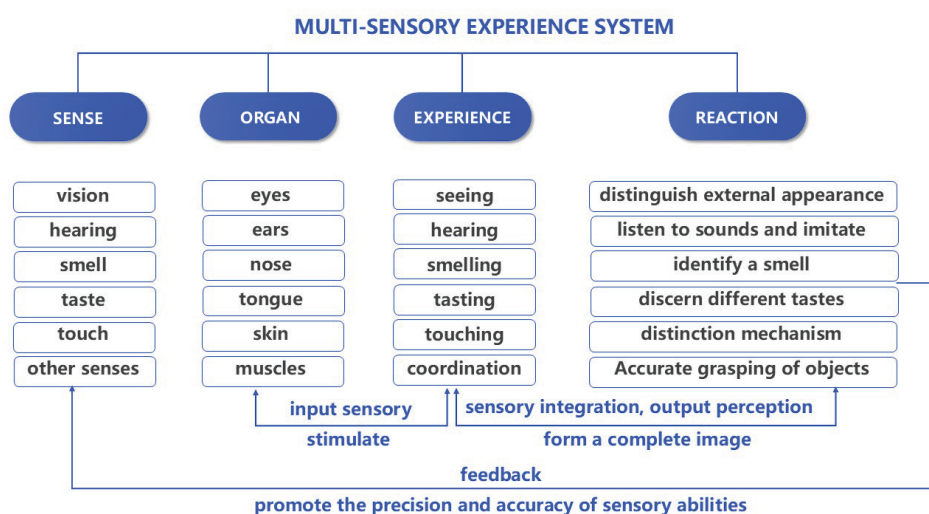


Fig. 2 Multi-sensory system framework

Multi-sensory experience design is a design method that aims to create richer, immersive and meaningful experiences by engaging multiple senses [6]. In recent years, some scholars have applied the theory of multi-sensory experience design to children's spaces. For example, Huang SH has integrated it into the display of museum collections, so that children can get closer to the collections and art, effectively promoting the sustainable development of humanities and art [13]. Higuera-Trujillo JL and many other scholars believe that multi-sensory experiences can effectively relieve the stress of children and their companions in waiting spaces [12]. Therefore, this study introduces multi-sensory experiences into the spatial design of the dental clinic and thoroughly explores the creation of a child-friendly medical space, which significantly improves the medical experience of children in the dental clinic, reduces their fear of treatment, and improves their cooperation. This, in turn, injects new vitality into the development of children's oral health, creating a more warm, comfortable and efficient medical service space model.

The theory of multisensory experience has certain advantages when applied to the spatial design of child-friendly dental clinics. First, children are at a critical stage of psychological development and are extremely sensitive to unfamiliar environments [23]. The medical equipment in the dental clinic, unfamiliar medical staff, and the potential for pain can easily trigger negative emotions such as tension and fear in children. This emotional response often leads to resistance during the treatment process, which seriously interferes with the smooth progress of the treatment [14]. Multi-sensory experience design creates a comfortable, warm and child-friendly environment through the careful regulation of multi-dimensional sensory stimuli [20].

Second, Piaget's cognitive development theory states that children construct their knowledge of the world through interactions with their surroundings. Multi-sensory experience design can greatly attract children's attention and stimulate their curiosity and desire to explore. This experience not only helps distract children's fear of the medical treatment process but also promotes their cognitive development while waiting or during treatment, turning what could have been a frightening experience into an interesting journey of discovery.

Finally, from the social perspective of medical services, multi-sensory experience design is of great significance for improving parental satisfaction and shaping a good

reputation for the clinic. In the modern medical service system, patient and family satisfaction is an important indicator for measuring the quality of medical service. When children can have a good experience in the clinic and successfully complete the treatment process, parents will highly evaluate the professionalism and humanised care of the clinic.

### STATEMENT OF THE PROBLEM

Multisensory experiences play a key role in the physical and mental development of children. Although theoretical research on multisensory experiences and the design of child-friendly dental clinics have yielded results, further research is needed on how to closely integrate multisensory experiences at different levels with the interior design of the clinic to meet the physical and mental needs of children at different stages of development, so as to cultivate children's adaptability and positive experiences.

### THE RESULTS OF THE RESEARCH AND THEIR DISCUSSION

The multisensory experience can be divided into the basic sensory level, the interactive experience level, the educational experience level and the emotional experience level. In the interior design of a child-friendly dental clinic with multi-sensory experience, the visual, auditory and tactile designs form the basis of the sensory experience layer. Visually, lively colours, a reasonable layout and child-friendly elements are used to alleviate children's fears; audibly, gentle music, noise control and gentle voice communication are used to calm emotions; and tactilely, soft materials, comfortable equipment and interactive installations are used to give warmth and a sense of security. The three blend together to create a comfortable and interesting treatment environment for children.

The KU64 children's dental clinic in Berlin, Germany, is unique in its design of basic sensory experiences, fully embodying the child-centred concept. Visually, based on the psychology of colour, large areas of orange and yellow are used, paired with the playful white patterns on the ceiling to create a cheerful and relaxed atmosphere that relieves children's fears. Innovative spatial layouts, such as cave-like play areas, irregular partitions and stairs, stimulate children's curiosity and desire to explore, in line with their cognitive development. Elements such as cartoon patterns, floor graffiti and plush toys turn the clinic into a playground-like space, reducing children's resistance to medical places. Tactile sense, the clinic has selected furniture

and equipment. The sofas and chairs in the waiting area are made of soft materials, so that children can rest comfortably. The dental chair is equipped with a soft cushion and backrest to reduce discomfort during treatment. Interactive installations such as the climbing wall enrich the tactile experience and enhance children's sense of participation and fun. The KU64 children's dental clinic provides a valuable example of children's dental treatment space design (Fig. 3) by carefully designing the visual and tactile experiences to pay attention to children's psychological and physical needs in all aspects, creating a comfortable, fun and tension-relieving treatment environment.

In terms of interactive experience, guided interaction can use floor markings such as coloured footprints and arrows to attract children's attention with bright colours and simple graphics based on their cognitive characteristics, creating a clear path for the consultation and making the process easy to understand [11]. Participatory interaction aims to give children autonomy in each treatment stage. For example, displaying dental treatment tools and encouraging children to touch them can reduce their fear of the tools. Or setting up multi-themed treatment rooms in the clinic allows children to choose according to their preferences. This enhances children's initiative



Fig. 3. KU64 Children's Dental Clinic

Source: <https://www.gooood.cn/ku64-dental-clinic-ku65-kids-club-by-graft.htm>

and cooperation, strengthens doctor-patient interaction, creates a positive treatment atmosphere, and promotes the smooth progress of treatment.

The Yayashou Dental Clinic in Lanzhou, China, has achieved remarkable results in the design of interactive experiences, which are highly innovative and scientific. In terms of visual guidance, the bright and rich colours and the clear yellow arrow signs on the floor quickly attract the attention of patients, intuitively outline the treatment route, reduce patient anxiety and time loss, and improve the smoothness and predictability of the treatment process. This is especially suitable for children's sensitivity to colours. In terms of spatial guidance, the clinic has a reasonable division of functional areas,

with each area closely connected and spacious passageways. Based on ergonomics and behavioural psychology, patients move naturally without realising it, optimising the movement trajectory and improving the efficiency and comfort of space use. In terms of interactive facilities, the reception robot in the corridor can intelligently navigate and answer questions, interact with children in a fun way, stimulate their interest, and relieve their sense of strangeness and tension. The display area showcases oral health knowledge, tool models and success stories to help children understand the dental process and reduce resistance. In addition, the clinic has created several fun and themed consultation rooms for children to choose from. The unique decorations, colours and elements



create an immersive environment, allowing children to receive treatment in a relaxed atmosphere and improving the experience and compliance of the visit (Fig. 4).

In terms of educational experience, by creating a diverse space for lectures and classroom teaching, and deeply integrating interactive activities such as experiments, fun



Fig. 4. Yayashou Dental Clinic

Source: [https://mp.weixin.qq.com/s/mhPSf1HhlpNIT\\_YL2cS6qA](https://mp.weixin.qq.com/s/mhPSf1HhlpNIT_YL2cS6qA)

games and role-playing, oral health knowledge can be effectively conveyed to the audience in a lively and attractive way. The simulated treatment area is an innovative practice space for oral health education. With the help of highly realistic medical tools, it provides children with the opportunity to experience the oral treatment process first-hand [18]. This initiative can effectively help children to overcome their fear of oral treatment and various misunderstandings, gradually cultivate their correct understanding of oral health care, and lay a solid foundation for them to develop good oral hygiene habits.

The Qincheng Dental Clinic in Nanjing, China, has carefully created a comprehensive space that integrates science popularisation, experience and diagnosis and treatment. Among them, the science classroom space is unique in its ingenuity, using lectures, fun classes and other diverse formats to systematically impart oral health knowledge to children. The mock-up clinic is also ingeniously set up, allowing children to become familiar with the scene and process of going to the dentist in an immersive way. With the help of this unique method of simulation experience, children can more deeply and intuitively understand the key significance of oral health care and the specific content of a dentist's work, thus laying a solid foundation for cultivating correct oral health awareness and good habits from an early age. In addition, the clinic has

created a small exhibition space that takes into full consideration the physical and mental characteristics and practical needs of children. It uses a variety of interesting methods to disseminate knowledge, combining education with entertainment to make the knowledge transfer more efficient. The TV in the consultation room can play various programmes or popular science videos, further enriching the ways and forms of knowledge dissemination. The facilities in the clinic are professional and comfortable, and the equipment such as the dental chairs are modern, providing a reliable guarantee for accurate diagnosis and treatment. The overall environment is warm and pleasant, and from the spatial layout to the decorative details, it shows the care and protection for patients, which effectively helps patients to receive treatment with a more relaxed and positive attitude and improves the treatment experience and results (Fig. 5).

The family-style waiting area is a key part of the emotional experience. With the family at the centre, interactive parent-child facilities are incorporated to create a warm, family-like space. For example, a parent-child reading corner is set up, equipped with age-appropriate illustrated oral health books, and a parent-child handicraft area provides materials for making oral health models to encourage parent-child participation and enhance emotional communication [5]. This design conveys respect and care, provides



Fig. 5. Qincheng Dental Clinic

Source: <https://mp.weixin.qq.com/s/dty4kYPskaTtuQjP7iaecg>

psychological support for children, improves their acceptance and cooperation with oral healthcare, and helps oral healthcare services to be carried out efficiently.

The family-style waiting area of Guangzhou Delun Dental Clinic is highly innovative. With a space theme, it creates a warm and comfortable environment and builds a space for parent-child interaction. By setting up a VR experience area and an electric game area exclusively for children, it meets the entertainment needs of children and effectively alleviates the boredom of waiting. At the same time, there are also dedicated spaces for parent-child reading and

toothbrushing teaching activities, which further strengthen the emotional bond between parents and children. This design, from the perspective of space psychology, gives the clinic a strong family atmosphere and shows respect and care for children and their families. Being familiar with a warm environment can effectively alleviate children's fear of going to the dentist, provide them with solid psychological support, enhance their acceptance of oral medical treatment, and create a comprehensive, immersive, high-quality medical environment for patients, standing out from many clinics and winning the favour and praise of more families (Fig. 6).



Fig. 6. Delun Dental Clinic

Source: <https://mp.weixin.qq.com/s/hhjwRL53alZjH-KQ1YG9Ag>

Based on the above research, a child-friendly dental clinic interior design strategy based on multi-sensory experiences is proposed. Integrating multi-sensory experiences, science education, immersive atmosphere creation, and parent-child interaction elements is crucial to improving the child's experience of visiting the dentist and alleviating their fear of going to the dentist. It can create a warm and beneficial space for children and parents. First, a comfortable three-dimensional environment should be created using multi-sensory experiences. Visually, fresh, soft and lively colours like light blue, light green and warm pink should be used, with large murals of themes such as underwater adventures and forest fairies, cute lamps and cartoon decorations to create a space full of childlike wonder. Non-flickering lighting with an appropriate brightness ensures a comfortable viewing experience in the treatment and activity areas. Auditory experiences can be enhanced through soft classical children's songs and soothing music that are played continuously, while interactive sound devices in the waiting area trigger natural sounds such as birdsong and streams. High-quality soundproofing materials reduce equipment noise. An aromatherapy diffuser that emits a light lavender and citrus fragrance, and air purification equipment that ensures fresh air can be used to improve olfactory experiences. In terms of tactile design, the furniture is preferred made of soft, skin-friendly materials, the treatment chairs that fit the curves of children's bodies, and through implementing a tactile experience area with items of different textures, giving children a comfortable and enjoyable experience from all sensory dimensions.

Second, popular science education is to be integrated into the entire process of the visit to promote knowledge transfer. A special area for oral health popular science can be set up in the waiting area, in a conspicuous and easily accessible location to attract children and parents. In terms of display methods, the panels with both text and pictures, in bright colours and at a height that is suitable for children, illustrate items of oral health science. They can be complemented by realistic tooth models and an interactive area that is easy for children to touch and feel. A multimedia area can be set up to play popular science animations in a loop, at a moderate volume. The space can be reserved in the consultation room for a large oral model and interactive electronic equipment, with which the medical staff can clearly explain treatment and health knowledge to patients with the aid of animations and lighting. At the end of the

consultation, a resource distribution area can be set up near the exit, which fits in with the overall atmosphere. The customised oral health handbooks, with cartoon, comic and game on the cover and inside pages, can be used to present the details of the consultation, care advice and follow-up time in a fun way, helping parents and children to establish oral health awareness.

Finally, immersive and interactive parent-child design can help alleviate dental phobia. Immersive experience design is dedicated to reshaping children's perception of dental clinics [17]. By constructing themed scenes such as a fairy tale world or a dreamlike universe, children can feel as if they are in a fun and magical space. The introduction of VR/AR technology brings children virtual adventures about oral health and visualised treatment processes, enhancing their understanding and acceptance of dental visits. In addition, role-playing areas to be set up, allowing children to familiarise themselves with the treatment process during games that simulate being a dentist, reducing their fear and resistance to dental treatment at a psychological level. Parent-child interaction elements can be used throughout, with small oral health classes set up for parents and children to participate together, where parents and children learn about dental care together and participate in interactive games, enhancing communication between parents and children about oral health awareness. Interactive parent-child collaboration devices can be installed in the waiting area and treatment area, such as the parent-child puzzle wall. By completing tasks together, not only can children's nervousness be relieved, but parent-child relationships can also be enhanced, creating a relaxed and safe medical environment for children.

## CONCLUSIONS

In summary, multi-sensory experience is crucial in the design and operation of child-friendly dental clinics. By identifying and summarising related concepts, the connotation and development status of multi-sensory experience design are clarified. The multi-sensory experience level is analysed in depth, covering basic senses, interaction, education and emotional experience, etc., and a theoretical framework for creating a comprehensive child oral examination environment is constructed. Improvement strategies for interior design are proposed from multiple dimensions such as senses, popular science education, immersive experience and parent-child interaction, which refine the application methods of multi-sensory



experience in the interior design of clinics. These strategies aim to make use of children's sensory development characteristics, and through spatial design, facility layout and interactive activities, create a friendly environment for children that is conducive to oral treatment and also promotes physical and mental development. In the future, with in-depth research on children's developmental needs and multi-sensory experiences, the design of child-friendly dental clinics will be more in line with children's characteristics. We need to continue to pay attention to research progress, optimise design strategies, and provide children with a better, more comfortable and more personalised oral healthcare environment to help them grow up healthily.

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## АНОТАЦІЯ

**Чжао Ке, Косенко Д. Дизайн інтер'єру дружньої до дітей стоматологічної клініки для мультисенсорного досвіду**

**Мета.** Інтеграція мультисенсорного досвіду в дизайн інтер'єру стоматологічної клініки, дружньої до дітей, відповідає фізичним і психологічним потребам дітей і є орієнтиром для оптимізації середовища догляду за ротовою порожниною. У цій статті розглядаються відповідні концепції та поточна ситуація, аналізуються рівні мультисенсорного досвіду для побудови теоретичної основи, та пропонується багатовимірна стратегія дизайну, заснована на розумінні критичного періоду розвитку дитини, для створення середовища, сприятливого для орального лікування дітей, їх фізичного і розумового розвитку, і оптимізації дизайну таких просторів.

**Методологія.** Інтеграція мультисенсорного досвіду та дизайну інтер'єру стоматологічних клінік, дружніх до дітей, досліджується за допомогою теоретичних досліджень, тематичних досліджень, вивчення досвіду проектування та формулювання багатовимірної стратегії дизайну середовища.

**Результати.** Мультисенсорний досвід має важливе значення для дизайну стоматологічної клініки, дружньої до дитини. Дослідженням виділено чотири рівні мультисенсорного досвіду: базові відчуття, взаємодія, освіта та емоції, кожен з власними аспектами розробки. Розглянуто та узагальнено приклади реалізації мультисенсорного дизайну інтер'єру дитячої стоматологічної клініки з урахуванням вказаних чотирьох рівнів. Запропоновано багатовимірну стратегію дизайн-проектування інтер'єру дружньої до дитини стоматологічної клініки.

**Наукова новизна.** Узагальнено теоретичні та практичні підходи до дизайн-проектування інтер'єру стоматологічних клінік, дружніх для дітей, на основі теорії розвитку дитини з урахуванням мультисенсорного досвіду.

**Практична значущість.** Результати сприяють покращенню дизайну закладів для лікування порожнини рота дітей, оптимізації якості послуг з догляду за ротовою порожниною. Надано рекомендації щодо дизайну дитячої стоматологічної клініки.

**Ключові слова:** дизайн середовища, дизайн інтер'єру, дизайн меблів та обладнання, мультисенсорний дизайн, дружній до дітей дизайн, експериментальний дизайн, партисипаторний дизайн.

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