

Exploring Intervention Pathways for Children's Medical Fear: A Cognitive Behavioral Perspective

Jia Zhang, Mei Zeng*, Yanfang He, Yue Hu

Department of Pediatrics, The First Affiliated Hospital of Yangtze University, Jingzhou, China

Email: *442494279@qq.com

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Abstract

This study aims to conduct an in-depth analysis of children's medical fear to mitigate its negative impacts on children's physical and mental health as well as treatment outcomes. By comprehensively applying literature research, case analysis, and other methods, this study systematically examines the four major sources of children's medical fear from a cognitive-behavioral perspective, including pain expectation, sense of loss of control, unfamiliar environment, and past trauma. Based on cognitive-behavioral theory, an intervention path encompassing cognitive interventions (such as cognitive restructuring and cognitive education) and behavioral interventions (such as systematic desensitization and exposure therapy) is proposed, and the differences in interventions for children of different age groups are explored. The research finds that this intervention path has significant application potential and is expected to play an important role in clinical practice and the promotion of children's mental health, providing effective guidance for improving children's medical experience and treatment compliance.

Keywords

Children's Medical Fear, Cognition and Behavior, Intervention Path, Pain Expectation, Sense of Loss of Control

1. Introduction

1.1. Research Background

Children's medical fear is a common psychological phenomenon in pediatric

*Corresponding author.

medical care, exerting significant negative effects on children's physical and mental health, treatment cooperation, and overall treatment effectiveness. Studies have shown that children often experience intense fear in medical settings due to factors such as pain expectation, unfamiliar environment, sense of loss of control, and past trauma. This emotion may not only lead children to avoid or delay medical treatment but also trigger behaviors such as crying and resistance, thereby reducing the work efficiency of medical staff and affecting treatment outcomes [1]. In addition, long-term medical fear may have profound impacts on children's mental health, such as increasing the risk of anxiety and depression, and even subtly influencing their medical behavior patterns in adulthood [2]. Therefore, in-depth exploration of the causes and intervention strategies of children's medical fear is not only an important issue to improve the quality of pediatric medical services but also a key link to ensure children's physical and mental health.

1.2. Problem Statement

Although existing studies have initially explored the sources and manifestations of children's medical fear, there are still certain limitations in the academic understanding of this field. On the one hand, most existing studies focus on the analysis of single factors, lacking a comprehensive exploration of multi-dimensional sources such as pain expectation, sense of loss of control, unfamiliar environment, and past trauma. On the other hand, although interventions for children's medical fear have been attempted, such as play therapy and situational simulation, these methods often lack systematicness and pertinence and fail to fully integrate the core principles of cognitive-behavioral theory in their design. In addition, the collaborative role of families and hospitals in the intervention process has not received sufficient attention, resulting in intervention effects that are difficult to meet expected goals. Therefore, this study aims to fill the above research gaps by in-depth analyzing the cognitive-behavioral mechanism of children's medical fear and proposing a more scientific and practical intervention path.

1.3. Research Objectives

The main objectives of this study are to fully reveal the four major sources of children's medical fear, namely pain expectation, sense of loss of control, unfamiliar environment, and past trauma, and to construct an effective intervention path based on cognitive-behavioral theory. Specifically, this study will first clarify the psychological mechanisms of each source and their impacts on children's medical fear through literature review and theoretical analysis. Secondly, combining the core viewpoints of cognitive-behavioral theory, it will propose multi-dimensional intervention strategies including cognitive restructuring, cognitive education, systematic desensitization, and exposure therapy. Finally, it will explore the application prospects of these intervention paths in clinical practice, aiming to provide theoretical support and practical guidance for improving children's medical experience and treatment effectiveness [3].

2. Literature Review

2.1. Theories Related to Children's Medical Fear

Research on children's medical fear is inseparable from the support of psychological theories, among which the theory of fear emotion development and cognitive-behavioral theory play important roles in explaining the formation mechanism of children's medical fear. The theory of fear emotion development points out that children's fear emotions are closely related to their age, cognitive ability, and life experience. Especially when facing unfamiliar or potentially threatening situations, children are more likely to produce fear responses [2]. For example, in medical settings, children's fear of pain, separation, and the unknown often stems from their limited cognitive ability and excessive vigilance towards dangerous situations. In addition, according to cognitive-behavioral theory, an individual's cognitive processes directly affect their emotional responses and behavioral performance. Due to the immature cognitive development of children, they are prone to misinterpret medical procedures and environments, thereby exacerbating fear emotions [4]. These theories provide a solid theoretical foundation for in-depth analysis of the sources and intervention paths of children's medical fear.

2.2. Research Progress on the Sources of Children's Medical Fear

Domestic and foreign studies have shown that the main sources of children's medical fear include pain expectation, medical environment, past traumatic experiences, and other aspects. Firstly, pain expectation is considered one of the core factors of children's medical fear. Studies have found that children's pain expectation of medical procedures is often based on past experiences or descriptions from others. This expectation will significantly amplify their fear of the medical process, thereby affecting treatment cooperation [5] [6]. Secondly, the unfamiliarity and oppression of the medical environment are also important causes of children's fear. The spatial layout of the hospital, medical equipment, and the clothing of medical staff may all make children feel uneasy, especially in the absence of parental companionship, this sense of fear is more intense [7]. In addition, unpleasant past medical experiences will form traumatic memories in children's minds, which are reactivated in subsequent medical scenarios, further exacerbating children's fear responses [6]. Although existing studies have achieved certain results in revealing the sources of children's medical fear, there are still limitations such as insufficient sample size and single research method, which urgently need to be improved by more systematic studies.

2.3. Research on Interventions for Children's Medical Fear

Interventions for children's medical fear mainly include play therapy, situational simulation education, and interventions based on cognitive-behavioral theory. As a widely used method in children's psychological intervention, play therapy diverts children's attention through game activities, helps them relieve tension, and establishes a correct understanding of medical care [1]. For example, the "reading

+ play” therapy, combined with the theory of cognitive-behavioral therapy, has effectively reduced the medical fear of children with leukemia [2]. Situational simulation education reduces children’s fear of the unknown by allowing them to familiarize themselves with medical procedures and environments in advance. Studies have shown that situational simulation education can significantly reduce anxiety and pain scores of preschool children with strabismus during perioperative intravenous catheterization [6]. In addition, interventions based on cognitive-behavioral theory, such as systematic desensitization and exposure therapy, are also widely used in the intervention of children’s medical fear. These methods help children overcome fear by gradually exposing them to fear stimuli and have been proven to be effective in multiple studies [8] [9]. However, the specific application scenarios and effects of different interventions still need further exploration to optimize their application in clinical practice.

3. Analysis of the Four Major Sources of Children’s Medical Fear

3.1. Pain Expectation

3.1.1. Formation of Pain Expectation

Children’s expectation of medical pain often stems from their life experiences and others’ descriptions of the medical process. During growth, children gradually form a cognitive framework for medical procedures by observing the medical experiences of family members or peers. For example, if a child witnesses others showing painful emotions due to injections or surgeries, they may associate such scenes with pain, thereby generating anticipatory fear when facing similar situations themselves [2]. In addition, verbal descriptions also play a key role in the formation of pain expectation. Negative evaluations of medical procedures or overemphasis on pain sensations by adults may further strengthen children’s fear. Studies have shown that this anticipatory fear is not only related to an individual’s sensitivity to pain but also influenced by social learning theory, that is, children construct their own emotional experiences by observing and imitating others’ behavioral responses [6]. Therefore, the formation of pain expectation is a complex psychological process involving the multiple effects of direct experience, indirect learning, and environmental cues.

3.1.2. Association between Pain Expectation and Fear

Pain expectation significantly amplifies children’s fear and has a profound impact on their treatment cooperation. When children expect to experience pain, the amygdala area in their brains is activated, triggering intense fear emotions. This emotional response may cause children to exhibit resistant behaviors such as crying, struggling, or avoiding medical procedures, thereby reducing treatment compliance and effectiveness [7]. For example, in a study on children with leukemia, it was found that after receiving the “reading + play” therapy, the pain expectation of the intervention group significantly decreased, and the level of medical fear also decreased accordingly. This indicates that regulating pain expectation through in-

intervention can effectively alleviate children's fear [9]. In addition, pain expectation may also have a negative impact on children's long-term mental health. Repeated pain expectation experiences may lead children to form persistent fear memories of the medical environment, and even affect their medical behavior patterns in adulthood. Therefore, intervention targeting pain expectation is not only the key to reducing children's medical fear but also an important link to improve overall treatment effectiveness.

3.2. Sense of Loss of Control

3.2.1. Experience of Loss of Control in the Medical Process

In medical settings, children often experience a sense of loss of control due to the complexity of treatment processes and restrictions on physical activities. For example, during invasive procedures such as venipuncture or bone marrow aspiration, children's bodies are fixed in specific positions and cannot move freely. This physical restriction triggers psychological unease. At the same time, the professionalism and technicality of medical procedures make it difficult for children to understand their purposes and processes, further exacerbating the sense of loss of control. In addition, the closed and unfamiliar nature of the hospital environment may also weaken children's sense of security, making them feel unable to control their own situation. Studies have shown that the sense of loss of control is one of the important sources of children's medical fear. Especially in intensive care areas such as neurosurgical wards, children have more intense experiences of loss of control due to severe illness and being away from parental companionship. This sense of loss of control is not only manifested as emotional anxiety and fear but may also lead to behavioral resistance or withdrawal in children.

3.2.2. Reinforcement of Fear by the Sense of Loss of Control

The sense of loss of control further reinforces children's medical fear through psychological mechanisms and negatively affects their trust and cooperation in medical care. When children feel out of control, the stress system in their brains is activated, releasing a large amount of stress hormones such as cortisol, thereby increasing the intensity of fear emotions [10]. For example, in a study on situational simulation education, preschool children with strabismus had reduced sense of loss of control and significantly lower levels of anxiety and fear during intravenous catheterization due to the introduction of picture books and video explanations during preoperative visits [11]. This indicates that providing information and enhancing controllability can effectively alleviate the reinforcing effect of the sense of loss of control on fear. However, when the sense of loss of control persists, children may develop resistance to medical procedures and even refuse treatment. This lack of trust not only affects short-term treatment outcomes but may also have a profound impact on children's long-term medical attitudes. Therefore, in the medical process, medical staff should focus on helping children restore a sense of control over the situation through communication and intervention measures, thereby reducing fear and improving treatment compliance.

3.3. Unfamiliar Environment

3.3.1. Unfamiliar Factors in the Hospital Environment

Elements such as the spatial layout, decorative colors, and medical equipment of the hospital together constitute an unfamiliar environment perceived by children, becoming one of the important sources of their medical fear. In terms of spatial layout, hospitals usually adopt a functional zoning design, and the corridors between various departments are complex. For children with immature cognitive abilities, this spatial structure is likely to trigger a sense of confusion and unease [5]. In addition, the internal decoration of hospitals is mostly dominated by gray and white tones. This cool color not only lacks affinity but may also make children associate it with “horrible” or “cold” images, thereby increasing their fear [12]. The existence of medical equipment further exacerbates the sense of unfamiliarity. For example, flashing monitors, cold stethoscopes, and sharp syringes are not only threatening in appearance but may also be accompanied by pain or discomfort during use, making children have a strong resistance to them. Studies have pointed out that the sense of oppression and alienation in the medical environment is one of the main reasons for children’s medical anxiety, especially in children’s hospitals, this impact is particularly significant [13].

3.3.2. Psychological Mechanism of Fear Triggered by Unfamiliar Environment

Due to the characteristics of their cognitive development stage, children have unique psychological mechanisms for generating fear of unfamiliar environments. According to Piaget’s cognitive development theory, children’s cognitive ability is in the stage of transition from representation to concrete operations, and their thinking style mainly relies on intuitive experience and sensory stimulation [12]. Therefore, the complex spatial relationships, cold medical equipment, and unfamiliar medical staff in the hospital environment may exceed the scope of children’s cognitive understanding, thereby triggering fear emotions. In addition, children’s psychological endurance is relatively weak. When facing an unfamiliar environment, the amygdala area in their brains prioritizes processing potential threat information, leading to the rapid activation of fear emotions [2]. Studies have shown that interventions such as cartoon decoration and situational games can significantly reduce children’s fear responses to unfamiliar environments. For example, in a study on cartoon decoration of medical space components, the clothing of medical staff and the treatment environment after adding cartoon decorations significantly improved children’s visual behavior and reduced their anxiety levels [13]. This indicates that interventions targeting children’s cognitive characteristics can effectively alleviate fear emotions triggered by unfamiliar environments.

3.4. Past Trauma

3.4.1. Impact of Past Medical Trauma

Unpleasant past medical experiences of children have a long-term impact on their

psychology and may form profound traumatic memories. For example, during invasive procedures such as venipuncture or surgery, children may experience intense psychological stress reactions due to the combined effects of pain, sense of loss of control, or unfamiliar environment. This negative experience not only triggers fear at that time but may also leave lasting memory traces in the brain, becoming a potential source of medical fear in the future [7]. Studies have shown that the formation of traumatic memories is closely related to children's emotional regulation ability. Due to the immature emotional regulation mechanism of children, they are unable to effectively cope with intense stimuli, leading to the consolidation of traumatic memories [6]. In addition, caregivers' lack of awareness of children's medical fear may also exacerbate the impact of traumatic memories. For example, if parents fail to promptly identify and intervene in children's medical fear, they may repeatedly experience similar negative emotions in subsequent medical scenarios, thereby deepening the intensity of traumatic memories.

3.4.2. Association between Traumatic Memories and Current Fear

Past traumatic memories are easily retriggered in current medical scenarios, thereby triggering children's fear responses. For example, when children re-enter the hospital or come into contact with stimuli related to past trauma (such as syringes or white coats), the hippocampus area in their brains will quickly retrieve and activate relevant traumatic memories, leading to the re-emergence of fear emotions [10]. This recurrence of memories is not only manifested as emotional anxiety and fear but may also be accompanied by physiological reactions such as increased heart rate and shortness of breath [9]. Studies have shown that through interventions such as situational games and cognitive education, children can be helped to reconstruct their cognitive framework of medical care, thereby reducing their reliance on traumatic memories. For example, in a study on the situational game nursing model, the medical fear score of the observation group was significantly lower than that of the control group through participating in situational games. This indicates that traumatic memories' impact on current fear can be effectively alleviated through intervention measures [7]. Therefore, intervention targeting past trauma is not only an important way to reduce children's medical fear but also a key link to promote their mental health development.

4. Applicability of Cognitive-Behavioral Theory in the Research of Children's Medical Fear

4.1. Overview of Cognitive-Behavioral Theory

As an important psychological theoretical framework, Cognitive-Behavioral Theory (CBT) emphasizes that an individual's emotions and behaviors are significantly influenced by their cognitive processes. The core viewpoint of this theory is that there is a dynamic interaction between an individual's cognition, behavior, and emotions, among which cognition is the key mediating factor connecting external stimuli and emotional responses [2]. Specifically, cognitive-behavioral the-

ory holds that an individual's cognitive evaluation of external events determines their emotional experience and behavioral responses, rather than the events themselves directly causing emotional or behavioral changes. For example, in the face of medical situations, children's cognitive interpretation of the hospital environment, medical procedures, and pain expectation will directly affect the intensity of their fear and treatment cooperation [4]. In addition, cognitive-behavioral theory also emphasizes that by changing an individual's cognitive patterns and behavioral habits, their emotional state can be effectively regulated, thereby achieving the intervention and improvement of psychological problems. This theory not only provides a systematic analytical perspective for understanding children's medical fear but also lays a solid theoretical foundation for the subsequent design of intervention paths.

4.2. Explanation of Children's Medical Fear by Cognitive-Behavioral Theory

Based on cognitive-behavioral theory, the generation and maintenance of children's medical fear can be regarded as the result of complex interactions between cognition, behavior, and emotions. Firstly, children's cognitive evaluation of medical situations is a key incentive for the generation of fear emotions. For example, when children interpret medical procedures as "inevitable pain" or "a threat to their own safety", this negative cognitive evaluation will directly trigger intense fear emotions [3]. Secondly, behavioral factors play an important role in the maintenance of medical fear. Due to unpleasant past medical experiences, children may exhibit avoidance behaviors. This behavioral avoidance not only reinforces fear emotions but also further consolidates negative cognitive patterns, forming a vicious circle [14]. In addition, cognitive-behavioral theory also points out that children's emotional responses in medical situations will react on their cognition and behavior. For example, intense fear may lead children to be overly vigilant of the medical environment, thereby increasing their sensitivity to unfamiliar environments and the sense of loss of control. Therefore, cognitive-behavioral theory provides a comprehensive explanatory framework for understanding the multi-dimensional causes of children's medical fear and emphasizes the core role of cognition and behavior in the formation of fear emotions.

4.3. Intervention Ideas Based on Cognitive-Behavioral Theory

Based on the core viewpoints of cognitive-behavioral theory, the basic idea of intervening in children's medical fear can start from two aspects: cognition and behavior, aiming to break the vicious circle of fear emotions and establish positive coping mechanisms. At the cognitive level, the focus of intervention is to help children identify and correct their misconceptions about medical situations. For example, through cognitive restructuring techniques, children are guided to re-interpret the meaning of medical procedures, regarding them as "a process of restoring health" rather than "a source of pain" [8]. In addition, cognitive education

is also an effective intervention method. Medical knowledge is imparted to children through popular science lectures, story-telling, and other forms to reduce fear caused by the unknown [11]. At the behavioral level, systematic desensitization and exposure therapy are widely used in the intervention of children's medical fear. Systematic desensitization helps children gradually adapt to and reduce fear responses by gradually exposing them to fear stimuli. Exposure therapy encourages children to face fear situations directly, thereby overcoming psychological barriers [3]. These intervention methods not only have theoretical feasibility but also have been verified in clinical practice, showing significant effects. In addition, a large meta-analysis on the efficacy of cognitive-behavioral therapy in the treatment of children's procedural anxiety confirmed that CBT-related interventions have stable and significant efficacy in alleviating children's medical-related fear and anxiety, providing strong empirical support for the intervention ideas proposed in this paper [15]. In summary, the intervention ideas based on cognitive-behavioral theory provide a scientific and practical solution for the management of children's medical fear.

5. Cognitive-Behavioral-Based Intervention Paths for Children's Medical Fear

5.1. Cognitive Intervention Paths

5.1.1. Cognitive Restructuring

As one of the core techniques of cognitive intervention, cognitive restructuring aims to help children identify and correct their misconceptions about medical situations, thereby establishing a more reasonable and positive cognitive model. During the medical process, children often experience excessive fear due to a lack of understanding of medical procedures. These misconceptions may come from past negative experiences, others' descriptions, or their own imagination. For example, young patients may directly associate the hospital environment with pain, forming a one-sided cognition of "going to the hospital will be very painful" [2]. Through cognitive restructuring, medical staff and parents can guide children to re-examine these ideas and gradually replace the original wrong beliefs through factual verification and logical reasoning. Specifically, methods such as questioning, discussion, and situational simulation can be used to help children recognize the necessity and safety of medical procedures. For example, in a study on children with leukemia, the "reading + play" therapy significantly reduced the children's fear of the medical environment through story-telling and interactive activities, indicating that cognitive restructuring can effectively alleviate fear caused by misconceptions [3].

5.1.2. Cognitive Education

Cognitive education conveys medical-related information to children through popular science knowledge teaching, story-telling, and visual tools to reduce fear caused by the unknown. Children's unfamiliarity with medical procedures is often an important source of fear, so providing clear and easy-to-understand medical

knowledge helps reduce their anxiety levels. For example, by creating picture books or animated videos related to surgeries, children can understand the medical process and possible discomfort in advance, thereby reducing fear caused by the unknown [4]. In addition, situational games have also been proven to be an effective means of cognitive education. In the situational game nursing model, nurses demonstrate the bone marrow aspiration process through doll toys and encourage young patients to participate in role-playing, enabling them to master medical knowledge and enhance psychological adaptability in games [9]. This method not only improves children's cognitive ability of medical procedures but also promotes their trust in the treatment process, further reducing the incidence of fear emotions.

5.2. Behavioral Intervention Paths

5.2.1. Systematic Desensitization

Systematic desensitization is a classic behavioral intervention method whose core lies in gradually exposing children to fear stimuli while combining relaxation training to reduce fear responses. This method usually consists of three steps: first, constructing a fear hierarchy scale, ranking children's fear sources according to the severity; second, guiding children to perform deep muscle relaxation training, such as deep breathing or progressive muscle relaxation; finally, exposing children to fear stimuli step by step while they maintain a relaxed state. For example, in a study on preschool children with strabismus, the application of situational simulation education during preoperative visits allowed young patients to gradually come into contact with surgery-related scenes and tools, significantly reducing their anxiety and pain scores during intravenous catheterization [8]. This method helps children gradually adapt to situations that originally triggered fear through progressive exposure, thereby reducing the intensity of fear responses.

5.2.2. Exposure Therapy

The basic principle of exposure therapy is to let children face fear situations directly and gradually overcome fear through repeated contact. Different from systematic desensitization, exposure therapy emphasizes direct confrontation rather than gradual progression, and is suitable for children who can tolerate higher-intensity stimuli. In the intervention of children's medical fear, exposure therapy is often used in combination with cognitive education to ensure that children receive adequate psychological support during the exposure process. For example, in a study on bone marrow aspiration, the experimental group received additional situational game interventions on the basis of routine care, including situational simulation and role-playing. The results showed that their intraoperative pain behavior scale scores and total medical procedure fear scores were significantly lower than those of the control group [6]. This indicates that exposure therapy can change children's fear cognition of medical procedures through real situational experiences, thereby achieving long-term alleviation of fear emotions. It should be noted that intervention methods such as exposure therapy may cause

temporary pain to children. Therefore, during the implementation process, ethical guidelines must be strictly followed, written consent from parents or legal guardians must be obtained in advance, and informed consent must be obtained from children in an easy-to-understand way according to their cognitive level. At the same time, children's psychological status must be closely monitored during the intervention to ensure their psychological safety, and the intervention intensity should be adjusted or the intervention should be suspended in a timely manner if necessary.

5.3. Intervention Differences for Children of Different Age Groups

5.3.1. Intervention Characteristics for Early Childhood (3 - 6 Years Old)

The psychological development characteristics of young children (3 - 6 years old) determine that their intervention methods should focus on intuitiveness and fun. Children at this stage are in the stage of representational thinking, and their cognition of things mainly relies on sensory experience. Therefore, intervention measures should be as specific and visualized as possible. For example, in the intervention of young children, the medical environment can be improved through cartoon decoration, and colorful toys or interactive games can be used to divert attention, thereby reducing their resistance to medical procedures [1]. In addition, parental companionship and comfort are particularly important at this stage. Because young children are highly dependent on their parents, active parental participation can significantly improve intervention effects. However, it should be noted that young children's language expression ability is limited. Medical staff should evaluate intervention effects by observing their behavioral responses and adjust strategies in a timely manner [7].

5.3.2. Intervention Characteristics for School-Age Children (6 - 12 Years Old)

The cognitive and behavioral characteristics of school-age children (6 - 12 years old) make their intervention strategies need to pay more attention to logic and autonomy. Children at this stage already have a certain degree of abstract thinking ability and can understand simple medical knowledge and operation processes. Therefore, intervention measures can incorporate more cognitive education and behavioral training. For example, in the intervention of school-age children, situational simulation education can be used to help them familiarize themselves with the medical environment, and positive behaviors can be strengthened through praise and reward mechanisms [12]. Studies have shown that the application of anesthesia induction based on the Child Life concept in preschool children significantly reduced their anxiety levels, suggesting that interventions for school-age children should fully utilize the development characteristics of their self-efficacy and encourage them to actively participate in the treatment process [3]. In addition, because school-age children are sensitive to social evaluation, medical staff should pay attention to protecting their self-esteem during the intervention process to avoid exacerbating fear due to negative evaluations.

5.3.3. Intervention Characteristics for Adolescents (12 - 18 Years Old)

Interventions for adolescents (12 - 18 years old) should focus on their unique cognitive development, social concerns, and fear sources. Adolescents at this stage have a highly awakened self-awareness, pay attention to privacy protection and peer recognition. Their fear of medical procedures may stem more from the deprivation of physical autonomy, excessive worry about treatment outcomes, and concerns about social image (such as worrying about the impact of treatment on appearance, being laughed at by peers, etc.). Intervention strategies should strengthen autonomy and confidentiality, and give adolescents full right to know and the opportunity to participate in decision-making. For example, allowing them to independently choose the time arrangement related to treatment and participate in the formulation of intervention plans. In terms of cognitive education, more scientific and logical popular science materials (such as medical popular science videos, graphic manuals) can be used to explain the principles, risks, and coping methods of medical procedures in depth to meet the needs of their abstract thinking development. In behavioral intervention, mindfulness training, emotional management skills, etc. can be combined to help them independently regulate fear emotions. At the same time, attention should be paid to adolescents' social needs. Discussions related to intervention should be avoided in public. If necessary, a peer support mechanism can be introduced to allow adolescents who have experienced similar medical processes to share their experiences and enhance their confidence in coping. In addition, adolescents may resist intervention due to rebellious psychology. Medical staff and parents should adopt an equal communication method, avoid preaching, and implement intervention after establishing a trusting relationship.

5.4. Assessment Methods for Children's Medical Fear

To scientifically assess the level of children's medical fear and intervention effects, standardized measurement tools need to be adopted. Common assessment methods include scale assessment and behavioral observation: 1) Scale assessment: such as the Children's Medical Fear Scale (CMFS), which covers dimensions such as medical environment, medical procedures, and pain, and is suitable for children of different age groups; the medical-related subscale of the Spence Children's Anxiety Scale (SCAS), which can assess anxiety caused by medical scenarios; for younger children, parent-rated scales (such as the parent-reported Children's Medical Fear Questionnaire) can be used, where parents assess based on their children's daily performance. 2) Behavioral observation checklist: By observing children's specific behaviors in medical scenarios (such as crying, struggling, avoiding, changes in heart rate, etc.), a standardized behavioral observation scale is formulated for real-time recording and scoring by medical staff or researchers. These assessment tools should be used regularly before, during, and after the intervention to dynamically monitor changes in children's medical fear, providing an objective basis for the adjustment of intervention plans and the verification of effects.

5.5. Impact of Cultural Factors on Interventions

Cultural factors may affect the expression of children's medical fear, parental attitudes, and the acceptability of intervention measures. Under different cultural backgrounds, families have different perceptions of children's pain and norms for emotional expression. For example, in some cultures, "endurance" is emphasized, and children may suppress fear emotions, while in other cultures, free emotional expression is encouraged. Parents' trust in the medical system and acceptance of intervention measures may also be affected by cultural concepts (such as acceptance of Western psychological intervention techniques, preference for traditional comfort methods, etc.). Therefore, when implementing intervention paths, full consideration should be given to the cultural background of children and their families. For example, for cultures that value family values, the core role of the family in the intervention should be strengthened; for cultures that emphasize collectivism, family support groups and other forms can be introduced; in the design of cognitive education materials, culture-related symbols and stories should be integrated to improve the adaptability of the intervention. At the same time, medical staff should respect the values and behavioral habits of different cultures, avoid adopting a single intervention model, and ensure the cultural sensitivity and acceptability of intervention measures.

6. Integration of Intervention Paths with Family and Hospital Settings

6.1. The Role of Families in Interventions

Family support plays a crucial role in the intervention of children's medical fear. Parents are not only the main caregivers of children but also an important source of their psychological security. Studies have shown that parents' emotional states and behavioral styles directly affect young patients' cognition and responses to the medical environment [4]. For example, when parents show excessive anxiety or lack confidence in the medical process, children are more likely to generate fear emotions. Therefore, parents need to first adjust their own mentality, face the medical process with a positive and calm attitude, and convey trust and support to their children through words and actions. In addition, parents can help their children establish correct cognition by educating them to accept medical care and medical staff. Specific measures include explaining the necessity of medical procedures in easy-to-understand language and letting children understand the meaning of treatment through metaphors or stories. For example, doctors and nurses can be compared to "superheroes" who help the body recover health, and the treatment process can be analogous to an "adventure journey" to overcome difficulties [10]. These methods can not only reduce young patients' resistance but also enhance their cooperation with medical procedures.

At the same time, parents can use things that children are interested in, such as games, animations, and music, to divert their attention, thereby alleviating medical fear. Reference [1] points out that setting up a game area in the ward with

interactive toys and music playback equipment can effectively reduce young patients' sense of unfamiliarity and resistance to the medical environment. Parents should actively participate in these activities, playing or listening to music with their children to make them feel accompanied and cared for. This family-involved intervention method not only helps improve young patients' psychological status but also promotes the development of the parent-child relationship, laying a good foundation for subsequent treatment [4].

6.2. Implementation of Interventions in Hospital Settings

As the core place where children receive medical services, the hospital's environmental design and the professional behavior of medical staff have an important impact on the implementation of intervention paths. Firstly, hospitals should optimize the spatial layout and decoration style to reduce children's fear of unfamiliar environments. Studies have shown that cartoon decoration in medical spaces can significantly change children's visual behavior and reduce their anxiety levels [5]. For example, adding colorful murals, cartoon character stickers, and interesting wayfinding devices in waiting areas, wards, operating rooms, and other areas can effectively relieve children's tension. In addition, the clothing of medical staff can also be appropriately cartoonized to enhance affinity and make it easier for children to accept their presence.

Secondly, medical staff play an indispensable role in the intervention process. They not only need to have solid professional skills but also master certain psychological knowledge and communication skills to better interact with young patients and their families. For example, the adoption of an intervention method based on the Child Life concept during anesthesia induction can significantly reduce the anxiety score and agitation rate of preschool children [8]. This method emphasizes starting from the perspective of children, helping them familiarize themselves with the medical process through situational simulation, role-playing, and other means, thereby reducing fear caused by the unknown. At the same time, medical staff should also focus on cooperation with parents to jointly formulate personalized intervention plans to ensure that each young patient receives targeted support and care [5].

6.3. Collaborative Intervention Model between Families and Hospitals

The collaborative intervention model between families and hospitals is the key to improving the effect of children's medical fear intervention. Both parties need to establish an effective communication mechanism, jointly formulate and implement intervention plans to achieve resource sharing and complementary advantages. On the one hand, hospitals can popularize knowledge about children's medical fear and corresponding coping strategies to parents through health education lectures or the distribution of popular science manuals, helping them improve their intervention capabilities [1]. On the other hand, parents should

promptly feedback their children's psychological status and behavioral changes to medical staff, providing a basis for adjusting intervention plans. For example, if a young patient shows intense fear of specific medical equipment, medical staff can design more targeted systematic desensitization training based on the information provided by parents.

In addition, families and hospitals can strengthen collaboration with the help of modern information technology. For example, regularly update the intervention progress of young patients through online platforms and invite both parties to participate in discussions to ensure the consistency and continuity of intervention measures [11]. This collaborative model can not only improve intervention effects but also enhance the trust between parents and medical staff, creating a safer and warmer medical environment for children. In short, only through close cooperation between families and hospitals can the role of intervention paths be fully exerted, minimizing children's medical fear and promoting their physical and mental health development [1].

7. Application Prospects and Challenges of Intervention Paths

7.1. Application Prospects

The cognitive-behavioral-based intervention path for children's medical fear shows broad application prospects in clinical practice and the field of children's mental health promotion. Firstly, through systematic cognitive restructuring and behavioral training, this intervention path can significantly reduce children's fear in medical scenarios, thereby improving their treatment cooperation and overall treatment effectiveness [3]. For example, comprehensive intervention measures such as the situational game nursing model have been proven to effectively alleviate young patients' pain perception and anxiety levels, while improving family satisfaction, which provides strong support for the practical application of the cognitive-behavioral intervention path [7]. In addition, with the increasing attention paid to psychological intervention in pediatric medical care, such intervention paths are expected to become an important part of routine medical processes, further optimizing the quality of medical services.

From the perspective of children's mental health promotion, the cognitive-behavioral intervention path can not only improve short-term medical fear symptoms but also have a positive impact on their long-term mental health by cultivating children's correct cognitive patterns and coping strategies [14]. Studies have shown that untreated medical fear may lead to psychological problems such as post-traumatic stress disorder (PTSD) in children, and cognitive-behavioral therapy (CBT) has significant advantages in improving such symptoms [14]. Therefore, integrating the cognitive-behavioral intervention path into the children's mental health education system not only helps reduce the negative impact of medical fear but also enhances children's psychological resilience, laying a solid foundation for their future development.

At a broader public health level, the cognitive-behavioral-based intervention path also has high promotion potential. By providing professional training to medical staff, such intervention methods can be popularized in medical institutions at all levels, benefiting more child patients [3]. In addition, the collaborative intervention model combining family support and hospital resources can further strengthen intervention effects and provide comprehensive psychological support for children. This multi-dimensional application potential makes the cognitive-behavioral intervention path expected to become an important tool for the management of children's medical fear in the future.

7.2. Potential Challenges

Although the cognitive-behavioral-based intervention path for children's medical fear has significant application prospects, it may face multiple challenges in practical implementation. Firstly, individual differences among children are an unavoidable factor. Children of different ages, genders, and personality characteristics have significant differences in their cognition and responses to medical fear, which places high requirements on the personalized design of intervention paths [7]. For example, young children may rely more on sensory experiences and emotional comfort, while school-age children need more logical explanations and cognitive guidance [10], and adolescents need to balance their autonomy and social concerns. Therefore, during the implementation of the intervention, full consideration must be given to the individual characteristics of children, and targeted intervention plans must be formulated.

Secondly, resource constraints are also an important factor restricting the promotion of intervention paths. The implementation of cognitive-behavioral interventions requires the participation of professional psychologists or trained medical staff. However, at present, medical resources in some regions of China are relatively scarce, especially the lack of mental health service resources, which may affect the popularization and effectiveness of intervention paths [7]. In addition, the implementation of intervention paths also requires a certain amount of time and economic investment. For example, the development of the situational game nursing model requires specific venues and equipment support, which poses challenges to the resource allocation capacity of medical institutions.

Another potential challenge is the establishment and operation of the collaborative intervention mechanism between families and hospitals. Although family support plays a key role in the intervention of children's medical fear, due to the uneven cognitive level of parents on medical fear, some parents may not be able to fully cooperate with the implementation of intervention measures [10]. Therefore, how to improve parents' participation through health education and communication and coordination, and establish an effective family-hospital collaborative mechanism, is a key issue that needs to be addressed in the implementation process of intervention paths.

It should be noted that this study is a conceptual review rather than a systematic

literature review, and has not conducted a comprehensive systematic search, screening, and quantitative analysis of relevant studies, which is a limitation of this study. To address the above challenges, we can start from the following aspects: first, strengthen the training of professionals to improve the mastery and application capabilities of medical staff on the cognitive-behavioral intervention path; second, optimize resource allocation to reduce intervention costs through policy support and technical means; third, strengthen family health education to improve parents' cognition and intervention willingness of medical fear, thereby forming a good situation of joint participation by families and hospitals [3] [14]. Through efforts in various aspects, these challenges can be gradually overcome, and the wide application of the cognitive-behavioral-based intervention path for children's medical fear can be promoted.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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