INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

Vol 15, Issue 3, (2025) E-ISSN: 2222-6990

Application of New Media Interactive Art from the Perspective of User Center in the Packaging Design of Children's Medicine Boxes

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To Link this Article: http://dx.doi.org/10.6007/IJARBSS/v15-i3/24809 DOI:10.6007/IJARBSS/v15-i3/24809

Published Date: 05 March 2025

Abstract

This paper explores the application of new media interactive art in the packaging design of children's medicine boxes from a user-centered perspective. Focusing on children as a special consumer group, it addresses low medication adherence and aims to enhance children's enthusiasm for medication through humanized and entertaining packaging design. The research reviews the current status and theoretical foundations, including user-centered design, new media interactive art, and cognitive psychology. It analyzes issues in children's medicine packaging design, such as coexistence of attraction and misleading information, insufficient standardization, and lack of innovation. To address these, the paper proposes integrating new media interactive art into the design, exploring application methods like game behavior interaction, multi-sensory interaction, emotional interaction, and precise dosage design. A case study on pediatric Qingfei Huatan oral liquid packaging is analyzed. The research concludes that new media interactive art effectively improves children's medication experience, enhances safety and adherence, emphasizing the need for user-centered design, exploration of new media technology applications, and prioritizing environmental protection and sustainable development in children's pharmaceutical packaging.

Keywords: User-Centered, New Media Interactive Art, Children, Medicine Box Packaging

Introduction

Children, as a unique consumer group for pharmaceuticals, have always been a focal point of concern for families and society regarding their physical and mental health. However, in reality, children often refuse to take medication, which not only affects treatment outcomes but may also lead to a series of negative consequences. Addressing this issue requires innovative approaches to make the medication process more acceptable and engaging for children.

New media interactive art, with its unique interactivity and innovation, provides new ideas and methods for improving children's pharmaceutical packaging. By integrating playful and interactive elements, this approach can capture children's attention and reduce their psychological resistance to medication. The application of new media interactive art transforms medicine packaging into an engaging experience, making it easier for children to comply with their treatment plans.

The significance of this study extends beyond individual children to families, healthcare providers, and the pharmaceutical industry. For children, improved medication adherence enhances treatment effectiveness and promotes better health outcomes. For parents, it alleviates the stress and challenges associated with administering medication. Additionally, for pharmaceutical companies, designing more child-friendly and interactive packaging can enhance market competitiveness and consumer trust. By leveraging new media interactive art in pharmaceutical packaging, this study contributes to advancements in pediatric healthcare and opens new opportunities for innovation in the children's pharmaceutical market.

Literature Review and Theoretical Basis

Literature Review

With the advancement of technology and the diversification of consumer needs, the packaging design of children's medicine boxes is gradually moving towards user-centricity and new media interactivity (Ahmed et al., 2011). User-centered design emphasizes putting users at the core and focusing on their needs and experiences. Meanwhile, new media interactive art utilizes digital technology, the internet, and other new media tools to endow packaging with more interactivity and fun (Ahram et al., 2011). This section will provide an overview of the research status on the application of new media interactive art in the packaging design of children's medicine boxes from a user-centered perspective (Bataineh & Bataineh, 2007), examining both domestic and international perspectives (Batish et al., 2011; Beynon-Davies, 2002).

In China, research on the packaging design of children's medicine boxes started relatively late but has gradually gained attention in recent years. Domestic scholars have begun to focus on the issue of medication adherence among children and attempt to improve it through design means (Breault, 1974). In terms of user-centered design, domestic research has primarily concentrated on analyzing specific needs of children and their parents regarding medicine packaging, such as safety (Chen & Chuang, 2008), ease of use (Cross, 2008), and fun (David, 2001), and has proposed design principles and suggestions accordingly (Ford, 1976). For instance, some studies have suggested that children's medicine packaging should employ bright colors, clear icons, and easy-to-understand text instructions to reduce children's resistance to medication. In terms of the application of new media interactive art (Franklin & Rodgers, 2008), domestic research is still in the exploratory stage (Hayes, 2002). Some scholars have begun to experiment with incorporating AR/VR technology, audio interaction, tactile feedback, and other new media elements into the packaging design of children's medicine boxes to enhance interactivity and fun (Koliou et al., 2010; Mrvos & Krenzelok, 2007). However, due to technical costs and limitations in practical application scenarios, these studies have largely remained at the stage of theoretical discussion and conceptual design, without widespread market application (Yildiz, 2009).

In contrast, research on user-centric and new media interactive design of children's medicine boxes in foreign countries is more in-depth and extensive (Anuradha et al., 2023). Many developed countries have completed the market segmentation of medicine packaging for pediatric patients, conducting user research to gain insights into children's psychological and behavioral patterns during medication and enhancing the interaction between packaging and patients accordingly (Ke, 2019). In terms of user-centered design, foreign research focuses on designing packaging that better meets children's needs, taking into account their psychological and physiological characteristics (Zheng & Ji, 2018). For example, by applying theories such as color psychology and graphic semiotics, packaging can be designed to attract children's attention and reduce their fear, while also emphasizing ease of use to ensure that children can independently complete the medication process under parental guidance (Zhang, 2019). In terms of the application of new media interactive art, foreign research has achieved some substantial results. Some pharmaceutical companies have begun to apply new media tools such as AR/VR technology and intelligent sensing technology to the packaging design of children's medicine boxes, creating interactive and entertaining products (Wei et al., 2019). These products not only enhance children's medication experience but also improve their medication adherence through gamification design.

Researchers aim to motivate children to take medication regularly by incorporating game-like features into packaging, fostering a positive attitude towards the process (Bucchiarone, 2022). This approach leverages children's natural inclination towards play, making the experience more enjoyable and less stressful. Cross-cultural studies emphasize the importance of culturally sensitive designs in children's medicine packaging (Awan, 2019). Using culturally relevant icons, colors, and characters enhances children's emotional connection to the medication. International research recognizes parents' key role in administering medication to children and explores incorporating parental feedback into the design process (Sun, 2023). This collaborative approach fosters a sense of shared responsibility. Advancements in technology have facilitated the integration of smart packaging solutions in children's medicine boxes (Mihailidis, 2008). Smart packaging can track schedules, send reminders, and communicate with healthcare providers, enhancing medication management and adherence.

By comparing the research status at home and abroad, it can be observed that foreign research on user-centric and new media interactive design of children's medicine boxes is more mature and in-depth. While domestic research has a late start but is developing rapidly, there is still room for improvement in terms of technology application and market promotion. Future domestic research can draw on foreign advanced experience and technical means and innovate design by combining China's actual situation and cultural background regarding pediatric medication.

Theoretical Basis

User-Centered Design (UCD)

User-Centered Design (UCD) in the context of children's medicine box packaging necessitates a profound comprehension of the intricate needs and sentiments of both young patients and their caregivers. To cater to children, designers must delve into their innate preferences, cognitive capabilities at various developmental stages, and the often-prevalent fear associated with taking medication. This understanding informs the selection of vibrant

colors, playful graphics, and interactive elements that not only capture their attention but also alleviate anxiety, fostering a more positive medication experience. For parents, the focus shifts to ensuring packaging is intuitively operable, with secure resealing mechanisms and personalized dosage instructions tailored to their child's unique requirements. Extensive research into families' daily habits and emotional reactions to different packaging designs is paramount, as it enables designers to create solutions that harmoniously blend into their lifestyles, minimizing disruptions and enhancing overall convenience. This comprehensive, user-centric methodology guarantees that the packaging not only fulfills functional necessities but also fosters emotional connections, truly serving the diverse needs of both children and their caregivers.

New Media Interactive Art

New Media Interactive Art, a groundbreaking fusion of artistic creativity and cutting-edge technology, is reshaping the landscape of children's medicine packaging by introducing immersive and interactive experiences that transcend traditional boundaries. By harnessing the power of smart technologies such as Augmented Reality (AR) and Virtual Reality (VR), these innovative packages are transformed into captivating interactive worlds, filled with engaging educational games, captivating animations, and interactive body tours. These elements not only make the medication process less daunting but also foster a deeper understanding of health and wellness. Furthermore, the integration of audio and tactile feedback layers enhances the overall experience, distracting children from any medication-related anxiety and fostering positive associations with the treatment regimen. Personalization and adaptability features, tailored to each child's age, preferences, and medication progress, ensure that the packaging evolves with them, providing a continuously engaging and relevant journey. This revolutionary integration of New Media Interactive Art into medication packaging profoundly enriches the experience for both children and their caregivers, making medication time a more enjoyable and informative occasion.

Cognitive Psychology

Drawing from the principles of Cognitive Psychology, the design of children's medicine packaging necessitates a nuanced understanding of the cognitive processes that shape children's experiences. To create visually appealing and cognitively effective designs, designers meticulously consider factors such as perception, attention, memory, thinking, and imagination. The strategic use of colors, shapes, textures, and layouts is essential in capturing children's attention and fostering positive perceptions of the medication. By employing contrasting colors and visually compelling elements, designers are able to immediately engage children and hold their attention. Furthermore, mnemonic devices are incorporated to enhance memory retention, ensuring that children can easily recall critical information about dosage and administration. Clear layouts, concise instructions, and interactive visual aids empower children, fostering a sense of autonomy and control over their medication routine. Additionally, the incorporation of fantastical elements, storytelling, or gamification techniques leverages children's natural curiosity and imagination, transforming the medication experience into an engaging and enjoyable adventure. This holistic approach to design ensures that children's medicine packaging not only meets functional requirements but also resonates deeply with their cognitive and emotional needs.

Emotional Design

Emotional Design in children's medicine packaging endeavors to forge an emotional connection between the product and its young users, transforming what could otherwise be a daunting medication experience into a positive and uplifting encounter. By thoughtfully incorporating warm and inviting colors, endearing cartoon characters, and engaging interactive elements, designers create an atmosphere that instills a sense of joy and comfort, making the medication process more appealing to children. Furthermore, the inclusion of personalization options, such as allowing children to select their favorite characters or designs, strengthens this bond, fostering a sense of ownership and attachment to the packaging and, by extension, the medication itself. The overarching aim is to alleviate children's fears and foster trust in the treatment process, ensuring that they view taking their medicine as a positive and supportive experience rather than a chore. By harnessing the power of color, imagery, interactivity, and personalization, designers are able to craft packaging that not only stimulates children's fondness for their medication but also encourages compliance and companionship throughout their treatment journey.

Sustainable Design

Sustainable Design in the realm of children's medicine packaging embodies a comprehensive strategy aimed at minimizing environmental footprints and fostering a circular economy. It underscores the importance of using eco-friendly materials, such as cardboard and renewables derived from sustainable sources, which not only reduce the carbon footprint during production but also contribute to a healthier planet. By optimizing packaging designs, waste generation is significantly curtailed, ensuring that only the necessary amount of resources are utilized. Furthermore, the incorporation of features that facilitate easy recycling and reuse, including single-material constructions for streamlined separation and refillable containers that extend product lifecycles, underscores the commitment to circularity. Beyond environmental considerations, sustainable design also embraces social responsibility, advocating for fair labor practices, supporting local suppliers to stimulate local economies, and minimizing transportation distances to reduce emissions. This holistic approach harmoniously balances economic viability, social equity, and environmental protection, ultimately prioritizing long-term sustainability for future generations.

Current Status and Issues of Children's Medicine Packaging Design

Market Status and Common Issues

Coexistence of Attractiveness and Misleading Nature in Packaging Design

As the market for children's medicines expands, the significance of packaging design in captivating young patients' interest cannot be overstated. However, this pursuit of attention often comes at a cost. Some manufacturers, driven by marketing objectives, resort to overly flashy packaging adorned with cartoon characters and vibrant colors. While these designs undoubtedly succeed in grabbing children's attention, they inadvertently blur the line between medication and playthings. This misperception can lead to disastrous consequences, as children may erroneously identify medicines as toys or sweets, heightening the risk of accidental ingestion and potential harm. Thus, the challenge lies in striking a delicate balance between attracting children's curiosity and ensuring packaging clearly communicates the product's intended purpose and potential dangers. See Table1.

Table 1
Packaging Design for the Children's Pharmaceutical Market

Key Points	Description
Market Background	The children's pharmaceutical market is continuously expanding
Importance of Packaging Design	Attracting the interest of young patients is crucial
Cost of Pursuing Attention	Excessive pursuit of attention can lead to negative consequences
Manufacturer's Strategy	Use overly flashy packaging adorned with cartoon characters and vibrant colors to attract children
Design Effect	Successfully grabs children's attention but inadvertently blurs the line between medication and playthings
Potential Risks	Children may mistakenly identify medicines as toys or sweets, increasing the risk of accidental ingestion and potential harm
Challenge	Striking a delicate balance between attracting children's curiosity and ensuring packaging clearly communicates the product's intended purpose and potential dangers

Insufficient Standardization of Packaging

The issue of inadequate standardization in children's medicine packaging is a pressing concern. Packaging that lacks clarity in usage instructions and omits crucial details such as age-appropriate dosages creates confusion for parents administering medication to their children, leading to potential errors and compromising the efficacy of treatment. Additionally, the use of substandard packaging materials that are susceptible to damage or contamination poses a significant threat to medication safety. These materials may not adequately protect the medication from environmental factors, allowing moisture, air, or contaminants to penetrate, thereby altering the medicine's composition and efficacy. The consequences of such lapses can be severe, ranging from reduced therapeutic outcomes to adverse health effects. Hence, the need for rigorous standardization in children's medicine packaging, including clear and comprehensive usage instructions and the adoption of high-quality materials, cannot be overstated.

Lack of Innovation in Packaging Design

The stagnation of innovation in children's medicine packaging design is evident, with the prevalence of monotonous and uninspiring designs dominating the market. These packages fail to captivate children's attention due to their lack of novelty and aesthetic appeal, contributing to a general disinterest in the medication process. Furthermore, the mismatch between packaging size and medication quantity results in wasteful oversizing, not only consuming excess materials but also detracting from sustainability efforts and creating portability issues for patients and caregivers. The lack of creativity and consideration for practicality in these designs highlights the urgent need for a paradigm shift towards more engaging, functional, and environmentally conscious packaging solutions for children's medicines.

Specific Design Issues and their Impacts

Unclear Visual Information

The issue of inadequate packaging design for children's medications is a pressing concern. Numerous packages on the market suffer from unclear visual cues and overly technical

language in their instructions, posing a significant challenge for parents seeking to administer medication safely. This lack of straightforward information can lead to confusion and misinterpretation, ultimately elevating the risk of medication misuse. Moreover, the visual design of many packages often incorporates overly complex or monotonous color schemes that fail to captivate children's attention or foster a positive association with the medication. This can exacerbate children's natural resistance to taking medicine, making the entire process more difficult for both children and their caregivers. Therefore, there is a dire need for innovative packaging designs that prioritize clarity, simplicity, and visual appeal to enhance medication safety and compliance among children. See Table2.

Table 2
Challenges and Solutions for Children's Medication Packaging Design

Aspect	Current Issue	Impact	Solution Needs
Visual Cues	Unclear visual cues	Difficulty for parents to administer medication safely	Clear and intuitive visual design
Instructions	Overly technical language	Confusion and misunderstanding	Concise and straightforward language
Information Delivery	Lack of direct information	Increased risk of medication misuse	Prioritize clarity and accuracy of information
Color Design	Complex or monotonous color schemes	Failure to captivate children's interest or foster positive associations	Adopt attractive and creative color designs
Child Resistance	Exacerbates children's natural resistance to medication	Makes the medication process more difficult for both children and caregivers	Alleviate resistance through visually appealing design
Innovation Demand	Inadequate current designs	Affects medication safety and compliance	Necessitates innovative packaging designs that emphasize clarity, simplicity, and visual appeal

Safety Hazards

The absence of adequate safety features in certain medicine packaging poses a significant risk to children, particularly in households with young and curious minds. A primary concern lies in the design of bottle caps, which, if inadequately engineered, can be easily opened by children, leading to accidental ingestion. This not only endangers children's health but also creates unnecessary stress and anxiety for parents. Furthermore, the lack of effective resealing mechanisms in some packaging compromises the integrity of the medication post-opening. When packaging fails to provide a tight seal after the initial opening, it allows moisture, air, or other contaminants to penetrate, causing the medication to deteriorate over time. This degradation not only affects the efficacy of the medication but also undermines its safety, potentially leading to adverse reactions or reduced therapeutic benefits. Hence, there is a pressing need for medicine packaging that incorporates robust safety features, including

child-resistant caps and reliable resealing mechanisms, to safeguard children from accidental ingestion and ensure the quality and potency of the medication remain intact throughout its shelf life.

Neglect of Children's Psychological Needs

The majority of current children's medicine packaging falls short in acknowledging the intricate psychological profile and unique needs of young patients, resulting in designs that are devoid of the playfulness and interactivity that could otherwise captivate their imaginations. Children, with their developing cognitive faculties, often struggle to comprehend intricate packaging details and medication instructions, leading to confusion and, ultimately, a sense of aversion towards the very treatment meant to aid their recovery. This psychological disconnect not only dampens their enthusiasm for taking medication but also undermines the effectiveness of the treatment itself, as non-compliance with prescribed dosing schedules hinders the intended therapeutic outcomes. Thus, there is a compelling need for packaging designs that embrace children's psychological nuances, incorporating elements of fun and interactivity to alleviate their apprehensions and foster a more positive attitude towards medication.

Directions and Strategies for Improvement

Concise and Standardized Design

Packaging design for children's medicines ought to embody a harmonious blend of conciseness and standardization, steering clear of overly elaborate designs that could potentially misguide impressionable young minds. The focus should shift towards creating visually appealing yet straightforward packaging that effectively communicates essential information without overwhelming users. To this end, incorporating clear and concise usage instructions, tailored to include age-specific dosage guidelines, is paramount. Such an approach not only enhances the safety of medication administration but also empowers parents and caregivers with the knowledge they need to ensure proper dosing, thereby minimizing the risk of overdose or underdose. By adhering to these principles, packaging design for children's medicines can evolve into a reliable tool that promotes safe and effective medication use.

Emphasis on both Safety and Convenience

To enhance the safety of children's medicine packaging, it is imperative to integrate child-resistant caps and other robust protective measures that effectively deter unintended access by young children. Simultaneously, the design of these packaging solutions must prioritize user-friendliness, ensuring that parents and older children can effortlessly open and close the containers with minimal frustration. To achieve this delicate balance, opening mechanisms should be meticulously optimized to strike a harmonious compromise between security and accessibility. The result is packaging that safeguards against accidental ingestion while maintaining a seamless user experience, with reliable resealing capabilities post-opening to preserve medication integrity and safety.

Emotional Design

Embracing emotional design strategies in children's medicine packaging necessitates a nuanced understanding of their psychological needs and preferences. By integrating endearing child-friendly graphics, such as playful animals or beloved cartoon characters,

alongside vibrant and contrasting colors that captivate young imaginations, designers can create packaging that resonates deeply with children. Interactive elements, like simple puzzles or educational games integrated into the packaging, further enhance the experience, turning the mundane act of taking medication into an engaging and enjoyable activity. This holistic approach fosters a positive emotional connection between children and their medication, alleviating fears and resistance while promoting a more welcoming attitude towards the treatment process.

Strengthened Regulation and Guidance

To ensure the utmost safety and efficacy of children's medications, government departments must bolster their regulatory framework, subjecting children's medicine packaging to rigorous scrutiny for safety compliance, standardization adherence, and informational accuracy. This heightened oversight is crucial in protecting vulnerable populations from potential hazards associated with poorly designed or misleading packaging. Concurrently, pharmaceutical companies must augment their commitment to parental education, providing comprehensive medication guidance through detailed instructions, informative brochures, and supplementary materials. By empowering parents with a clear understanding of dosage schedules, administration techniques, and potential side effects, these efforts aim to minimize medication errors and optimize treatment outcomes for children.

Application of New Media Interactive Art in Children's Medicine Box Packaging Design

Design Philosophy

The fusion of the user-centered perspective with the innovative concept of new media interactive art in the packaging design of children's medicine boxes endeavors to revolutionize the medication experience for both children and their parents. By adopting a design approach that prioritizes the unique needs and preferences of its users, these packages strive to create an engaging and enjoyable experience that transcends traditional medicine administration. The incorporation of interactive elements and dynamic multimedia content, fueled by new media technologies, fosters a sense of playfulness and exploration, making the act of taking medication less daunting and more appealing to children. Simultaneously, these designs ease the burden on parents by providing clear, concise instructions and intuitive handling mechanisms, ensuring medication administration is a seamless and stress-free process.

Appearance Structure

The exterior of the smart medicine box is as shown in Figure 1, Figure 2, Figure 3, and Figure 4. The outer case a) is divided into the upper and the lower layer. The upper layer is set up with medicine supply mechanism that can contain and output different kinds of pills or tablets in different amount. The lower layer is for the drive control mechanism to driving and control the medicine supply mechanism according to the set time, set types and set amounts.

As shown in Figure 4, the drug supply mechanism includes: 8 medicine slots d) arranged at two sides of the interior of upper layer to hold different kinds of drug pills and tablets, as shown in Fig.4 and Fig.2 drug slots d) are arranged on the each side of the medicine box in symmetrical way, and on the side of each medicine slot d) one vibration motor is arranged to drive the drug pills in the slot d) to discharge from the drug outlet at the bottom of the drug

slot. The signal input end of the vibration motor e) is connected with the control signal output end of the drive control circuit through a wire, a push rod is arranged under the medicine outlet of each slot d) to push the medicine pills or tablets discharged from the outlet of the medicine box d) into the medicine taking box c) on the top of the medicine box, and the signal input end of the pushing mechanism f) is also connected through a wire to the control signal output end of the drive control circuit. The pushing mechanism f) comprises an outlet channel and a push rod penetrating the channel. When the coil is powered on, it will generate the momentum to the push rod to move towards the outlet of the slot d) so as to push the pills into the medicine taking box c), when the coil is powered off, the push rod will be retracted.

The exterior is set up with medicine taking box c) to receive the medicine sent by the medicine supplying mechanism and for the user to take medicine. The medicine box c) is arranged in the middle part of the bottom surface of the lower layer of the shell, and the direction of the outer Shell is the moving direction of pulling out and pushing. The front of the exterior case a) is set up with a display screen t), the upper side of the exterior case is arranged with a heart rate detecting port i) for checking the heart rate, and the SOS button j) for emergency help, and the top of each medicine taking box d) is set up with on/off cover h). Heart rate detection port i) has a detection module that can check user's heart rate by putting one finger on, and the heart rate detection module and the SOS button j) are respectively connected with the driving control circuit with a wire. A camera b) is arranged in the medicine taking boxes d) to supervise whether the medicine is taken or not. The camera b) covers a surveillance range of the lower layer and the corresponding medicine taking box c). The medicine supply mechanism is provided with one photoelectric sensor g) at each of the 8 medicine outlet for collecting the information of medicine output pieces. The camera b), the photoelectric sensor g) and the display screen t) are respectively connected with the drive control circuit with a wire.

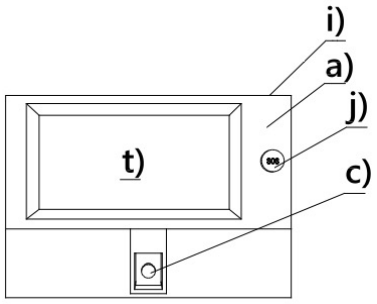

Figure 1. Front view of the smart medicine box

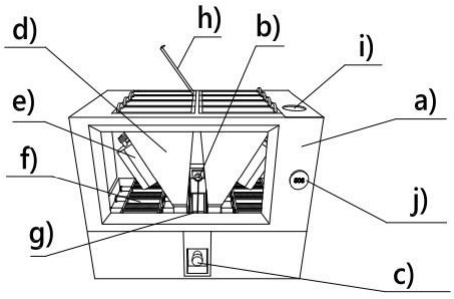

Figure2. Front interior view

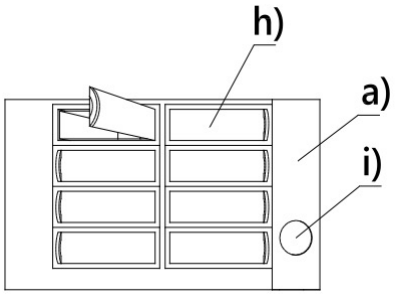

Figure3. Top view

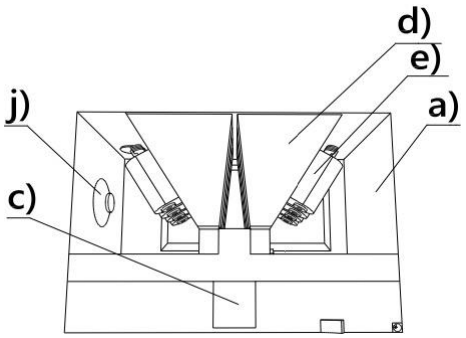

Figure 4. Back interior view

Specific Applications

Game Behavior Interaction Design

Harnessing children's innate love for games, innovative medicine packaging design incorporates playful elements that transform the medication routine into an enjoyable experience. By integrating a puzzle-inspired or interlocking construction into the medicine box, designers create an interactive narrative that captivates children's curiosity and diverts their attention from the often-unpleasant aspects of taking medicine. As they meticulously maneuver the intricate pieces or slide the interlocking panels, children find themselves unwittingly engaged in a captivating game, all the while completing the necessary steps of medication administration. This strategic integration not only imbues the packaging with a sense of adventure and fun but also fosters a positive association with the medication process, making it a less daunting and more appealing task for young patients.

Multi-Sensory Interaction Design

Multi-sensory interaction design in children's medicine packaging transcends traditional visual-only approaches, immersing young patients in a holistic experience that engages their senses on multiple levels. By leveraging a symphony of visual, auditory, and tactile stimuli, designers craft packaging that captivates and soothes. Vibrant colors and endearing cartoon characters illuminate the packaging, instantly capturing children's attention and fostering a sense of wonder. Meanwhile, tactile innovations like soft rubber grips or scented films stimulate touch and smell, offering a comforting, familiar sensation that alleviates anxiety. Lastly, subtle audio cues—melodic tunes or gentle reminders—echo as the packaging is interacted with, creating a harmonious ambiance that further enhances the medication routine, turning it into a moment of calm and joy.

Emotional Interaction Design

Emotional interaction design in children's medicine packaging delves into the realm of psychology, weaving together elements that evoke heartfelt emotions and a sense of human connection. By incorporating personalized touches that resonate deeply with children, these designs aim to transform the medication experience into a comforting and uplifting moment. Warm greetings and heartfelt messages, etched gracefully onto the packaging, serve as a tangible reminder of familial love and societal support, fostering a sense of belonging and care. Furthermore, the inclusion of sentimental packaging features, like collectible box lids or creative pill packet papers that can be assembled into patterns, imbues the medication routine with a sense of accomplishment and joy. These thoughtful additions not only alleviate the stress associated with taking medicine but also instill a positive mindset, making the entire process a rewarding experience for young patients.

Precise Dosage Design

To ensure the utmost precision and safety in administering children's medication, packaging designs now incorporate innovative features tailored to precise dosage control. By adopting dual- or multi-compartment packaging systems, each tailored to specific age and weight ranges, parents can effortlessly select the appropriate dosage for their child. These compartments are clearly labeled with age- and weight-specific guidelines, eliminating guesswork and ensuring accurate dosing. Furthermore, comprehensive medication guidance and dosage instructions are prominently displayed on the packaging, providing parents with the confidence and knowledge to administer the medication correctly. This design revolution not only bolsters medication safety and efficacy but also alleviates the stress and uncertainty that often accompanies children's medication administration, making it a more streamlined and manageable process for parents.

Practical Case Analysis - Packaging Design of Pediatric Qingfei Huatan Oral Liquid

Through field research and observations, it was found that many children need to carry their medication to school. However, the large packaging of medications is not suitable for portability, and carrying individual bottles without protective outer packaging can easily lead to breakage of glass bottles. To address this issue, two bottles of oral liquid were individually packaged, with each package containing the daily dosage suitable for children. The large medicine box contains six small packages (each containing 2 bottles of oral liquid), making it more convenient for children to carry. The packaging uses 0.46mm thick white cardboard, with each small package holding 15ml x 2 oral liquid bottles, and the bottles measuring 20mm in diameter and 100mm in height. As shown in Figure 5, the right side of the box flap folds to form a platform to securely hold the glass bottles. The box is secured with two locking tabs, ensuring safety while maintaining ease of opening and retrieval. Figure 6 shows the structural design of the outer packaging box, which adopts a tubular folding carton with a tab-insert closure. A security label is placed on the lid, which leaves residue on the box when removed, making it tamper-evident. The bottom of the box is sealed with glue for strength and anti-theft purposes.

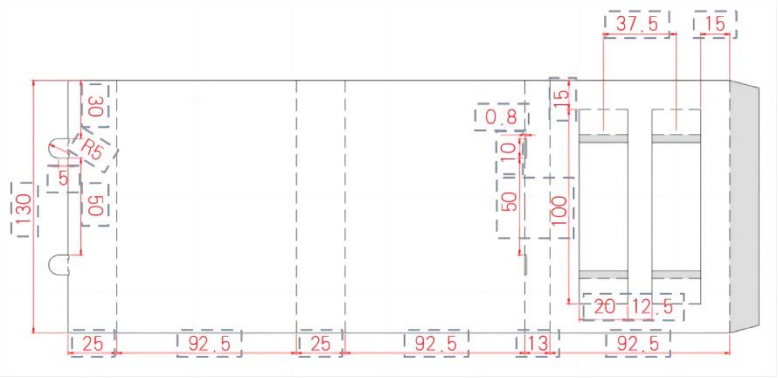

Figure5. Structural Design of the Inner Packaging Box for POH Oral Liquid

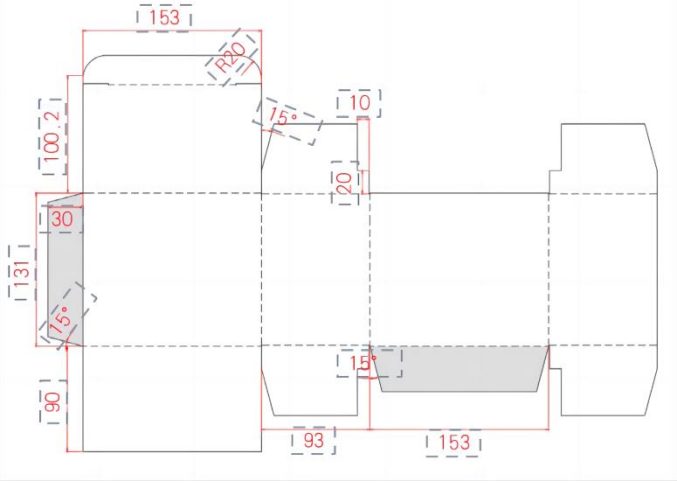

Figure6. Structural Design of the Outer Packaging Box for POH Oral Liquid

Research Conclusions and Prospects

Research Conclusions

This study on the application of new media interactive art from a user-centered perspective in the packaging design of children's medicine boxes has yielded the following key conclusions:The application of new media interactive art significantly enhances the fun and interactivity of children's medicine packaging. Through design strategies such as game behavior interaction, multi-sensory interaction, and emotional interaction, new media interactive art effectively captures children's attention, reduces their resistance to medication, and thereby improves medication adherence.The medication experience for children has been improved. The incorporation of fun designs and interactive elements makes the medication process more enjoyable and effortless, allowing children to take their medication while playing and fostering a more positive attitude towards it.Medication safety and accuracy have been enhanced. Precise dosage designs and clear medication guidance information help parents accurately administer the correct dosage, mitigating the risks associated with improper medication use.Innovation in children's medicine packaging design has been promoted. By introducing new media interactive art into children's medicine box packaging, traditional design limitations have been broken, opening up new design avenues and directions for the pharmaceutical packaging industry.The concept of user-centered design has been deepened. By thoroughly investigating the needs of children and their parents, packaging designs that better align with their practical requirements have been created, embodying the user-centered design philosophy.

Future Research

The field of children's medicine packaging design will continue to deepen user-centered design and explore new applications of new media technology to further enhance children's medication experience and safety. Specific prospects include:Further integration of new media technologies: As virtual reality (VR), augmented reality (AR), and other technologies advance, their application in children's medicine box packaging design is expected to broaden. By creating immersive experiences that allow children to interact with packaging in virtual environments, fun and interactivity will be further enhanced.Prevalence of smart packaging: Future children's medicine packaging will prioritize smart designs, such as incorporating smart chips to track medication usage and provide reminders, offering parents more convenient medication management tools.Emphasis on environmental protection and sustainability: While pursuing fun and interactivity, environmental protection and sustainability will become essential considerations. The adoption of biodegradable materials and optimization of packaging designs to reduce waste will become industry norms.Promotion of personalized customization services: With the rise of personalized demands, future children's medicine packaging may offer customized design services, tailoring packaging to children's ages, preferences, and other characteristics to meet the specific needs of different families.Strengthened interdisciplinary collaboration: Innovation in children's medicine packaging design necessitates multidisciplinary cooperation. Future efforts should enhance collaboration among design, psychology, materials science, information technology, and other fields to jointly advance children's medicine packaging design.

In summary, the application of new media interactive art in children's medicine box packaging design holds immense potential. It will continue to support children's medication safety and fun, while also driving the healthy development of China's children's pharmaceutical market.

References

Ahmed, B., Fatmi, Z., Siddiqui, A. R., & Sheikh, A. L. (2011). Predictors of unintentional poisoning among children under 5 years of age in Karachi: A matched case-control study. Injury Prevention, 17(1), 27–32.

Ahram, T., Karwowski, W., & Amaba, B. (2011). Collaborative systems engineering and social-networking approach to design and modeling of smart products. Behavior and Information Technology, 30(1), 13–26.

Bataineh, H. A., & Bataineh, A. M. (2007). Childhood accidental poisoning in Tafila. Iranian Journal of Pediatrics, 17(1), 23–26.

Batish, A., Bhattacharya, A., & Singh, B. (2011). Multi-response optimization and empirical modeling of cardiopulmonary responses during manual lifting tasks. Human Factors and Ergonomics in Manufacturing & Service Industries, 21(1), 29–43.

Beynon-Davies, P. (2002). Information systems: An introduction to informatics in organisations. Palgrave

Breault, H. J. (1974). Five years with 5 million child-resistant containers. Clinical Toxicology, 7(1), 91–95.

Chen, C. C., & Chuang, M. C. (2008). Integrating the Kano model into a robust design approach to enhance customer satisfaction with product design. International journal of production economics, 114(2), 667-681.

Cross, N. (2008). Engineering design methods: Strategies for product design. Wiley.

David, G. (2001). Robust decision-making for engineering design. Journal of Engineering Design, 12(1), 3–13.

Ford, M. B. (1976). Child-resistant packaging introduction (Child-Resistant Packaging, ASTM STP 609). American Society for Testing and Materials, 1–14.

Fowlkes, W. Y., & Creveling, C. M. (1995). Engineering methods for robust product design. Addison-Wesley.

Franklin, R. L., & Rodgers, G. B. (2008). Unintentional child poisonings treated in United States hospital emergency departments: National estimates of incident cases, population-based poisoning rates, and product involvement. Pediatrics, 122(6), 1244–1251.

Hayes, J. H. (2002, February). Energizing software engineering education through real-world projects as experimental studies. In Proceedings of the 15th Conference on Software Engineering Education and Training (CSEE&T 2002) (pp. 192–206). IEEE.

Koliou, M., Ioannou, C., Andreou, K., Petridou, A., & Soteriades, E. S. (2010). The epidemiology of childhood poisonings in Cyprus. European Journal of Pediatrics, 169(7), 833–838.

Mrvos, R., & Krenzelok, E. P. (2007). Child-resistant closures for mouthwash: Do they make a difference. Pediatric Emergency Care, 23(10), 713–715.

Yıldız, A. R. (2009). A new design optimization framework based on immune algorithm and Taguchi's method. Computers in industry, 60(8), 613-620.

Anuradha, K., Shetty, A. S., Vineeta, V. S., Ravi, S., & Likhitha, N. (2023). Vehicle number plate detection through live stream using optical character recognition (OCR). In Proceedings of the 7th International Conference on Trends in Electronics and Informatics (pp. 1548–1553).

Ke, C. (2019). Design and implementation of intelligent voice medicine box, Shock Compression of Journal of Fujian Computer. 146-148.

Zheng, J.Y., Ji, X. (2018). Research on the design of intelligent medicine box for the elderly, Shock Compression of Design Research, 2, 114-120.

Zhang, Y. Y. (2019). Design of an intelligent rotating medicine box for the aged, Shock Compression of Technology Innovation and Application. 28-29.

Wei, C., Zhao, L., Zhang, M., Liu, S.Y. (2019). Design of intelligent medicine box for drug administration monitoring in intelligent medicine, Shock Compression of Microcontrollers & Embedded Systems. 64-67.

Bucchiarone, A. (2022). Gamification and virtual reality for digital twin learning and training: architecture and challenges. Virtual Reality & Intelligent Hardware, 4(6), 471-486.

Awan, A. U. R. (2019). Pathological online game use and its effects on adolescents' subjective well-being and sleep quality: A moderated-mediation model (Master's thesis). Central China Normal University, Hubei.

Sun, W. (2023). Digitalized interactive design and application of intangible cultural heritage taking Beijing embroidery as an example. Innovation Humanities and Social Sciences Research, 9, 33-41

Mihailidis, A. (Ed.). (2008). Technology and aging: Selected papers from the 2007 international conference on technology and aging (Vol. 21). Ios Press.