Proceedings of the 7th International Conference on Educational Innovation and Psychological Insights
DOI: 10.54254/2753-7048/2026.32752

A Psychological Intervention Study on Wearable Technology Empowering Art Therapy from an Interdisciplinary Perspective

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Abstract. Children's mental health problems have become an increasingly important global concern, while traditional pharmacological treatments often involve potential side effects. As a non-pharmacological intervention method, art therapy has gradually gained attention; however, its traditional forms still face limitations in effectiveness and technological support. With the development of intelligent wearable technology, integrating wearable devices with art therapy offers new possibilities for psychological intervention in children. In response to the current serious situation of children's mental health, the limitations of traditional intervention methods, and the research gap in the integration of wearable textiles and art therapy in the field of child psychotherapy, this study delves into the intervention mechanism, design path, and application value of wearable therapeutic clothing. The research clarifies the feasibility of integrating multi-sensory art therapy with wearable technology, fills a gap in related interdisciplinary research, improves the theoretical system of non-pharmacological intervention for children's mental health, and provides a theoretical basis and reference for the development of intelligent therapeutic clothing and the practice of child psychological intervention.

Keywords: Art Therapy, Extended Reality, Wearable Apparel, Interdisciplinary Design, Sensory Interaction

1. Introduction

Domestic and international research reveals that the current mental health of children and adolescents is not optimistic [1]. In modern society, people's demand for mental relief and emotional expression is increasing, and wearable devices for emotional healing have emerged against this background [2]. However, there remains a significant research gap in the academic community regarding the psychological effects of wearable textiles in mental health monitoring [3]. Potential adverse reactions of traditional psychological medications bring many inconveniences to patients [4]. In the exploration of treatment strategies for mental illnesses, art therapy has gradually attracted widespread academic attention, yet the effectiveness of traditional art therapy still needs further improvement [5]. Therefore, combining the current status of children's mental health with technological development trends can fill the research gap in the field of nonpharmacological

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intervention and intelligent wearable technology for children's psychotherapy. From the perspective of the integration of wearable technology and art therapy, this paper aims to provide a theoretical basis and reference for the innovative development of nonpharmacological intervention programs and intelligent healing clothing for children's mental health.

Theoretically, this paper constructs a cross-disciplinary theoretical framework for the integration of art therapy and wearable technology, filling the gap in cross-disciplinary research between the two in the field of children's psychotherapy and providing new ideas and theoretical support for intervention research in design and psychology from an interdisciplinary perspective. In practical terms, this framework can provide clear guidance for the design of psychological treatment programs for children with mental illnesses and provide a solid theoretical basis and practical reference for the research and development of wearable clothing for related children's psychological treatment.

2. Research status and theoretical basis of sensory art therapy for children

The domestic literature demonstrates that medical sensory interactive wearables combine visual, auditory, tactile, and olfactory reactions so as to promote positive emotions and help rehabilitate the brain, and multi-sensory interventions are more suitable than uni-sense ones [6,7]. Combined with the clothing, wearable technology enables the ability of accessing physiological cues and non-sense contact with the world [8], which an intervention provides the technical assistance of psychological treatment of children. Nevertheless, there are no multi-sensory wearables to address the needs of children with mental illnesses though existing products are only domestic solutions, which cannot accurately match technology and intervention demands [9]. Experiments carried out across different countries reveal how wearable feedback may convert the single-sensory art therapy, which was commonly applied in psychotherapy, to multi-sensory and increase the level of information, which will produce positive outcomes in treating the children [10]. The research focuses on children having mental illnesses, considering the difficulties in the expression of nonverbal solutions and emotional regulation, but there are still drawbacks in the individual design and perception of the disparate impact of senses combination.

The rationale of Sensory Art Therapy, which is non-pharmacological, involves the use of five senses, that is, sight, hearing, smell, taste, and touch via means like art, music, dancing, color, storytelling, and play therapy, will guide this study [10]. Emotional states of children are being recorded through physiological recordings (e.g., ECG, sweat, emotion recognition sensors) and behavioral interactions with the help of flexible sensors [11–14], which avails objective information to the emotion recognition. The signals gathered are analyzed to minimize noise and isolate parameters such as heart rate and HRV which then allows the identification of an emotional state such as anxiety or calmness. The therapeutic session is presented in form of multi-sensory interactive therapy to relieve stress and cognitive-guided therapy to develop awareness and emotional control [15,16]. The feedback is given in real-time to children, as well as to caregivers or professionals, and facilitates the data-driven maximization of personalized interventions [17,18].

3. Case study

3.1. Case 1: Calm Wear: a smart tactile stimulation apparel

Calm Wear is an intelligent tactile stimulation garment which are created to suit children with Autism Spectrum Disorder (ASD) and Attention Deficit Hyperactivity Disorder (ADHD) [19]. Its

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basic uses are physiological monitoring and sense of touch. To conduct biological monitoring, Calm Wear incorporates two sensor elements ECG electrodes embroidery and conductive rubber cord tension sensors. The digitally designed ECG electrodes sewn into the product lining monitor the heart rate (HR) and heart rate variability (HRV), and the tension sensors of the rubber cord at a position beneath the right armhole can measure the RR interval data regarding the respiratory rate. When these sensors are combined, they will record vital physiological events that determine the state of anxiety of the wearer in real time.

A Shape Memory Alloy (SMA) spring is used to activate tactile feedback by contracting when heated to provide the airbag system with the required force. According to the analyzed HR and HRV signals, the garment sends airbags up and down, and the level of pressure is adjusted to the physiological needs of a child. This continuous and soft pressure makes one feel that he/she is being hugged, which is a calming tactile sensation. Calm Wear can achieve this through the combination of real-time physiological signals and adaptive tactile sensors so as to provide children with emotional stability, anxiety and agitation, as well as abnormal behavioral reduction in everyday family settings. The device conforms to the sense integration requirements and emotional control aspect of children with ASD and ADHD hence a handy gadget to be used in daily life.

3.2. Case 2: development of interactive clothing for children's emotion regulation based on sensory engineering

Based on multi-modal interaction technology, a development method for interactive clothing for children's emotion regulation was proposed. A smart interactive sweatshirt integrating flexible sensors, LED light feedback and sound modules was designed to realize multi-modal interaction triggered by pressure. The design uses a flexible interactive trigger sensor, which is connected to a linear converter and mounted on the hand of the clothing-matching doll to capture the pressure when the child presses the doll, as a trigger signal for interactive feedback; at the same time, a physical switch is set on the arm of the clothing to trigger the start of the sound module [20]. At the same time, a feedback output component is used (an Arduino Uno development board is used as the controller with a 5V, 1200mA power supply, and a sound module composed of an LED light module and a passive buzzer). The LED light is used to provide visual feedback, and the passive buzzer is used to provide auditory feedback.

The theory of the multi-sensory interactive healing is used in this case as visual, auditory, and tactile senses are incorporated. The kids can use the flexible sensors to turn on the various colors of LED lights with a hand of a doll and turn the music of a certain frequency on a switch on the arm of a garment. These multi-sensory interactions aid in distracting negative emotions, and the design of the pressure-feedback gives children the ability to regulate the tactile input, which increases the ability to feel control when using their emotions. Such interactive clothing can be used due to preschool and early childhood learning environments in particular, as the additional resource towards learning when it comes to emotional learning. Its offerings of exciting and entertaining communication eliminate anxiety and alienation in the groups and helps children adjust to social and educational conditions.

3.3. Case 3: anxiety meter

The Anxiety Meter represents a typical wearable device equipped with the function of realtime anxiety detection and monitoring. This device is designed to enhance the cognitive awareness of anxietyrelated symptoms among children diagnosed with autism spectrum disorder (ASD), and it

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can further encourage and promote the active application of relaxation strategies in this special group [21].

This case mainly centers on the accurate identification of anxiety symptoms and the improvement of cognitive understanding toward such emotional states in children with ASD, and the research adopts the wearable Shimmer2 system as the core hardware platform. The central monitoring module adopted in this scheme is the Shimmer2 device, which has been integrated with an Electrocardiogram sensor and a respiratory sensor to achieve multiphysiological signal collection. This integrated device is capable of recording the ECG signals and respiratory signals of children in real time, so as to effectively capture and extract the key physiological indicators that are closely associated with the occurrence and development of anxiety.

The raw ECG data obtained from realtime monitoring is processed by a special signal processing unit with a filtering range of 5 to 15 Hz. Through the procedure of signal noise reduction, various types of interference signals and noise components are eliminated from the original data, and then the effective heart rate data is extracted and analyzed. In this system, a tablet screen is employed as the main feedback terminal, which is used to visualize the anxiety level and present realtime reminder signals for the user.

This case study aims to improve the cognitive understanding of anxiety symptoms and cultivate the ability of emotional selfregulation in children with ASD. Based on the physiological signals continuously monitored by the Shimmer2 device, the system calculates the realtime anxiety level of the child and presents the results on the tablet screen through a vertical gradient color scale. In this visual coding system, the green color represents a calm emotional state, yellow indicates a moderate elevation in anxiety, and red signifies a state of high anxiety. Meanwhile, the dynamic movement of a horizontal bar is adopted to visually represent the current emotional arousal level of the child, which helps children with ASD to clearly perceive and understand the dynamic changes in their own anxiety. When the detected anxiety level rises to yellow or above, the device will activate a triple alert mechanism, including text display, auditory prompts, and vibration feedback. This multimodal alert is designed to guide children to actively apply prelearned relaxation techniques, so as to realize the selfregulation of anxiety and gradually improve their emotional control ability.

As an important auxiliary intervention tool for children with ASD, this wearable device integrates the functions of realtime anxiety symptom monitoring, cognitive training, and relaxation guidance. It possesses strong environmental adaptability and can be effectively applied in both home environments and outdoor scenarios for children with ASD. Once the system detects obvious signs of elevated anxiety, it will immediately send alerts to both the child and their parents or caregivers, thereby reducing the probability of emotional outbursts and abnormal behaviors caused by excessive anxiety.

3.4. Results and analysis

The interdisciplinary intervention framework developed in this study, through combining multi-sensory art therapy with wearable technology, allows to assess the effectiveness of non-pharmacological methods of child psychotherapy. The primary strength of the methodology is that, it is guided by theoretical guidance, which allows combining the concepts of art therapy with smart wearable devices. Nevertheless, it suffers weaknesses such as the lack of detail in the individualized structures of the multi-sensory interaction modes and the absence of comprehensive quantitative measurements of the therapeutic effects which in combination makes accurate judgement of the intervention efficacies difficult.

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4. Conclusion

This research explores the use of wearable technology and sensory art therapy in the psychological treatment of children and gives a proposal as how this can be applied to an interdisciplinary intervention model of an intelligent therapeutic clothing. The research advancement through literature analysis and three case studies representing the formation proves that wearable devices including physiological monitoring and multi-sensory feedback have the potential to be adopted in supporting emotional awareness and emotional regulation among children, especially children with ASD and ADHD. The conclusions made indicate that wearable technology can be used to complement traditional use of art therapy by facilitating real-time monitoring of physiology, multi-sensory effect, and automated feedback. The functions assist in delivery of individualized emotional providing care and enhance the effectiveness of non-pharmacological treatment in the mental care of children. Even as that, this research determines the research gap in the literature between wearable technology and art therapy and gives theoretical advice on how future therapy wearable products should be designed and developed.

Nevertheless, there are still a number of limitations. The research is not provided with profound discussion of personalized multi-sensory interaction design and it is also not provided with enough quantitative measurements of therapeutic results. Future studies need to maximise sensor accuracy and signal processing code, increase the comfort and usability of wearable materials and create more customised feedback systems. Moreover, extended empirical analysis and follow-up research in children with other mental conditions and age are necessary to prove the efficiency and viability of these types of intervention.

References

[1] Gao, Y. (2021). Study on the assessment of mental health problems among children and adolescents and their health effects (Doctoral dissertation, China Medical University).
[2] Wan, H. W., & Wang, C. (2025). Research on the design of wearable devices for emotional healing in the algorithmic age. Design, 38(17), 112–115.
[3] Dejene, B. K. (2025). Wearable smart textiles for mood regulation: A critical review of emerging technologies and their psychological impacts. Journal of Industrial Textiles, 55, 1–83.
[4] Wang, W., & Long, S. (2024). A review of art healing literature in the past ten years and insights into the relief of depression among college students in China. Source of Creative Design, (6), 63–68.
[5] Zhang, B., Yang, L. F., Sun, W., Xu, P., Ma, H., & Abdullah, A. B. (2025). The effect of art therapy interventions to alleviate depression symptoms among children and adolescents: A systematic review and meta-analysis. Clinics, 100683.
[6] Ou, J., Tan, Y., Fang, Y. J., Kang, Q. C., & Xu, Y. (2023). Design of smart wearable products for the elderly with Alzheimer's disease based on multi-sensory interaction. Packaging Engineering, 44(10), 116–124.
[7] Yin, J., Zhu, H., & Yuan, J. (2024). Health impacts of biophilic design from a multisensory interaction perspective: Empirical evidence, research designs, and future directions. Land, 13(9), 1448.
[8] Li, Z., Liu, Z., Wang, Z., et al. (2026). Body sensor networks based on flexible topological clothing. Nature Electronics, 9, 59–68.
[9] Guo, H., & Shen, H. Y. (2013). The application of art in psychotherapy of special children. Modern Education Review, (4), 72–76.
[10] Guo, S. H., Luo, X. X., Wang, J., & Huang, G. H. (2024). Effect of sensory art therapies on root canal treatment anxiety and high dental anxiety in adults: A systematic review with meta-analysis. PLOS ONE, 20(9).
[11] Xia, M., Li, J., Lu, Y., Ren, S., & Fang, J. (2024). Research on emotion monitoring system and its application in wearable field. Basic Sciences Journal of Textile Universities, 37(2), 72–81.
[12] Zang, J. B., An, Q., Li, B., Zhang, Z. D., Gao, L. B., & Xue, C. Y. (2025). A novel wearable device integrating ECG and PCG for cardiac health monitoring. Microsystems & Nanoengineering, 11(1).

DOI: 10.54254/2753-7048/2026.32752

[13] Cang, N., Feng, R., Mei, J., & Jang, T. (2025). Flexible wearable electrochemical sensors based on sweat biomarkers: Application and prospect in sports training. Chinese Journal of Sports Medicine, 44(9), 759–768.
[14] Chen, B. W., Huang, J. W., & Ling, X. L. (2025). Research progress of flexible sensors for smart wearable products. Journal of Textile Science and Engineering, 42(2), 63–76.
[15] Jain, A., Horowitz, A. H., Schoeller, F., Leigh, S. W., Maes, P., & Sra, M. (2020). Designing interactions beyond conscious control: A new model for wearable interfaces. Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 4(3).
[16] Asare, E. P. D., Kushitor, S. B., Sutherland, E. K., Boateng, M. O., & Manortey, S. (2024). Knowledge and use of art therapy for mental health treatment among clinical psychologists. PLOS ONE, 19(5).
[17] Moula, Z., Powell, J., Konstant, T. N., & Karou, V. (2023). Child-focused outcome and process evaluation of a school-based art therapy intervention: A pilot randomized controlled study. The Arts in Psychotherapy, 86.
[18] Sun, X. H., & Feng, Z. X. (2014). Interaction design for wearable devices. Decoration, (2), 28–33.
[19] Goncu-Berk, G., Zhang, R., & Yilmaz, C. (2021). CalmWear: A smart tactile sensory stimulation clothing. In Proceedings of the 2021 ACM International Symposium on Wearable Computers (pp. 184–188).
[20] Zhang, X. L., Ma, M. C., Li, C., & Xue, Z. S. (2025). Development of interactive clothing for children's emotion regulation based on Kansei engineering. Shanghai Textile Science & Technology, 53(10), 48–53.
[21] Nguyen, J., Cardy, R. E., Anagnostou, E., Brian, J., & Kushki, A. (2021). Examining the effect of a wearable anxiety detection technology on improving the awareness of anxiety signs in autism spectrum disorder: A pilot randomized controlled trial. Molecular Autism, 12(1).