

## *Retraction*

# **Retracted: The Application of Art Therapy Based on Particle Swarm Optimization Method for Preschool Children's Mental Health**

### **Wireless Communications and Mobile Computing**

Received 26 September 2023; Accepted 26 September 2023; Published 27 September 2023

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

### **References**

- [1] C. Wu and L. Sang-Yeol, "The Application of Art Therapy Based on Particle Swarm Optimization Method for Preschool Children's Mental Health," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 9261191, 9 pages, 2022.

## Research Article

# The Application of Art Therapy Based on Particle Swarm Optimization Method for Preschool Children's Mental Health

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Received 25 March 2022; Revised 28 April 2022; Accepted 3 May 2022; Published 20 June 2022

Academic Editor: Kuruva Lakshmana

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Art provides a starting point for children to understand works of art. In the initial stage of life, the development of vision and movement is particularly important, and painting helps coordinate the work of these systems. Art dispels the mystery of art and helps children connect with art classics, thus understanding the language and structure of art. In particle swarm optimization, the inertia weight is constant, but with the increase of iteration times, the inertia weight may become larger or smaller, so it tends to search globally or locally. This paper first analyzes what art therapy is from the basic concepts of art and art education and the stage characteristics of children's painting and then studies the application of art therapy based on particle swarm optimization in preschool children's art teaching. Finding the global optimal fitness function in the research process not only simplifies the computational complexity but also approximates the maximum coverage effect provided by the current network. The results show that applying particle swarm optimization algorithm to the research of mental health treatment of preschool children can establish an effective evaluation program in the practical research of children's art treatment.

## 1. Introduction

Children's artworks are the product of children's emotional overflow. Before they master the expression of words, they mostly use plastic art forms, with the help of symbols, lines, and colors. Teachers with knowledge background of artistic creation and educational psychology will carry out the practice. Therapists with common psychological background and teachers with special educational background will be unfamiliar with artistic materials, thus affecting the therapeutic effect on students [1]. Color elements play an increasingly important role in increasing added value of products and arousing consumers' desire to buy. CAD (computer-aided design) of color design has attracted more and more scholars at home and abroad to make useful attempts on it from various aspects [2]. In practical teaching, the positions of materials, shapes, colors, and other languages are chan-

ged, and children express their emotional experience in art activities. Then, teachers have the responsibility to understand children's works and understand their inner world through children's works [3]. We must rely on and respect students' personal feelings, stimulate students' imagination and creativity, and help students coordinate language relations in realizing creativity, to improve the sensitivity and judgment of the formal aesthetic feeling embodied in the use of different materials [4]. The idea is that in the creative process of art and artistic works, individuals can consciously or unconsciously reflect their inner feelings, reflect our observation, thinking, and value judgment of the surrounding world, and on this basis reflect the hidden information of preschool children's hearts [5].

Generally speaking, children can write and draw before they are two years old. Although some simple graffiti is not created in class, it is also a way for them to express their

understanding of the surrounding things for a lifetime. Art therapy is a psychological therapy or medical assistant method combining art with consultation and treatment. It is based on the theory and method of psychotherapy and the specific physiological and psychological activities of people in artistic activities. Child psychologists call this period “children’s graffiti period” [6]. Art therapy activity refers to the conscious use of art forms and creative processes in the treatment and rehabilitation community or educational environment to promote healthy communication and expression. Art and science tell different truths and laws. They tell people about goodness and beauty, give feelings, and tell about the typical and self [7]. Therefore, it is the best way for people to express their feelings, ethics, and wishes. It is a process of visualizing the content of the subconscious, which can reflect the internal and subconscious information of people. Painting art therapy is also a new industry at home and abroad [8]. The practice of art education is not only the description of pictures but also the perception and application of materials. Teachers should pay attention to all aspects of art education instead of regarding art education as pure art education. This also provides the possibility of applying art therapy in children’s education [9]. As a form of communication with preschool children, it can give full play to the therapeutic role of art education, which cannot be replaced by any other form [10].

One of the field orientations of art therapy is as follows: art creation is a therapy, and this process of creation can ease emotional conflicts and contribute to self-awareness and self-growth [11]. Artistic creation is not restricted but only encouraged and guided by words, so that they can express their hearts completely. For example, I put out all the pigments and let the children freely choose the colors they like to daub on the painting paper, without requiring them to draw any shapes and themes. The final result of painting art therapy behavior is to solve problems, adjust emotional conflicts, and perfect personality [12–14]. With a few language prompts, you can complete the imitation writing ability with the correct stroke order. The use of vision has been improved. In the course, most children can pay attention to and follow the teacher and the content of the course. The application of art and its products to psychological analysis and treatment, based on some associations of works and authors, can help individuals maintain the balance between the inner world and the outer world [15]. Nonverbal form is making up for the function that language cannot bear, and at the same time, it also exerts the unique charm of art. In the process of art therapy, art, as an intermediate medium, provides information to the therapist from the beginning of individual art creation to the completion of the work, including two major factors: recessive and dominant [16]. In such a learning process, one will feel that material language makes it possible to recombine a variety of artistic elements into infinity. At the same time, it also provides a broad space for the personalized development of students [17, 18]. In particle swarm optimization, the inertia weight takes a constant value, but the inertia weight may be larger or smaller with the number of iterations, so it is biased towards global search or local search in the iterative

TABLE 1: Emotion and color relationship.

	Optimization	Node
Design main tone	5.31	0.65
Nonprincipal tone determination	3.51	2.71

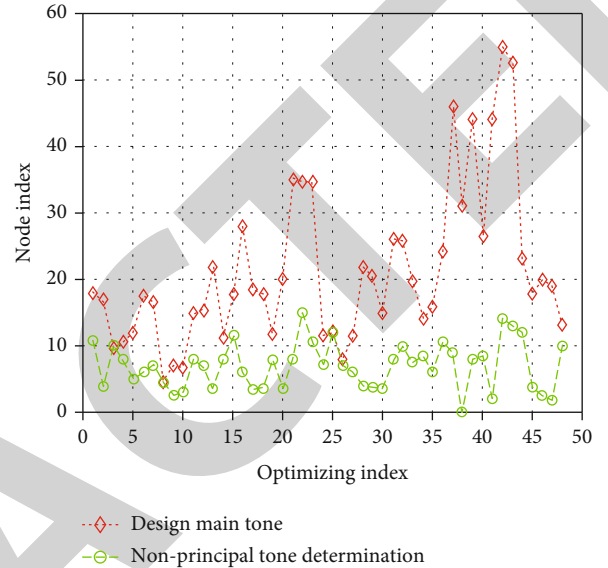


FIGURE 1: Emotion and color relationship.

TABLE 2: Stage characteristics of children’s painting.

	Motor response	Perceptual input
Line	13.30	12.98
Color	15.15	13.06
Sense of space	8.25	9.15

operation process. In this paper, 200 preschool children were selected as the research objects, including 111 males and 89 females, aged 3-5 years, with an average age of 4.21 years.

The main contributions of this paper are as follows:

Based on the basic concepts of art and art education and the stage characteristics of children’s painting, this paper analyzes what art therapy is and then studies the application of art therapy based on particle swarm optimization in preschool children’s art teaching.

In this paper, finding the global optimal fitness function not only simplifies the computational complexity but also approaches the maximum coverage provided by the current network.

## 2. Related Work

Sharma believes that artistic performance is more direct and can ensure that therapists have a better understanding of the subconscious and psychological state of the tested orphaned and disabled children [19].

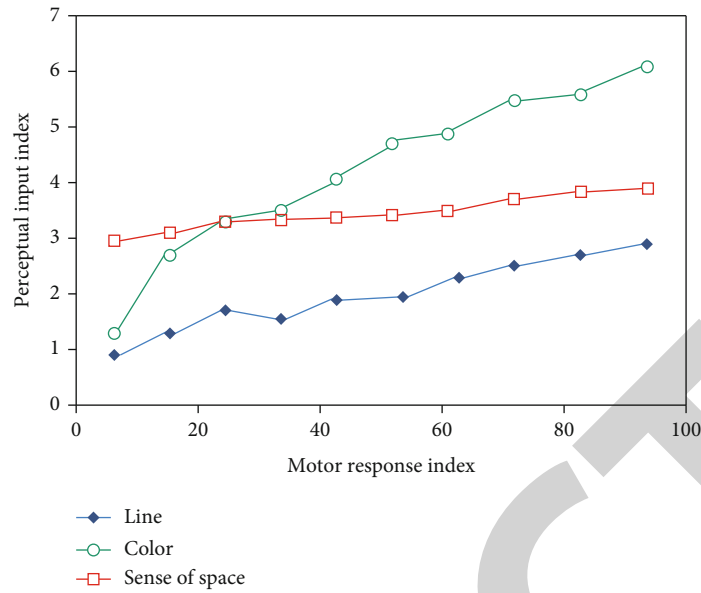


FIGURE 2: The periodic characteristics of children's painting.

TABLE 3: The bud of character form and schema.

	Creativity	Classification
Painting image	2.32	1.95
Style language	3.08	2.08

Delaney's research shows that art imitation and imitation of art classics provide children with an opportunity to understand art classics. Art unveils the mystery of elegant art, makes elegant art life, and makes it easier for children to get close, so as to help children initially enjoy art and experience art [20].

In the research of Gachago et al., inertia weight is introduced to make the previous speed affect the new speed. Cluster analysis is used to improve the performance of particle swarm optimization algorithm, and dynamic inertia weight particle swarm optimization algorithm is proposed in 2019. The algorithm uses the dynamic inertia weight that decreases with the increase of the number of iterations [21].

Aiming at the premature convergence problem of the existing quantum particle swarm optimization (QPSO), Xueming et al. proposed a QPSO algorithm based on artificial fish swarm [22]. The algorithm is based on quantum behavioral particle swarm optimization (qbepso), introduces population and follow-up activities, and uses adaptive parameters to avoid falling into local population extremes. Experimental results show that the improved algorithm improves the optimization ability of the algorithm.

Yingmei et al. studied the particle swarm optimization (PSO) algorithm [23], originated from the research on the foraging behavior of birds. In particle swarm optimization, each particle can be regarded as a point in the solution space. Particle swarm optimization (PSO) is a new intelligent optimization algorithm, which has few parameters and is easy to implement.

Xiaoyan et al. proposed in the study on the effect of psychological and behavioral intervention on intravenous infusion of outpatient preschool children that art therapy has the characteristics of nonverbal communication, has stronger adaptability than general psychotherapy, and can really alleviate tension [24].

In 2019, Ying et al. screened preschool children with ADHD through questionnaires and interviews and conducted a posttest after painting treatment [25]. The study found that the art of painting has a significant corrective effect on the hyperactivity behavior of preschool children.

Wen also studied other properties of PSO, such as the explosion stability and convergence of PSO in multidimensional complex space. He applied art therapy to different groups and established popular evaluation procedures in art therapy practice to study the relationship between children's painting and intellectual development [26].

### 3. What Is Art Therapy

**3.1. Art and Art Education.** When art therapy becomes a universal method applied to art education, teachers should create a safe and free supportive environment for students and establish an equal relationship of mutual trust with them. The virtual force between heterogeneous nodes affects the updating process of the location vector of the difference algorithm, guides the evolution of the population, and realizes the optimization of the network node layout. However, the algorithm has a high dependence on the accuracy of node location. It is easy to fall into the local optimum without discarding the relative difference solution, so that the local optimum solution cannot be bypassed and can continue to search forward, which results in a certain deviation of the calculation results and reduces the accuracy of the algorithm [27]. Art therapy shows the content that words

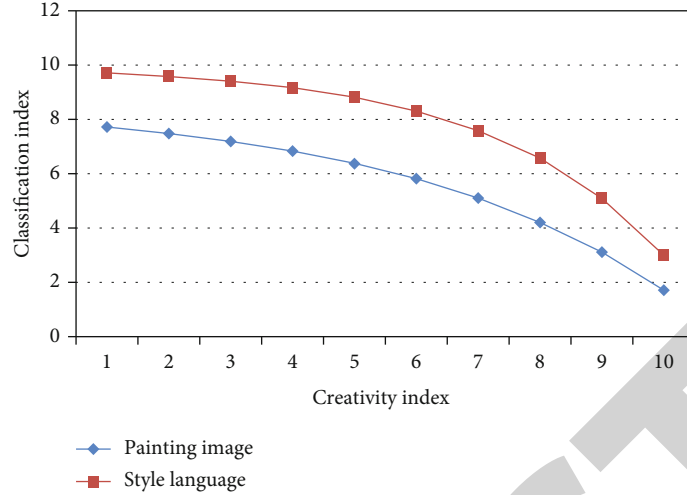


FIGURE 3: The germination of character form and pattern.

cannot express through many forms. Our language often acts as a double-edged sword. Sometimes, we can express ourselves completely through it; sometimes, we can hide and wrap ourselves through it; and sometimes, our rich inner world cannot be described by language [28] [29].

With the color emotion database, the user only needs to select the emotional expression desire of the design according to the prompt of the system, and the system automatically selects the matching color as the main color from the database and records its RGB value to get the main color; the relationship between emotion and color is shown in Table 1 and Figure 1.

**3.2. The Stage Characteristics of Children's Painting.** Students' responses to color naming are vague, confusing, and stereotyped. In the process of using color, they are often stubborn to choose only one or two colors, and their modeling ability is poor. In order to help users determine the dominant color intuitively when using the system, the keywords and values of emotional awareness represented by color are corresponded through a binary group. The teaching principle is used to structure its artistic activities, while the former uses mental health as the basis and purpose of treatment, and psychotherapy is used to structure its therapeutic activities [30]. And put it into the color emotional database, to observe and appreciate children's art works; you will find that it is not a simple picture or endless graffiti, but a portrait of children's mind; and it will be different according to time, place, people, and media. In the particle swarm algorithm, the fitness of each particle is calculated according to the fitness function, and then, the particle is evaluated according to the fitness. The fitness function is selected according to the actual situation and efficiency. Art education pays attention to the finished products of art activities, but art therapy is more concerned with the process of creation. From the perspective of children, we will measure the theme of their works and guide them correctly, give full play to children's imagination and creativity, and cultivate their interest in

TABLE 4: Development of visual schema.

	Creativity	Classification
Painting skills	3.60	3.51
Deductive reasoning	6.21	5.31

drawing models to promote their all-round development. In the game, the child's potential is realized, and the sensibility and rationality are balanced, thus establishing a harmonious and perfect personality.

Most children's artistic painting ability will follow this universal law, and this commonality has the same connection among children all over the world. Understanding the development of the law can know and judge the problems that arise outside the law, the stage of children's painting. Features are shown in Table 2 and Figure 2.

Compared with the content and works of children's art, the process of children's art activities is more important. Art therapy should achieve three levels of content: improving the social functions of body, emotion, and cognition, improving self-awareness, and promoting the transformation of personality. It is a comprehensive perceptual training from outside to inside to touch, push, pull, cut, and glue all kinds of materials at the same time of internal recollection and perception. And to think about problems from the perspective of children themselves is the key to solve the problems they face. At the same time, the new and strange visual effect of the change is changing and guiding the public's aesthetic taste. It not only opened up a new field for painting language but also established a new painting concept.

The state of children's painting and storytelling is divided into two types: "modeler" and "playwright," and "modeler" is more focused on painting itself. I like to explore and take risks with my own works, but the discussion about paintings is not so keen. The germination of character forms and patterns is shown in Table 3 and Figure 3. The development of visual patterns is shown in Table 4 and Figure 4.

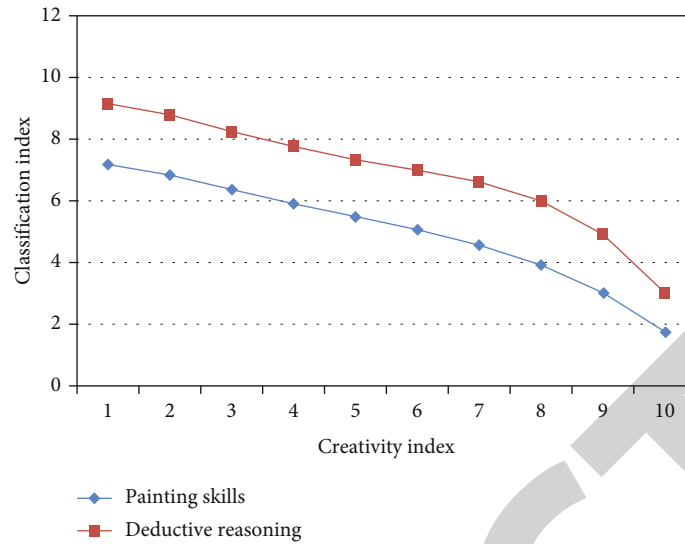


FIGURE 4: Development of visual schema.

## 4. Result Analysis and Discussion

*4.1. Education of Fine Arts Skills and Aesthetics.* Art education, which is dominated by artistic creation, is inseparable from the creativity of art, because it pays more attention to the process and the relationship shown in the process. Art education pays more attention to the results of art and will evaluate the process according to the results. Guiding students to have active reverie stimulates students' imagination and thinking ability, so that the teaching activities can be carried out in a positive atmosphere, in order to achieve a good teaching effect. In art activities, teachers focus on the changes of behavior and psychology in the process of students' activities and use artistic means to help students learn to perceive, experience, and express, so as to better understand themselves, face themselves, communicate effectively with others, and promote psychological growth. When your emotions, trauma, or hopes are transformed into works, and the works are recognized, understood, and appreciated by the teachers and the surrounding students, not only is the work recognized but also a process of self-recognition, which is true for preschool children. It is a big breakthrough in emotion. Let them completely vent their hearts. For example, I put the paint out, let the children choose the color they like on the paper, and do not ask them to draw any shape and theme, just use the color to vent and express themselves.

The beauty of children's paintings is different from the beauty of art in our general sense, but the beauty of children's paintings expresses their health, vitality, strength, softness, innerness, and vividness. It is possible to exercise children's self-care. Children need to prepare their own painting tools and find painting materials, composition, coloring, modification, etc. in the process of painting, which can greatly exercise children's self-care ability. Through the contact between students in small games and activities, students are guided to communicate with the expressions that normal people can accept. After the works are finished, they appreciate their works, appreciate

TABLE 5: Particle swarm optimization algorithm parameters.

	Training	Sample
Number of iterations	5.05	0.36
Convergence error	4.92	0.21

the sharing of others' works, describe their feelings in their own language, and share happiness. This can also be used for reference in our art education. Psychologically oriented art classroom needs not only students to learn art professional knowledge but also to express themselves in a relaxed and "safe" classroom atmosphere. If children draw lines very heavily, it is possible to reflect the following psychological tendencies: one is that the individual draws vigorously because of tension, in order to counteract the anxiety or anxiety of the heart. Second, physiological diseases may be brain. Third, the individual has an arbitrary and strong personality. The form of Xuan paper dyeing and painting is the combination of rough and fine hand movements, which is convenient for children to exercise their behavioral ability, simple and fast pattern and color expression, and helps children to express their emotions directly. Discuss, communicate, and counsel to understand the meaning of special symbols used by children. In addition, art therapy can help some preschool children to achieve stability and guide their conscious behavior.

Particle swarm optimization (PSO) adjusts the step size of particles to the global optimal position, which is called inertia factor. It is an important adjustment parameter of PSO. Large can promote global optimization, and small can promote local optimization. It can usually choose a constant between 0.1 and 0.5. The fitness value can be calculated by fitness function, and the particle's quality can be judged by judging the fitness value. Each particle moves in the solution space, tracking the local optimal position and the global optimal position to update the individual's position. In the

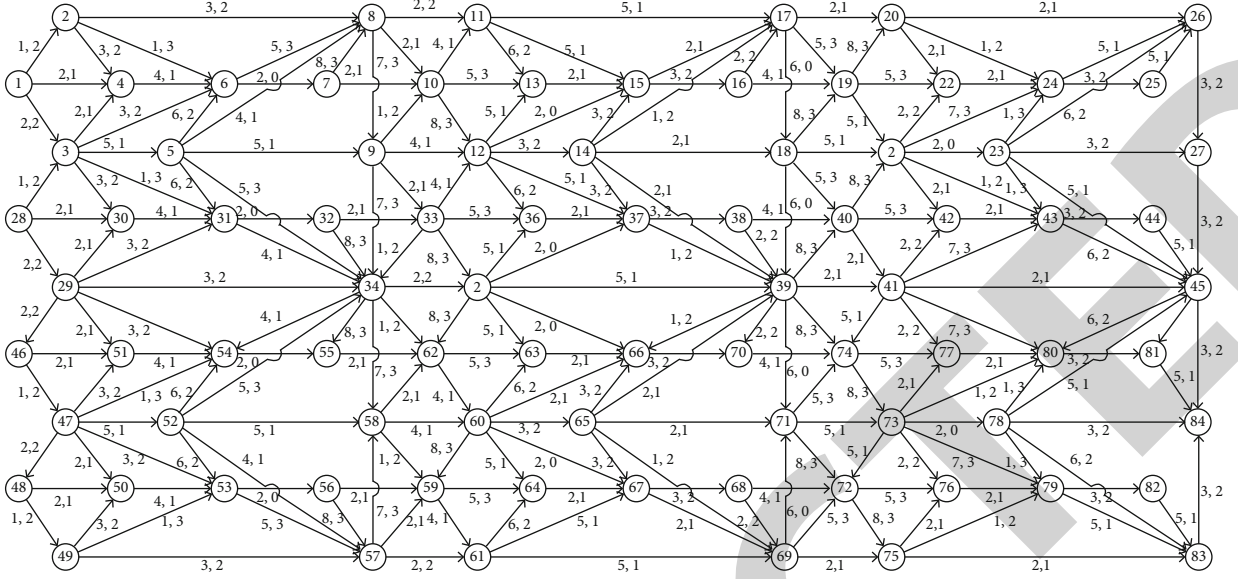


FIGURE 5: Training samples.

particle swarm optimization algorithm, with the parameter value, each dimension in the vector represents the value of the weight or threshold, which is the ownership value and the threshold number in the algorithm. The particle swarm optimization algorithm parameters are shown in Table 5 and Figure 5. The particle fitness is shown in Table 6 and Figure 6. The particle swarm algorithm flow chart is shown in Figure 7.

For the particle swarm algorithm to operate on the semi-feasible domain, a new evolutionary algorithm for solving constrained optimization problems using PSO algorithm is proposed:

$$X = \{x_{ij}\}_{m \times n} \quad (0 \leq i \leq m, 0 \leq j \leq n). \quad (1)$$

The following improvements to the global extremum and individual extrema selection methods of the particle swarm optimization algorithm for multiobjective optimization problems are as follows:

$$p_{ij} = \frac{x'_{ij}}{\sum_{i=1}^m x'_{ij}}. \quad (2)$$

Again, when updating the position of each particle, it is necessary to determine whether the position of the particle is in the quasisolution area at this time; if not, then update; otherwise, retain the original value:

$$e_j = -k \sum_{i=1}^m (p_{ij} \ln p_{ij}), \quad (3)$$

$$w_j = \frac{g_i}{\sum_{j=1}^n g_i}. \quad (4)$$

TABLE 6: Particle fitness.

	Parameter	Optimization
Fitness evaluation	19.34	17.56
Termination condition judgment	15.90	15.32

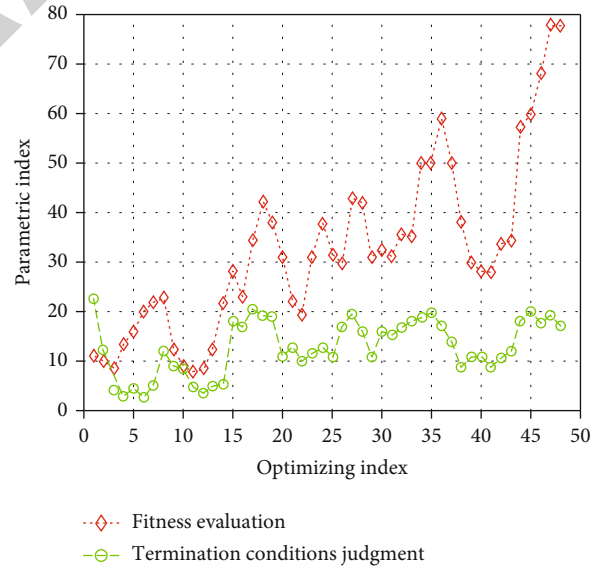


FIGURE 6: Particle fitness.

The selection can be made as follows:

$$f(t) = \sum_{j=1}^N \sum_{k \in Z} d_k^j \phi_{jk}(t) + \sum_{k \in Z} c_k^N \phi_{Nk}(t). \quad (5)$$

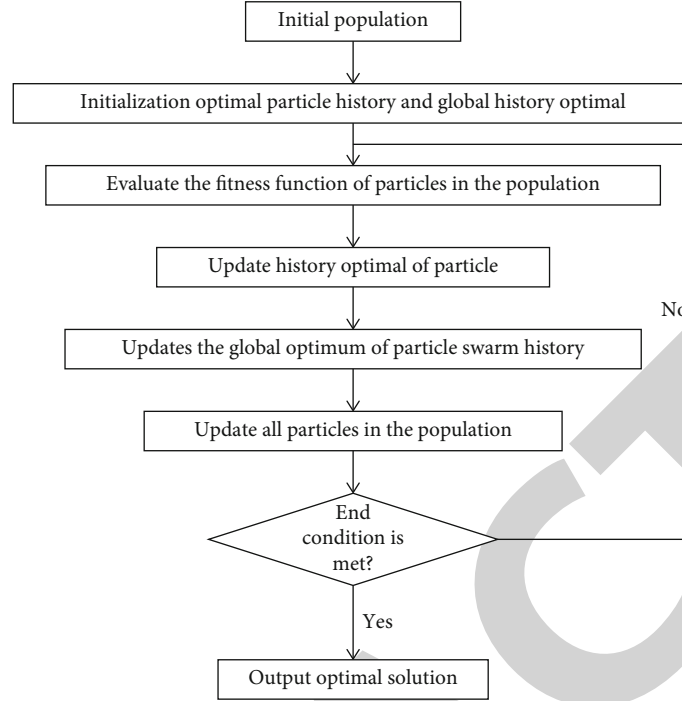


FIGURE 7: Particle swarm algorithm flow chart.

So I will update my speed and position according to the following formula:

$$E_{mi} = \sum_{i=1}^k (i\Delta t) \cdot |S_{mi}|^2. \quad (6)$$

Particle swarms consist of many candidate classification schemes. Evaluating the pros and cons of the classification scheme is the key to applying the optimization algorithm for clustering:

$$H = [h_1, h_2, \dots, h_k] = A^{1/2}E, \quad (7)$$

$$U_{ij} = \frac{H_{ij}}{\sqrt{\sum_{t=1}^k H_{it}^2}}, \quad i = 1, \dots, n, j = 1, \dots, k. \quad (8)$$

The pros and cons of each particle are determined by the fitness function i-1 as follows:

$$\frac{dx_1^{(1)}}{dt} + ax_1^{(1)} = \sum_{i=1}^N b_i x_i^{(1)}. \quad (9)$$

Return the particle's dimension to a valid search scope that is symmetric with the corresponding boundary:

$$\hat{a} = (B^T B)^{-1} B^T Y_N, \quad (10)$$

$$d_{\max} = \max \{d_i\}, \quad i = 1 \dots n. \quad (11)$$

4.2. *Realism*. The main contribution of art education to our education system and society is to emphasize the potential

TABLE 7: Realism.

	Enhance	Reference
Get rid of self-thinking	5.05	4.12
Reversible thinking	6.21	5.30
Having abstract concepts	4.09	3.16

of individual and self-creation; especially, art can harmoniously integrate everything in the process of growth and create a healthy person. Painting has become a feasible channel. A line, a color, and a symbol all have metaphors. Jianmen can learn about preschool children's feelings and ideas about themselves, others, and the environment through painting and nonverbal communication. The best position of fitness value is the position experienced by a single particle, and Gbest is the best position of fitness experienced by all particles. The fitness is calculated every time the particles are updated, and the new fitness is compared. The introduction of multigroup activities can help the particles that have fallen into or will fall into local extremum escape and move to the optimal direction, thus improving the local convergence of particle swarm optimization. Similarly, back-end activities also point to the individual to be executed and the current particle. All individuals within the perceptual distance form a small area together. If the fitness is good, the small area is not too crowded, and the individual moves to this position: the search is an iterative process, and the criterion of stopping is to reach the maximum number of iterations or meet the minimum error condition. The stopping condition depends on the problem to be optimized.

It is worth mentioning that children's painting is known as the "golden period of art development." At this time, the



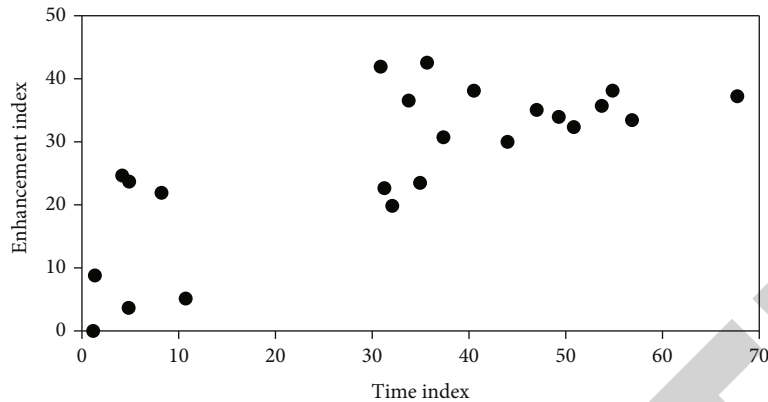


FIGURE 8: Realism.

paintings have the imaginative creativity, bright and bold color, unconstrained creative image, exuding charm, and realism as shown in Table 7 and Figure 8.

In the lgscps algorithm, each particle in the group shares mutual information globally and benefits from the discovery and previous experience of all other colleagues in the search process. Everyone involved can develop the ability of self-creation and self-rehabilitation, so in one-on-one treatment, problems can be found and analyzed through patients' paintings. The research on modeling and performance is of great help and promotion to the development of children's intelligence and the cultivation of children's character and quality. Sketch teaching can also broaden children's horizons, provide rich materials for painting, and avoid the passive situation of "building a car behind closed doors" or "no painting."

## 5. Conclusion

Through art, children associate themselves with art, thus laying the foundation for a "correct" understanding of art, which is not only reflected in the spiritual meaning and aesthetic value orientation but also in the material meaning of the change of traditional painting language. And the change of tools and materials has brought about the change of painting expression, which has become one of the important factors in the evolution of painting language. Teachers should try their best to correct or intervene children's bad behaviors and psychological phenomena in art activities, so as to make children's art education more humane and promote the healthy and harmonious development of every child. This paper starts with the basic concept of art education and the stage characteristics of children's painting, analyzes what art therapy is, and then studies the application of art therapy based on particle swarm optimization in children's art teaching.

Finding the global optimal fitness function not only simplifies the computational complexity but also approaches the maximum coverage effect provided by the current network. Applying the theory and method of art therapy to preschool children's educational activities can promote children's physical and mental development. This paper studies the

application of art therapy based on particle swarm optimization in preschool children's art. The research results have certain guiding significance, but there are still some shortcomings in sample selection, which need further optimization. Art therapy, like psychotherapy, also belongs to the medical field, and the system and certification of art therapy qualification need to be constantly improved. Only by standardizing the market management and perfecting the system can the effect of art therapy be maximized.

## Data Availability

The data used to support the findings of this study are included within the article.

## Ethical Approval

The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of Wonkwang University (project identification code).

## Consent

All subjects gave their informed consent for inclusion before they participated in the study.

## Conflicts of Interest

The authors declare that they have no competing interest.

## Authors' Contributions

C.W. wrote the original draft. L.S. wrote, reviewed, and edited the manuscript.

## Acknowledgments

This project is supported by the Scientific Research Foundation of Guangxi Minzu University (2021KJQD33).

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