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Research Article

The Influence of Modern Art Therapy on the Mental Health and Positive Development of Primary School Students in Xiamen

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Abstract

This study examined the effectiveness of culturally integrated modern art therapy in promoting mental health and positive development among primary school students in Xiamen, China. A quasi-experimental design with a wait-list control was used, which included 60 students from three schools in the region, aged 8-10 years. Results indicated a 19.7% reduction in psychological difficulties, a 24.3% improvement in social adaptability, and a 27.6% enhancement in creative thinking. Mediation analysis suggested that cognitive restructuring served as a candidate mediator accounting for approximately 54.2% of the intervention effect, while scores on the cultural identity scale increased by 21.4%. These outcomes were maintained at the three-month follow-up assessment. The study offers a preliminary model of culturally responsive art therapy in Chinese educational settings, integrating therapeutic processes with place-based cultural materials and digital tools, and indicates that locally grounded cultural elements may support modern interventions for children's holistic development.

Keywords

modern art therapy, primary school students, cultural adaptation, mental health, positive development

1. Introduction

The present-day mental health challenges affecting primary school-aged children are at an unprecedented high. Epidemiological research conducted in the recent past reveals that approximately 20% of children in the 6-11-year age bracket experience significant emotional and behavioral challenges, while a comparable proportion fall short of expected positive developmental milestones. Modern art therapy has been recognized as a distinctive therapeutic modality that addresses children's emotional and psychological challenges and

supports positive development through neuroplasticity-based and digitally mediated approaches (Versitano et al., 2025). Unlike conventional verbal-based approaches, modern art therapy combines cognitive neuroscience and creative media to address children's emotional and cognitive development.

The application of modern art therapy-based intervention strategies in educational settings has demonstrated two-fold benefits, including the reduction of mental health issues as well as positive developmental outcomes. Several randomized controlled trials have shown that children exhibit significant improvements in emotional, social, and creative problem-solving skills (Malboeuf-Hurtubise et al., 2021). School-based delivery models are highly effective in promoting positive outcomes by embedding therapeutic processes within familiar educational settings (Sullivan et al., 2025). Qualitative findings from children's perspective highlight the importance of school-based art therapy intervention strategies, which have been shown to enhance children's self-expression, empowerment, as well as emotional well-being (Moula et al., 2022). However, the existing literature is predominantly based on Western cultural settings, with limited empirical evidence on culturally adapted modern art therapy in Chinese primary school contexts and scarce examination of the cognitive-behavioral mechanisms through which such interventions may exert their effects.

As a center of Minnan cultural heritage, Xiamen offers distinctive opportunities for culturally specific therapeutic approaches aligned with indigenous models of well-being and flourishing. The rich artistic traditions of the region, including calligraphy, traditional art, and folk art, are natural bridges to modern therapeutic models and culturally specific approaches to positive development. While cognitive-behavioral principles in their conventional verbal form may have limited developmental appropriateness and cultural salience for primary school populations, their integration with creative media and culturally meaningful materials offers a means of preserving their analytical strengths while addressing children's expressive and culturally situated needs.

Within the present study, modern art therapy is operationally defined as a structured therapeutic approach that integrates cognitive-behaviorally oriented creative tasks, digitally mediated tools, and standardized psychometric and physiological measurement, thereby differing from interpretation-based traditional art therapy in both delivery and evaluation. Building on this definition and the gaps identified above, the present research seeks to elucidate the cognitive-behavioral process through which modern art therapy contributes to the enhancement of mental health and positive development for primary school students in Xiamen. By analyzing the proposed therapeutic pathway, the research seeks to quantify intervention effects on psychological well-being and positive development, and to propose an

evidence-based model for the delivery of culturally sensitive art therapy in Minnan education settings. It is hypothesized that, relative to a wait-list control, the eight-week program will reduce psychological difficulties and enhance social adaptability and creative thinking with effects sustained at three-month follow-up, that cognitive restructuring will mediate the link between creative engagement and mental health improvement, and that the magnitude of benefit will be moderated by students' identification with local Minnan cultural elements.

2. Literature Review and Theoretical Framework

2.1. Modern vs. Traditional Art Therapy: Cognitive-Behavioral Advances

Modern art therapy represents a substantive advance over traditional expressive arts therapy through the integration of cognitive-behavioral principles with digital production and monitoring tools, which collectively allow therapeutic processes to be both guided by and evaluated against observable indicators rather than interpretation alone. Empirical studies have identified that art-based therapeutic engagement stimulates fundamental neural circuits that govern emotion, memory, and decision-making processes, thus effecting change through observable and measurable mechanisms. Digital technologies further enable practitioners to monitor physiological changes in real time, allowing adjustments to be made on the basis of both observation and data. Virtual reality and tablet-based digital media offer immersive experiences that extend traditional art therapy while effectively engaging digital-native populations (Yıldız et al., 2025).

Conventional art therapy, while retaining the fundamental principles of humanistic therapy, has relied on interpretive methods without standardized measures. However, the new methods have removed these limitations by incorporating neuroimaging, cardiophysiological measures, and computerized analysis of artistic productions, thereby providing quantified results of the progress of therapy (Snir, 2022). The integration of cognitive-behavioral principles with art-based methods preserves both the analytical rigor of the former and the expressive spontaneity of the latter. Technological integration has rendered these therapeutic approaches more accessible, accurate, and relevant to the population of primary school students, who are naturally exposed to it in the context of their education system.

2.2. Art Therapy Applications in Primary Education Context

In view of such advancements in technology and theory, there is a growing need for intervention strategies that accommodate both therapeutic demands and educational settings. Current art therapy programs have successfully incorporated various modalities such as individual, small-group, and classroom settings, catering to different student needs and

learning styles. In art therapy with primary students, developmentally appropriate strategies employ materials such as collage, clay work, and digital art that suit children's physical and intellectual abilities. The collaborative roles of teachers and therapists are highlighted as crucial for effective art therapy programs. Studies suggest that environmental support fostered through professional collaboration facilitates the transfer of therapeutic gains to everyday school life (Léger-Goodes et al., 2024).

Effective collaboration includes consultations, planning, and development that enhances the understanding of teaching staff regarding therapeutic processes. Evidence of effectiveness indicates that the delivery models of schools ensure comprehensive support systems that bring together health and education sectors, which reduces the barriers of accessibility for vulnerable groups. On the other hand, challenges of implementation relate to limitations of physical space and scheduling, while success factors relate to effective administration support, resource allocation, and referrals. Modern programs reflect a growing shift toward preventive models that support students before problems escalate, with evidence pointing to both improved effectiveness and greater accessibility.

2.3. Cultural-Cognitive Framework for Positive Development

The interface between cultural sensitivity and modern methodologies of therapy offers an opportunity to develop holistic models that are sensitive to local culture and at the same time promote positive outcomes. Positive psychology is characterized by the development of positive qualities, unlike traditional models that focus on the removal of problems, and cultural adaptation is an essential consideration in positive psychology intervention. Studies have shown that therapy models are most effective when adapted to local cultural values, norms, and practices, particularly in non-Western societies where community-based interventions align more closely with cultural worldviews (Suemith-Fajardo et al., 2025). As a hub of Minnan cultural heritage, Xiamen provides rich opportunities for art therapy, with traditional calligraphy fostering concentration, traditional painting supporting cultural identity, and traditional craftsmanship enabling mastery experiences.

Contemporary developmental models emphasize the interplay between cultural meaning-making and individual psychological development. Modern art therapy practices integrate cultural integration through the use of technology-enhanced traditional practices that include digital calligraphy apps and virtual cultural experiences that connect children with their heritage while developing modern skills (Liu, 2024). A study on the effectiveness of cross-cultural interventions has demonstrated that art-based intervention strategies that include Indigenous practices and cultural symbols have shown considerably positive results

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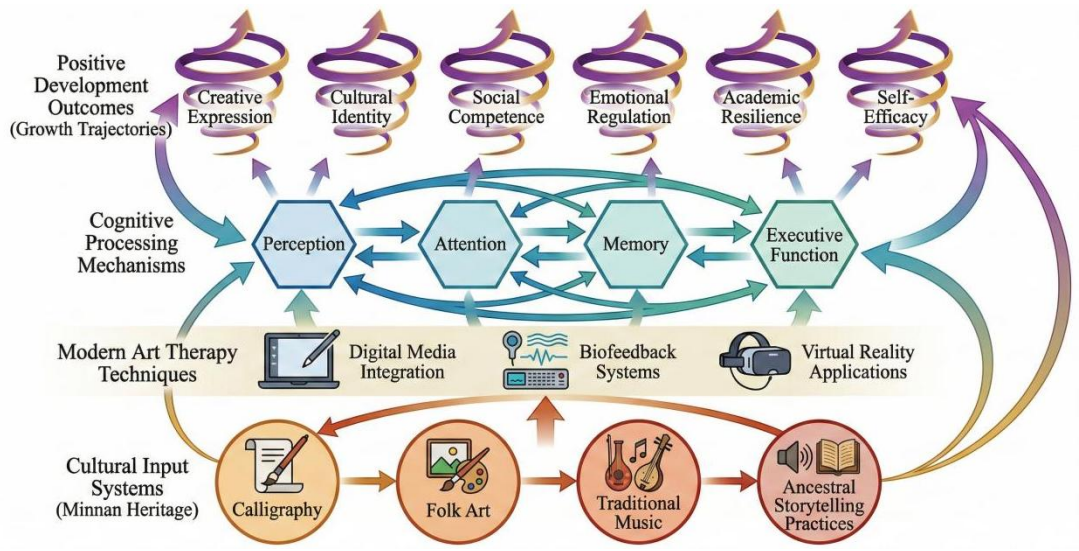
compared to culturally non-adapted intervention strategies (Applewhite et al., 2025). As illustrated in Figure 1, the cultural-cognitive framework integrates positive development domains with culturally specific elements to provide a comprehensive model that respects cultural traditions.

Figure 1

Cultural-Cognitive Framework for Positive Development in Modern Art Therapy



3. Research Methodology

3.1. Study Design

This study employed a quasi-experimental design with a wait-list control arm and multiple measurement points. Class-level allocation was adopted in place of individual randomization to remain compatible with school organizational structures while preserving methodological transparency. The wait-list arrangement was chosen on ethical grounds, ensuring that students assigned to the wait-list arm received the same eight-week intervention after the three-month follow-up assessment of the intervention arm was completed. The purpose of using such a research design is to evaluate the effectiveness of modern art therapy interventions in the educational system of Xiamen while maintaining scientific rigor. The mixed research framework includes quantitative and qualitative methods with outcome evaluation and process evaluation. The quantitative methods are used to elucidate the mechanisms underlying art therapy interventions. The baseline measurement was conducted for two weeks, and patterns were stabilized. The eight-week intervention period included mid-point, immediate post-intervention evaluation, and three-month follow-up.

Tablet-based assessment tools and physiological monitoring devices were used to collect process data in real time, in line with the modern art therapy framework outlined earlier. Brief

weekly assessments were embedded within sessions to capture temporal patterns, supporting methodological rigor while addressing the practical aim of evaluating modern art therapy for primary school children in Xiamen.

3.2. Participants and Xiamen Educational Setting

Participants were recruited from three representative public primary schools in different districts of Xiamen, ensuring demographic diversity while preserving cultural consistency with the local context. School selection was based on the adequacy of technological infrastructure that supports modern art therapy intervention, which requires access to the Internet, basic digital devices, and school commitment to innovation in student well-being. A stratified sampling approach was used to select 60 students from 8 to 10 years old, from Grade 3 to Grade 4, with 20 students from each school.

Within each participating school, intact classes from Grade 3 and Grade 4 were allocated to the intervention or wait-list arm by an independent research assistant using a procedure that stratified allocation by school and balanced the two arms on age, sex, and baseline SDQ total score, an arrangement adopted in place of individual randomization to minimize within-classroom contamination between conditions. The resulting analytic sample comprised thirty students in the intervention arm and thirty in the wait-list arm, and all completed the eight-week intervention together with the three-month follow-up, yielding full retention across the study period.

The adequacy of this sample size was supported by an a priori power analysis conducted in G*Power 3.1, specifying a repeated-measures analysis of variance with a within-between interaction, a moderate-to-large effect of f = 0.25, a two-sided alpha of .05, statistical power of .80, two groups, and four measurement occasions with an assumed correlation among repeated measures of .50, which indicated that a minimum of forty-four participants would be required, confirming the adequacy of the recruited sample for the planned primary contrasts while remaining modest for fully confirmatory mechanistic inference.

The special cultural environment of Xiamen, with its blending of traditional Chinese culture and external elements due to its geographical location and economic development, has provided an appropriate environment for the introduction of modern art therapy. Inclusion criteria comprised students identified through routine school screening as having mild social difficulties or developmental potential, as defined by current educational guidelines. Exclusion criteria were limited to a documented need for individual psychiatric treatment, severe behavioral problems likely to disrupt group sessions, and scheduling conflicts with the academic program. Recruitment leveraged the digital communication networks available

across Xiamen's educational institutions, reaching both parents and children. Parent information sessions incorporated multimedia presentations introducing the concepts and rationale of modern art therapy.

The study protocol governing these recruitment and intervention procedures received ethical approval from the Institutional Review Board of the affiliated university and was endorsed by the principals of all participating schools. Written informed consent was obtained from each parent or legal guardian following the multimedia parent information sessions described above, and written assent was obtained from each child after an age-appropriate verbal explanation of the study activities. Participation was voluntary, withdrawal at any stage carried no academic or social consequence, and all identifying information was stored separately from study data on an encrypted institutional server.

3.3. Modern Art Therapy Intervention Protocol

The intervention protocol integrated evidence-based therapeutic frameworks with contemporary digital technology and local cultural elements from Xiamen. The intervention was delivered in twice-weekly 60-minute sessions over eight consecutive weeks, yielding sixteen sessions per participant, in a purpose-built therapeutic space within each participating school. The thirty intervention participants from each school were organized into three closed groups of ten students, with each group led by the same facilitator throughout the eight-week period in order to preserve the therapeutic relationship and ensure dosage equivalence across schools. Equipment included tablets with art-creation software, biofeedback devices for monitoring heart rate variability, and display screens for group sharing. The materials integrated locally meaningful cultural references, including architectural motifs from Xiamen, maritime imagery reflecting the city's coastal setting, and Minnan cultural elements such as tea ceremonies and folk art.

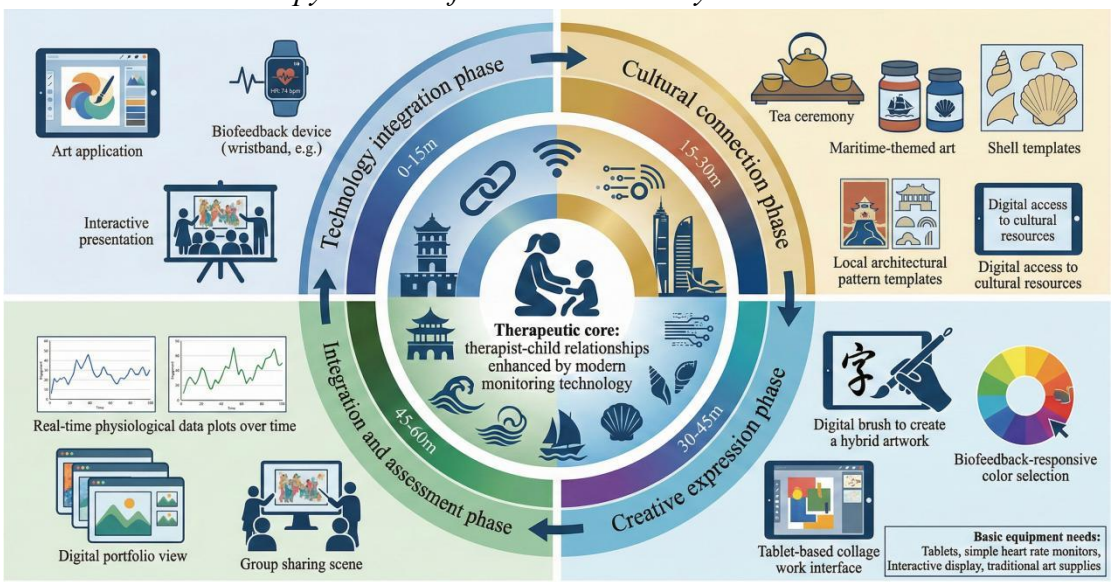
Sessions making use of these tools and materials were delivered by qualified art therapists, each holding a relevant postgraduate qualification in art therapy, expressive arts therapy, or clinical psychology and possessing no fewer than three years of supervised practice with school-aged children, with every facilitator additionally completing a forty-hour pre-intervention training course covering the study manual, Minnan cultural content, and operation of the digital tools. To ensure standardization across the three participating schools, each session followed a written manual specifying objectives, materials, activity sequence, and verbal prompts, weekly group supervision was held with the lead investigator, and a fidelity checklist was completed by an independent observer for one randomly selected

session per group per week, with mean fidelity exceeding ninety percent across the intervention period.

As shown in Figure 2, the proposed intervention process is methodologically designed to move through specific stages that ensure that modern technology is factored in during creation and evaluation without losing sight of the therapeutic relationship. Within this manualized structure the eight-week curriculum advanced through four phases of two weeks each, namely an engagement phase introducing the digital tools and the cultural-cognitive rationale of the program, a self-exploration phase emphasizing emotional awareness through color and form, a cultural-creative phase in which students produced culturally grounded artworks drawing on Minnan motifs, and a consolidation phase oriented toward reflection, peer sharing, and transfer to everyday school life. Dedicated software supported both individual and collaborative artistic activities, while real-time physiological monitoring provided objective feedback on engagement and arousal during each session. The program targeted measurable improvements in emotion regulation, social skills, cultural identity, and creative problem-solving, combining traditional assessment approaches with digital tools embedded in the therapeutic process.

Figure 2

Integrated Modern Art Therapy Protocol for Xiamen Primary Schools



3.4. Mental Health and Positive Development Measures

The assessment protocol used conventional psychometrics as well as innovative measurement techniques that are aligned with recent philosophies of therapy. Primary mental health outcomes were assessed with the Strengths and Difficulties Questionnaire, which has established psychometric properties in Chinese populations. Health-related quality of life was

assessed with KIDSCREEN-27. The contemporary features of the assessment protocol include physiological response measurement using user-friendly biofeedback devices that are appropriate for children. The physiological measure used was heart rate variability as an indicator of emotional control and engagement. The analysis of digital art products used specific software that analyzed specific features related to color, complexity, symmetry, and symbolism.

Four further constructs central to the mediation and outcome analyses, namely emotion regulation, social adaptability, self-efficacy, and cognitive restructuring, were primarily operationalized through established child self-report instruments validated in Chinese-language school samples. Emotion regulation was assessed using the ten-item Emotion Regulation Questionnaire for Children and Adolescents (α = .82), covering aspects of emotion recognition, expression, and management, administered at baseline, mid-intervention, and post-intervention to provide a self-report counterpart to the physiological indicators described above. Social adaptability was measured using a validated Chinese-language fifteen-item Social Adaptability Scale for Children (α = .85) covering peer cooperation, classroom adjustment, and prosocial behavior, complemented by parallel teacher ratings recorded through the digital rating platform described earlier in this section. Self-efficacy was indexed using the ten-item General Self-Efficacy Scale adapted for school-aged Chinese populations (α = .80). Cognitive restructuring, treated as the candidate mediator in the analyses presented in Section 4.4, was assessed using the four-item cognitive restructuring subscale of the Cognitive Emotion Regulation Questionnaire (α = .78), and was complemented by a behavioral marker derived from the digital art product analysis described earlier, which coded changes in symbolic content and complexity across successive sessions as observable evidence of cognitive reframing. The four self-report instruments were administered at baseline, mid-intervention, and post-intervention, with self-efficacy and cognitive restructuring re-assessed at the three-month follow-up.

As illustrated in Table 1, the total plan of measurement was a combination of traditional approaches and more recent approaches in collecting data across the planned measurement schedule. Positive development indicators included a validated Xiamen cultural identity scale with established reliability and content validity in the local population, measuring connectedness with local heritage, pride in identity with the city, and appreciation for cultural diversity that was characteristic of the cosmopolitan setting of Xiamen. Academic functioning was assessed through teacher ratings of engagement with peers, cooperation with peers, and exemplars of creative problem-solving skills through digital rating approaches.

Another measure of sleep quality and daily functioning was the activity monitors, which were appropriate for pediatric populations, providing behavioral data to support self-reporting. Attentional capacity and cognitive flexibility were assessed using a series of brief tablet-based tasks, providing indicators of executive functioning relevant to art therapy participation. Taken together, these instruments provided a multi-source assessment plan informing the analytic procedures described in the following subsection.

Table 1

Comprehensive Assessment Protocol for Modern Art Therapy Study in Xiamen

Assessment Domain	Measurement Tool	Baseline	Week 2	Week 4	Week 6	Week 8	3-Month Follow-up
Mental Health	SDQ-Teacher/Parent Version	✓		✓		✓	✓
Quality of Life	KIDSCREEN-27	✓				✓	✓
Physiological Response	Heart Rate Variability Monitor	✓	✓	✓	✓	✓	
Creative Expression	Digital Art Product Analysis		✓	✓	✓	✓	✓
Xiamen Cultural Identity	Local Cultural Connection Scale	✓		✓		✓	✓
Attention/Executive Function	Tablet-based Cognitive Tasks	✓				✓	✓
Activity/Sleep Patterns	Simple Wearable Monitors	✓	✓	✓	✓	✓	✓
Academic Engagement	Digital Teacher Rating Platform	✓		✓		✓	✓

3.5. Statistical Analysis

All quantitative analyses were conducted in SPSS 26.0, with PROCESS macro 4.0 used for mediation and moderation and Mplus 8.3 for path-analytic and multilevel modeling. Baseline equivalence between arms was examined using independent-samples t-tests and chi-square tests. Between-group effects on primary and secondary outcomes were evaluated using two-way repeated-measures ANOVA with Group and Time as factors, and within-group change was tested using paired-samples t-tests. Effect sizes were reported as Cohen's d, accompanied by ninety-five percent confidence intervals.

Grounded in the cognitive-behavioral framework outlined in the introduction, mediation of cognitive restructuring was tested using PROCESS Model 4 with five thousand bootstrap resamples and bias-corrected ninety-five percent confidence intervals, while the sequential pathway linking artistic creation to mental health outcomes through creative thinking and

emotional expression was examined via path analysis in Mplus. The moderating role of cultural identity, motivated by the cultural-cognitive framework, was tested using PROCESS Model 1 with mean-centered predictors, and a multilevel analysis was conducted to examine variance attributable to individual, class, and school levels. All tests were two-tailed at $\alpha = .05$, and given the modest sample size, mechanistic findings were interpreted as preliminary rather than confirmatory.

4. Results

4.1. Baseline Characteristics and Cultural Context

The sample included 60 students from primary school in Xiamen, China. Their ages ranged from 8 to 10 years old, with an average age of 9.2 ± 0.8 years old. The sex distribution of the sample was relatively balanced, with 53.3% being male and 46.7% being female. Socio-economic status showed that most of the sample, 76.7%, belonged to middle-income status, as education resources in Xiamen are generally characterized by this status. Mental health status was also surveyed, showing that the SDQ difficulty score was 12.4 ± 3.2, which was in the normal range but near the borderline. The KIDSCREEN-27 mental health dimension score was 47.8 ± 6.1, slightly lower than the international norm.

In terms of positive development indicators, the creativity score was 26.3 ± 4.5, the social adaptability score was 31.7 ± 5.2, and the cultural identity score was 42.6 ± 6.8. There was no significant difference in the baseline indicators between the intervention and wait-list groups, with all p values exceeding .05 as shown in Table 2. The Xiamen cultural identity scale results showed a moderate level of identification with local marine culture and architecture.

Table 2

Baseline Characteristics of Study Participants (N=60)

Characteristic	Intervention Group (n=30)	Control Group (n=30)	p-value
Age, years (M±SD)	9.1±0.7	9.3±0.9	0.345
Gender, n (%)			0.612
- Male	17 (56.7)	15 (50.0)	
- Female	13 (43.3)	15 (50.0)	
SDQ Total Score (M±SD)	12.2±3.4	12.6±3.0	0.623
KIDSCREEN-27 Mental Health (M±SD)	48.1±6.3	47.5±5.9	0.708
Creativity Score (M±SD)	26.8±4.3	25.8±4.7	0.392

Cultural Identity (M±SD)	43.2±6.5	42.0±7.1	0.469

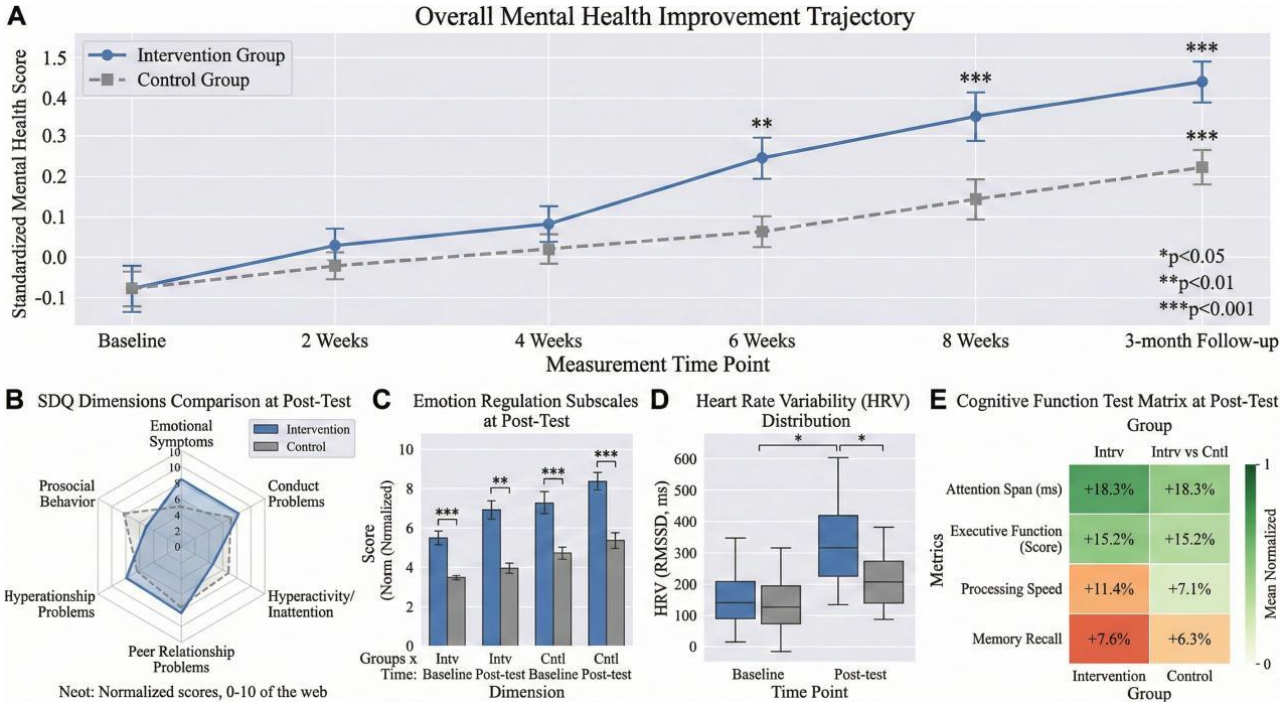
4.2. Primary Outcomes: Mental Health Improvements

The modern art therapy intervention produced significant improvements in mental health indicators. The total difficulties score in the SDQ decreased from 12.2±3.4 to 9.8±3.1 after the intervention, indicating a reduction of 19.7%, while the control group's score decreased from 12.6±3.0 to 12.1±2.9 ($p<0.01$). In the intervention group, emotion regulation scores improved across all three aspects of recognition, expression, and management, rising from 32.4 ± 5.1 to 38.9 ± 4.8 (a 20.3% increase), while no significant change was observed in the control group ($p = 0.248$). Cognitive function also improved in the intervention group, with attention span increasing by 18.3% (from 67.2 ± 8.3 to 79.5 ± 7.6) and executive function scores by 15.2%; no significant changes emerged in the control group.

Physiological monitoring data provided objective corroboration of the psychological improvements. As the intervention progressed, the trajectory of the mean heart rate variability (HRV) index increased, ranging from 28.4 ± 6.2 ms to 32.1 ± 5.9 ms. Figure 3 below shows the trajectory of the psychological health improvement in the intervention group, indicating that the improvement was sustained, and the effects were more pronounced after the fourth week of the intervention. The significant effects observed at the end of the 8-week intervention were maintained at a 3-month follow-up assessment.

Figure 3

Temporal Changes in Mental Health Indicators During Art Therapy Intervention



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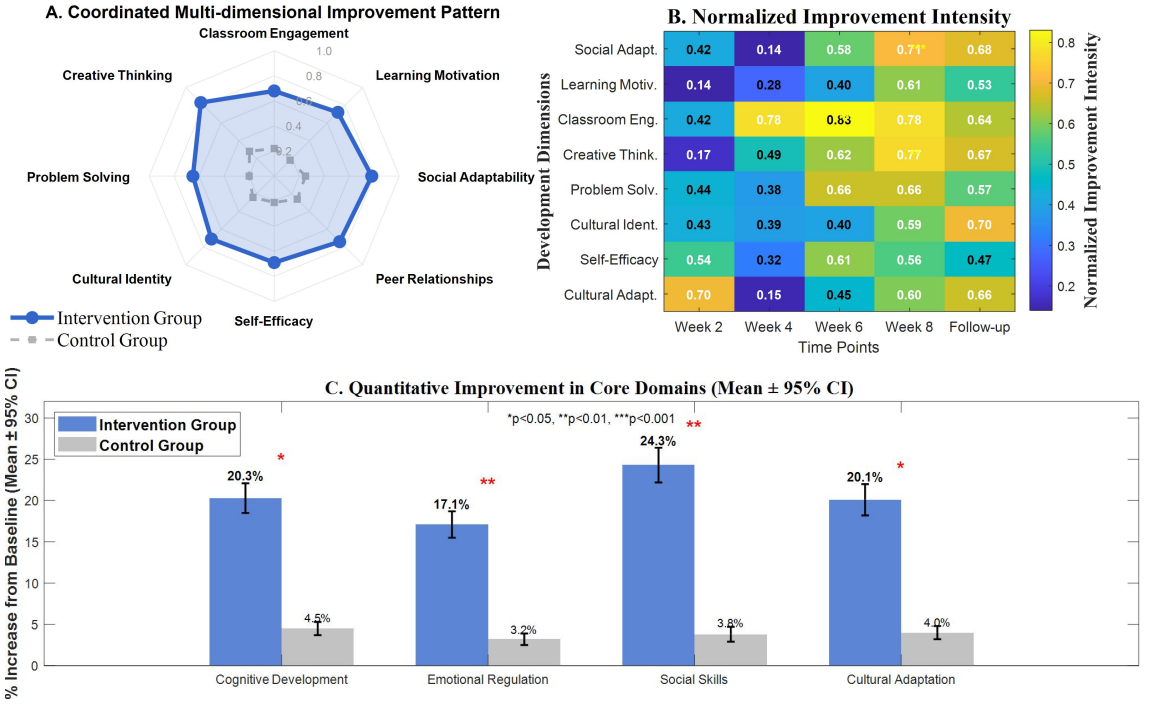
4.3. Secondary Outcomes: Positive Development Indicators

Modern art therapy showed positive effects across multiple dimensions of children's development. Social adaptability improved across peer relationships, cooperation, and social skills. The children's social adaptability index increased from 31.7±5.2 to 39.4±5.1 points, reflecting a 24.3% gain. By comparison, the control group showed only a 3.8% change, yielding an effect size of 1.47 ($p < .05$). Learning motivation and academic engagement also showed positive trends in the intervention group, with in-class attention span increasing by 22.1%, the frequency of student-initiated questions rising by 18.7%, and homework completion scores improving by 16.4%.

The development of creativity was also evaluated through standardized measurements of creative thinking and the analysis of artworks. The data revealed that the total creativity score in the intervention group increased from 26.8 ± 4.3 to 34.2 ± 5.0 (a 27.6% gain), exceeding the control group across the dimensions of fluency, flexibility, and originality. Cultural identity and self-efficacy showed parallel gains, with a 21.4% increase on the Xiamen cultural identity scale and an 18.9% increase on the self-efficacy scale. As shown in Figure 4, the positive development indicators followed coordinated trajectories across the intervention period.

Figure 4

Multi-dimensional Positive Development Outcomes



Drawing together the primary and secondary outcomes presented above, Table 3 summarizes the standardized effect sizes and confidence intervals; the mediation, path, and moderation analyses in Section 4.4 are reported separately given their exploratory nature.

Table 3

Primary and Secondary Outcomes with Effect Sizes

Outcome	Category	Intervention M ± SD (Pre → Post)	Control M ± SD (Pre → Post)	Intervention Change	Between-group d [95% CI]	p (between groups)
SDQ Total	Primary (MH)	12.2 ± 3.4 → 9.8 ± 3.1	12.6 ± 3.0 → 12.1 ± 2.9	−19.7%	0.77 [0.25, 1.29]	< .01
Emotion Regulation	Secondary (MH)	32.4 ± 5.1 → 38.9 ± 4.8	—	+20.3%	—	—
Social Adaptability	Secondary (PD)	31.7 ± 5.2 → 39.4 ± 5.1	—	+24.3%	1.47 [0.90, 2.04]	< .05
Creativity Total	Secondary (PD)	26.8 ± 4.3 → 34.2 ± 5.0	—	+27.6%	—	—

Note. Between-group d for SDQ was computed from reported means and SDs; d for social adaptability is from the original report. Dashes = values not derivable. MH = mental health; PD = positive development.

4.4. Mechanism Analysis and Cultural Adaptation

The exploratory analyses presented in this subsection, interpreted with the modest sample size in mind, examined the potential cognitive-behavioral pathways underlying the intervention and the role of cultural adaptation. Mediation analysis indicated that cognitive restructuring may serve as a mediator of the intervention effect, with the indirect effect accounting for approximately 54.2% of the total effect and showing a bias-corrected 95% confidence interval from 0.31 to 0.58, while the direct effect accounted for the remaining 45.8%, as supported by Bootstrap resampling. Path analysis further suggested that artistic creation contributed to creative thinking with a standardized coefficient of 0.51 at $p < .01$, which was associated in turn with greater emotional expression with a coefficient of 0.43 at $p < .05$, and ultimately with more favorable mental health outcomes with a coefficient of 0.58 at $p < .01$. Moderation analysis of local Xiamen cultural elements suggested that the magnitude of intervention benefit varied with students' level of cultural identity, with an interaction coefficient of 0.18 at $p < .05$, such that students reporting stronger cultural identity showed approximately 23.7% greater improvement than those reporting weaker cultural identity.

Complementing these inferential analyses, ratings on the integration of digital tools with traditional cultural activities yielded a mean of 3.8 with a standard deviation of 0.6, while

preferences for marine themes and for architectural patterns yielded means of 3.9 and 3.6 with standard deviations of 0.7 and 0.8, respectively. Beyond these descriptive ratings, the exploratory multilevel analysis indicated that baseline individual characteristics, class-level cultural atmosphere, and school-level technological support together accounted for 67.3% of the variance in intervention effects.

5. Discussion

The current study aims to examine the role of modern art therapy in supporting the mental health and positive development of primary school children through cognitive-behavioral processes. The 19.7% reduction in SDQ scores and the 24.3% gain in social adaptability are consistent with the proposition that creative expression may contribute to gains in emotional and behavioral domains within an art therapy framework. The 27.6% gain in creativity provides preliminary evidence that culturally integrated creative activities may be associated with greater cognitive flexibility, in line with existing theoretical accounts of art therapy.

The cultural setting of Xiamen offers distinctive opportunities for intervention adaptation. The integration of local maritime and architectural elements with technology-based platforms appears to support meaningful cultural engagement, reflected in a 21.4% gain on the cultural identity scale, which is in keeping with the rationale for place-based therapeutic interventions. The exploratory mediation analysis suggests cognitive restructuring as a candidate process accounting for approximately 54.2% of the intervention effect, indicating the potential of culturally grounded creative interventions to support psychological change within school-based prevention work. The manualized delivery by qualified art therapists, together with the maintenance of effects at three months, provides preliminary support for the feasibility and short-term sustainability of structured creative approaches.

The findings should be interpreted in light of several limitations. The quasi-experimental design with sixty participants limits statistical power and generalizability, and the class-level allocation introduces a degree of clustering that warrants cautious interpretation of the between-group estimates. The eight-week intervention period may be insufficient to capture longer developmental trajectories, and longer follow-up over twelve to twenty-four months would help to establish dose-response relationships across schools in the Minnan region. The mediation, path, and moderation analyses are best regarded as exploratory given the modest sample size and warrant replication in larger samples with systematic reporting of assumption diagnostics and model fit indices before strong mechanistic inferences can be drawn. The delivery of the program by qualified art therapists constrains direct transferability, and further

work on training, cost-effectiveness, and adaptation for school-based personnel will support broader uptake.

6. Conclusion

The present study examined the effectiveness of culturally integrated modern art therapy in promoting mental health and positive development among primary school children in Xiamen. The findings indicate a 19.7% reduction in psychological difficulties, a 24.3% gain in social adaptability, and a 27.6% gain in creative thinking, with cognitive restructuring emerging as a candidate mediating process accounting for approximately 54.2% of the intervention effect and with locally meaningful maritime and architectural elements appearing to support cultural engagement.

The study offers a preliminary model of culturally adapted art therapy in a Minnan educational setting and adds to the limited evidence on school-based art therapy in Chinese contexts. It also illustrates how digital production tools and physiological monitoring can be integrated with traditional cultural materials within a single intervention protocol. The three-month maintenance of effects within a school-based delivery framework provides initial guidance for preventive intervention design in Chinese schools, while reproducibility, longer-term outcomes, and scalability beyond specialist therapists warrant further investigation.

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Author contributions

Not applicable.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Conflict of interest

The authors declare that there is no Conflict of interest.

Ethics approval
Not applicable.

Consent to participate
Not applicable.

Consent for publication
All authors have given their consent.

Additional information

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