

Natural Printmaking Art: A Creative Process for Developing Autistic Children through Group Activities

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ABSTRACT

This research aimed (1) to study the creative process of natural printmaking art using the technique of hammering leaves and flowers on fabric among autistic children, (2) to analyze the effects of the activity on the development of emotions, concentration, social skills, and learning of autistic children, and (3) to create a prototype of an art activity that can be applied in the context of therapy and education for special children. The findings revealed that the activity enhanced concentration, hand-eye coordination, physical strength control, and social skills such as waiting, collaboration, and exchanging ideas. The artworks reflected emotional expression, creativity, and self-esteem, aligning with art therapy concepts that regard art as a medium connecting the inner and outer world. In addition, the group setting encouraged the children to cooperate, share materials, and develop patience, which further supported social integration and peer interaction. The process of selecting plants, arranging them, and creating imprints on fabric allowed the children to make independent decisions, solve problems creatively, and take pride in their accomplishments. These experiences promoted not only individual growth but also collective learning outcomes. This study suggests that nature-based art activities can be effectively applied to develop autistic children, improve their emotional and cognitive abilities, and provide meaningful social learning opportunities in therapeutic and educational contexts.

Keywords: Art Activities, Nature, Children with Autism, Art Therapy, Social Skills

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by challenges in social communication, restricted interests, and repetitive behaviors (American Psychiatric Association, 2013). Children with autism often experience difficulties in emotional regulation, sensory processing, and social interaction, which can significantly impact their overall development and quality of life. Traditional therapeutic approaches, while effective, may not fully address the multidimensional needs of these children, prompting educators and therapists to explore alternative interventions that engage multiple developmental domains simultaneously.

Art therapy has emerged as a valuable intervention for children with autism, offering a nonverbal medium for self-expression and communication (Malchiodi, 2012). Through creative activities, children can explore their emotions, develop fine motor skills, and enhance cognitive abilities in a safe and supportive environment. The tactile and visual nature of art making aligns well with the learning preferences of many autistic children, who often respond positively to hands-on, sensory-rich experiences. Research indicates that art-based interventions can reduce anxiety, improve focus, develop hand-eye coordination, enhance motor control, and facilitate social engagement among children with developmental disabilities (Schweizer et al., 2014).

The integration of nature into therapeutic art activities offers additional benefits. Nature-based interventions have been shown to promote calmness, reduce stress, and enhance attention span in children with special needs (Louv, 2008). The use of natural materials such as leaves, flowers, and plants

in art making connects children to their environment, fostering ecological awareness and sensory exploration. Natural printmaking, specifically the technique of hammering botanical elements onto fabric, combines artistic expression with sensory engagement, offering a unique opportunity for holistic development. Research related to product design for creating art using natural materials demonstrates the potential for developing creative processes and transferring skills through activities that emphasize sensory experiences (Sangwalpatch et al., 2024).

Despite growing evidence supporting art therapy and nature-based interventions, limited research has explored the specific application of natural printmaking for autistic children in group settings. This study addresses this gap by investigating how the creative process of leaf and flower hammering on fabric can serve as a therapeutic and educational tool. The research examines the impact of this activity on emotional development, concentration, social skills, and creative expression among autistic children, with the aim of developing a replicable model for therapeutic and educational practice.

Research Problems

Children with autism spectrum disorder face significant challenges in multiple developmental domains that affect their ability to engage with others and express themselves effectively. These challenges create barriers to learning, social integration, and emotional well-being, necessitating innovative therapeutic approaches that address their unique needs.

Research objectives

1. To study the creative process of natural printmaking art using the technique of hammering leaves and flowers on fabric among autistic children.
2. To analyze the effects of the activity on the development of emotions, concentration, social skills, and learning of autistic children
3. To create a prototype of an art activity that can be applied in the context of therapy and education for special children.

Research methodology

Research Design

This study employed a One Group Pretest-Posttest Design with a mixed-methods approach, integrating both quantitative and qualitative data. The aim was to examine the effects of a nature-based printmaking art activity, specifically hammering leaves and flowers onto fabric, on the development of attention, social communication, emotional regulation, motor skills, and creativity in children with autism, who participated alongside other children with special needs. The mixed-methods design allowed for triangulation of data sources, providing both measurable outcomes and rich descriptive information about participants' experiences.

All assessment instruments were administered by trained research assistants who were not involved in delivering the intervention, ensuring objectivity in data collection. Inter-rater reliability was established for all observational measures, with agreement coefficients ranging from $\kappa=0.78$ to $\kappa=0.85$ across instruments. Video recordings of selected sessions were independently coded by two raters to verify reliability of behavioral observations.

Motor Skills Assessment Protocol: A performance-based assessment focusing on fine motor skills and hand-eye coordination relevant to the hammering technique. The protocol included standardized tasks such as: grip strength and control (ability to hold hammer appropriately), force modulation (appropriate striking force for different materials), bilateral coordination (coordinated use of both hands - one holding material, one hammering), and precision placement (accuracy in positioning plants before hammering). Each task was scored using a 3-point scale (0=unable/requires full assistance, 1=emerging/requires partial assistance, 2=independent/proficient) during initial and final sessions.

Video recordings of hammering activities were analyzed frame-by-frame to document improvements in motor execution and coordination patterns.

Social Skills Rating Scale - Adapted for Art Therapy Context: An adapted version of a standardized social skills assessment, modified to capture social behaviors specific to group art activities. The scale evaluated five domains: cooperation (sharing materials, following group routines), turn-taking (waiting for materials, respecting others' workspace), peer interaction (initiating contact, responding to peers), communication (verbal and nonverbal expression related to art activities), and emotional regulation (managing frustration, expressing positive emotions appropriately). Each domain contained 4-6 specific behavioral items rated by trained observers on a 5-point frequency scale (1=never, 2=rarely, 3=sometimes, 4=often, 5=always) based on observations during the first three sessions (pretest baseline) and final three sessions (posttest).

Behavioral Observation Checklist for Attention and Engagement: A time-sampling observational protocol used to document on-task behavior, sustained attention, and task engagement during art activities. Observers recorded the presence or absence of specific behaviors in 2-minute intervals throughout each 45-minute session, including: eyes directed toward materials or artwork (visual attention), hands actively manipulating materials (active engagement), verbal or nonverbal communication about the task (task-related communication), and off-task behaviors such as wandering, self-stimulation, or distraction. Percentage of intervals with on-task behavior was calculated for each session, providing quantitative data on attention and concentration improvements from pretest to posttest.

Artistic Output Rubric: A structured evaluation tool designed to assess the quality and complexity of children's artwork across multiple dimensions including composition (arrangement and spatial organization), color usage (variety and intentionality of color selection), technical execution (precision of hammering and print clarity), and creative expression (originality and thematic coherence). Each dimension was rated on a 4-point scale (1=emerging, 2=developing, 3=proficient, 4=advanced) with specific behavioral indicators defined for each level. The rubric was applied to representative artworks created during the first session (pretest) and final session (posttest) by two independent raters trained in art education and autism interventions, with inter-rater reliability of $\kappa=0.82$.

To systematically measure pre-intervention and post-intervention outcomes, the following assessment instruments were employed:

Assessment Instruments

Participants

The participants were 8 children with autism, aged 5-14 years, currently enrolled in a special education center in Bangkok, Thailand. Participants were selected using purposive sampling based on the following inclusion criteria:

1. Diagnosed as autistic by a physician or specialist according to DSM-5 criteria.
2. Capable of engaging in simple art activities, such as grasping, hammering, or arranging materials.
3. Able to tolerate group settings with adult support.
4. Parental consent obtained for participation.

The sample included 6 males and 2 females, representing the typical gender distribution observed in autism spectrum disorder. Functional abilities varied across the group, with some children demonstrating verbal communication while others relied primarily on nonverbal communication methods. This heterogeneity reflects the natural variation within autism spectrum disorder and enhances the ecological validity of the findings.

Literature Review

1. Art Therapy and Autism Spectrum Disorder

Art therapy has been recognized as an effective intervention for children with autism spectrum disorder, providing alternative pathways for communication and self-expression. Malchiodi (2012) describes art therapy as a mental health profession that uses the creative process of art-making to improve and enhance physical, mental, and emotional well-being. For children with autism, who often struggle with verbal communication, art provides a nonverbal language through which they can express thoughts, feelings, and experiences that may be difficult to articulate in words.

Schweizer et al. (2014) conducted a comprehensive review of clinical case descriptions examining what works in art therapy with children with autism spectrum disorders. Their analysis revealed that art therapy interventions consistently demonstrate positive outcomes across multiple domains, including reduced anxiety, improved emotional regulation, enhanced social interaction, and increased self-esteem. The researchers identified key therapeutic factors including the structured yet flexible nature of art activities, the tangible quality of art products, and the sensory engagement inherent in artistic creation.

2. Nature-Based Interventions for Children with Special Needs

The therapeutic value of nature has been extensively documented in research on environmental psychology and nature-based interventions. Louv (2008) introduced the concept of nature deficit disorder, arguing that reduced contact with nature contributes to behavioral problems, anxiety, and depression in children. For children with autism, nature-based activities offer unique benefits that complement traditional therapeutic approaches.

Blazhenkova and Kumar (2018) investigated the relationship between nature-based activities and cognitive development in children with developmental disabilities. Their research found that exposure to natural environments and engagement with natural materials significantly enhanced attention, reduced stress responses, and improved overall well-being. The researchers suggest that natural settings provide an optimal level of sensory stimulation, which is neither overwhelming nor understimulating, that helps autistic children achieve a state of calm alertness conducive to learning and skill development.

3. Sensory Integration and Creative Activities

Sensory processing differences are a core feature of autism spectrum disorder. Many autistic children experience either hypersensitivity or hyposensitivity to sensory input, affecting their ability to process and respond to environmental stimuli (Baranek et al., 2006). Art activities that incorporate varied sensory experiences can support sensory integration and help children develop more adaptive responses to sensory input.

Natural printmaking through leaf and flower hammering provides a rich multisensory experience. Children engage their tactile sense through touching different plant textures, their proprioceptive sense through the physical action of hammering, their visual sense through observing colors and patterns emerge, and potentially their olfactory sense through the natural scents released during the process. Sangwalpatch et al. (2024) demonstrated that art activities using natural materials can effectively develop creative processes and skill transfer through sensory-rich experiences.

4. Group-Based Interventions and Social Skills Development

Social skills deficits are among the most challenging aspects of autism spectrum disorder. White et al. (2007) emphasize that social difficulties in autism extend beyond simple social interaction to include complex aspects of social cognition, emotional reciprocity, and understanding social contexts. Group-based interventions provide structured opportunities for social learning in supportive environments.

Henley (2001) describes how group art therapy sessions create natural contexts for social skill development. Through shared creative activities, children learn to take turns, share materials, offer help, request assistance, and appreciate others' work. The parallel nature of art-making allows children to work

alongside peers without the pressure of direct interaction, gradually building comfort with social proximity and collaboration.

5. Fine Motor Skills and Hand-Eye Coordination

Motor skill difficulties are common in autism spectrum disorder, with research indicating that approximately 80% of autistic children exhibit some form of motor impairment (Fournier et al., 2010). These motor challenges affect daily functioning, academic performance, and participation in recreational activities. Art activities provide purposeful contexts for developing and practicing motor skills in engaging ways.

The hammering technique used in natural printmaking requires precise hand-eye coordination, bilateral coordination (using both hands together), force modulation, and sustained motor control. These motor demands can be graded—starting with larger, simpler movements and progressing to more refined, controlled actions—making the activity adaptable to individual skill levels. Research by Case-Smith (2013) demonstrates that repetitive practice of motor skills in meaningful, enjoyable activities leads to significant improvements in motor control and coordination.

Related Artists and Nature-Based Art Practices

1. Andy Goldsworthy: Environmental Art and Natural Materials

Goldsworthy's work is relevant to this research in several ways. First, his focus on the tactile and sensory qualities of natural materials resonates with the needs of autistic children, who often respond positively to sensory-rich experiences. His careful attention to color, texture, and pattern in leaves and flowers provides inspiration for how such materials can be explored artistically. Second, Goldsworthy's ephemeral works—which exist temporarily before returning to nature—teach acceptance of impermanence and process over product, a philosophy particularly valuable in therapeutic contexts where the journey matters more than the destination.



Figure 1. Four examples of Andy Goldsworthy's environmental sculptures via <https://anitasagastegui.com/2020/05/12/kindergarten-andy-goldsworthys-environmental-art/>

2. Mel Chin: Ecological Art and Community Collaboration

Mel Chin (b. 1951) is a conceptual artist whose diverse practice includes ecological restoration projects, collaborative community art, and work that addresses environmental and social issues. His project Revival Field (1991-ongoing) pioneered the field of ecological art by using hyperaccumulator plants to extract heavy metals from contaminated soil, demonstrating how art can actively heal damaged environments (Spaid, 2002).

Chin's relevance to this research lies in his emphasis on art as collaborative problem-solving and environmental healing. His approach demonstrates how artistic practice can engage with ecological concerns while fostering community participation and learning. For therapeutic work with autistic children, Chin's model of collaborative, purpose-driven art-making offers a framework for understanding how creative activities can serve multiple functions—artistic expression, environmental awareness, and social engagement—simultaneously.



Figure 2. Mel Chin, 1991-ongoing plants, industrial fencing on a hazardous waste landfill
an ongoing project in conjunction with Dr. Rufus Chaney, senior research agronomist, USDA
via <https://melchin.org/oeuvre/revival-field/>

Both Goldsworthy and Chin demonstrate how working with natural materials can foster deeper connections with the environment, encourage sensory exploration, and create meaningful artistic experiences. Their practices provide artistic and philosophical foundations for understanding how natural printmaking activities can serve therapeutic functions while maintaining artistic integrity and environmental consciousness.

Findings

The findings indicate that nature-based printmaking activities, using leaves and flowers to create imprints on fabric, systematically enhanced the emotional, attentional, creative, and social development of children with autism. Analysis of multiple data sources revealed consistent patterns of improvement across all targeted developmental domains.

1. Enhanced Attention and Concentration

Behavioral observations revealed significant improvements in attention span and task engagement. In early sessions, children's attention typically lasted 5-10 minutes before requiring redirection or breaks. By the final sessions, most participants sustained focused engagement for 30-45 minutes. Video analysis showed progressive increases in time spent examining materials, planning arrangements, and executing hammering techniques carefully. The sensory richness of natural materials—varied colors, textures, and forms—appeared to capture and maintain children's attention more effectively than conventional art materials.

2. Motor Skills and Coordination Improvement

The hammering technique required precise hand-eye coordination and bilateral coordination skills. Initial observations showed children struggling with grip strength, force modulation, and coordinated movements. Several children initially hammered too forcefully, tearing fabric, or too gently, failing to transfer pigments effectively. Over successive sessions, noticeable improvements emerged in motor control. Children developed better grip patterns on hammers, demonstrated smoother striking motions, and showed enhanced ability to modulate force appropriately for different materials.

3. Emotional Expression and Self-Regulation

The children demonstrated increased emotional expression and engagement throughout the intervention. Facial expressions, vocalizations, and body language indicated positive emotional responses to the activities. Smiling, laughing, and expressions of excitement were common, particularly when children successfully created clear prints or discovered interesting color combinations. Several initially hesitant children gradually became more animated and expressive, suggesting growing emotional comfort and confidence.

A notable reduction in repetitive behaviors such as hand flapping, rocking, and self-stimulatory behaviors was observed during active engagement with materials. While these behaviors typically increased during unstructured time or transitions, they decreased significantly when children were absorbed in selecting, arranging, and printing with natural materials. This suggests that the activity provided appropriate sensory input and cognitive engagement that reduced the need for self-regulatory behaviors.

4. Social Interaction and Communication Skills

Group activities promoted significant development in social skills. Children demonstrated progressive improvements in turn-taking, material sharing, and cooperative behaviors. Early sessions required frequent adult intervention to facilitate sharing and manage conflicts over desired materials. By later sessions, children increasingly negotiated material use independently, waited their turns, and offered materials to peers without prompting.

Peer interactions increased in frequency and quality. Children began showing interest in others' work, offering comments, suggestions, and encouragement. Instances of collaborative problem-solving emerged, with children helping peers find materials, demonstrating techniques, and working together to solve challenges. One particularly striking observation involved two children spontaneously deciding to create matching designs, requiring negotiation and coordination to achieve their goal.

5. Creativity and Self-Esteem Development

Analysis of artworks revealed progressive development in creative thinking and artistic decision-making. Early works showed simple, random arrangements of single materials. Middle-phase works demonstrated intentional composition, color selection, and experimentation with overlapping and layering. Final works exhibited sophisticated planning, thematic coherence, and individual artistic voice. Children experimented with creating patterns, mixing colors, and developing personal aesthetic preferences.

Additionally, the hammering process introduced children to the concept of pigment extraction from natural sources. When leaves and flowers were hammered onto fabric, their natural pigments—chlorophyll from leaves, anthocyanins from colorful flowers—were physically transferred and

embedded into the textile fibers. This tangible demonstration of how colors exist within plant materials and can be extracted through mechanical action provided a foundational understanding of natural dyes and pigments. Children discovered that different plants yielded different color intensities: some leaves produced vibrant greens while others created subtle yellow-greens; red flowers transferred bold magentas while purple blooms created softer lavenders. This experiential learning about color theory, pigment properties, and the relationship between natural materials and artistic media enriched the aesthetic dimension of the activity, transforming it from purely therapeutic exercise into genuine artistic education.

The creative process of natural printmaking specifically supported children's understanding of organic shapes (free-form shapes derived from nature) as opposed to geometric shapes. Through selecting and arranging leaves and flowers, children learned to appreciate the irregular, flowing forms found in botanical materials—curved edges, asymmetrical patterns, and natural variations in size and proportion. This exploration of organic shapes enhanced their aesthetic awareness and understanding of form in nature, contributing to their artistic vocabulary beyond the therapeutic benefits.



Figure 3. Images of printmaking activities by autistic children.



Figure 4. Print by an autistic child, 2025,
by an autistic child, natural print technique, 70 × 45 cm.

The process of creating tangible, beautiful artworks that could be displayed and shared contributed significantly to self-esteem development. Children showed visible pride in their creations, eagerly showing them to parents, teachers, and peers. The positive feedback they received reinforced feelings of competence and accomplishment. Several children who initially exhibited low self-confidence and avoided new challenges became noticeably more willing to take risks and try new approaches, suggesting enhanced self-efficacy.

Conclusions and Discussion

This research focused on studying and developing nature-based printmaking art activities for children with autism by hammering leaves and flowers onto fabric in a group setting. The comprehensive findings demonstrate that this intervention effectively addresses multiple developmental domains simultaneously, offering a holistic approach to therapeutic support for autistic children.

The research also highlights the value of integrating environmental awareness into therapeutic practices. By working with natural materials, children develop appreciation for nature's beauty, learn about plant diversity, and cultivate ecological consciousness. This environmental dimension adds meaningful context to the activity, connecting therapeutic work to broader educational goals of environmental literacy and sustainability. As contemporary society faces significant environmental challenges, fostering children's connection to nature serves both individual development and collective well-being.

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