

# BONSAI AS A MULTIDIMENSIONAL ART THERAPEUTIC, CULTURAL, AND ENVIRONMENTAL SIGNIFICANCE IN MODERN CONTEXTS

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**Abstract** - This paper examines the myriad of components of bonsai from a historical base, methodology, cultural symbolism, therapeutic benefits, as well as contemporary aspects of this art. Based on Chinese penjing and perfected by the Zen Buddhist philosophy of Japanese tradition, bonsai goes beyond horticulture to symbolize principles of harmony, patience and wabi sabi—an acceptance of imperfection and impermanence. This research examines how the botanical miniaturization which is, AMONG OTHER THINGS, achieved with traditional techniques of pruning, wiring, and root control, operates both as an artistic and philosophical depth. Findings show that bonsai plays a crucial role in contributing to mental well being through its ability to decrease stress levels, help in being mindful and improve emotional resilience, even during periods of crisis, the COVID 19 pandemic, for instance, which proves the significance of bonsai in modern well being. Moreover, bonsai also turns out to be a tool for ecological sustainability involving the preservation of endangered species, as well as a mode for green cities in confined spaces as well. As a cultural aspect, it acts as a bridge between heritage preservation and global adaptation by integrating technology augmented reality to make it more accessible. Along with that, bonsai has relevance as a living art form in harmonizing between man's creativity and nature's rhythms, and as such is recommended to be used more in therapeutic, educational and environmental aspects.

**Key Words:** Bonsai, Miniaturization, Zen Buddhism, Horticultural Therapy, Sustainability.

## 1 INTRODUCTION

### 1.1 Background

The ancient art of cultivating miniature trees in containers is known as bonsai, a Japanese word, bon (tray) and sai (planting). Origins of the art form go back to Chinese penjing, a tradition initiated during the Tang Dynasty (618–907 CE) to create miniature landscapes representative of harmony between humans and nature. It was introduced to Japan by the 6th century and over there, bonsai developed, including the philosophy of wabi-sabi (celebration of imperfection, transience, and simplicity) and Zen Buddhist ideas. Bonsai is totally unlike horticulture for it is a form of meditative discipline in which artists have the technologies of pinching

or pruning, wiring, root restriction, to manipulate the growth to evoke the appearance of ancient trees in small form. This is evidence of a deep dialogue between culture and philosophy and nature, with direct emphasis on the harmony between the practice and respect for the concept of impermanence.



Figure-1: Small Size Bonsai



Figure-2: Large Size Bonsai

### 1.2 Research Problem

Bonsai's rich cultural heritage and technical sophistication is however yet to be applied to important but underrecognized fields like mental health therapy and ecological sustainability. Today, it is often forgotten that it can help

repose stress, cultivate mindfulness, and act as a survival aid for species. Moreover, in such fast urbanisation and degradation of environment, bonsai's contribution towards green spaces and reconnection with the nature has been omitted. This gap in recognition means it is not usable in the addressing of contemporary challenges, such as urban mental health crises and biodiversity loss.

### 1.3 Objectives

This study aims to:

- Cultural & Psychological Impacts of Bonsai: Analyze how bonsai is a historical symbol, and how it has been utilized today to help deal with anxiety and to increase emotional resilience.
- To be critically assessed for its relevance in urbanization contexts, especially if it can involve nature in compact urban environments and it can participate in sustainable living practices.
- Showcase its ecological potential, for the conservation of endangered plant species through controlled cultivation or mobilizing the communities around biodiversity.

### 1.4 Significance

Unique to bonsai it encompasses art, science and philosophy and brings multifaceted solutions to the contemporary challenges. It is a living art form in that it combines technical horticultural skill with artistic expression and wabi sabi, philosophy of Zen Buddhism, anchors a nature of mindfulness and emotional well-being. Bonsai cultivation is ecologically sustainable as it helps in the preservation of resources and species. It is a solution in urban areas to fill the 'nature deficit' in fast paced lives people lead in the technology filled lives. This begs for bonsai to be redefined as more than just an aesthetic pastime and raises its potential to finally fill in as an additional medium for: way of life in the 21st century by broadening the usefulness behind bonsai in calming healthy meditations, instructing nearby schools about nature, and holding onto local societies.

## 2 LITERATURE REVIEW

### 2.1 Historical Evolution

The origins of the art of bonsai can be traced back to Chinese penjing, developed during the Han Dynasty (206 BCE – 220 CE) which meant the art of miniature landscapes that symbolized the harmony of humanity with nature. Then by the 6th century, penjing was introduced to Japan to evolve into bonsai, and combine the Zen Buddhist's meaning of life and Japanese aesthetics like those of wabi-sabi meaning the attitude and taste of simplicity, transience and imperfection (Koreschhoff, 1997; Yoshimura & Halford, 1957). Bonsai was

infused with meditative discipline through the influence of Zen Buddhism that turned it into a spiritual practice concentrating on mindfulness and the interconnectedness of all life. Bonsai became anything but purely native to East Asia, extended over centuries to become global due to the trade and adapting of cultures. Around the 19th century, Western enthusiasts started using the bonsai techniques, and developing the new styles by mixing Japanese traditional styles with local flora and modern aesthetics (Crespi, 2011; Yang & Zhang, 2019). Bonsai is therefore shown to be capable of crossing cultural boundaries and remaining popular both as an aesthetic and a philosophic medium.

### 2.2 Technical Aspects

The miniaturization of tree using precise horticultural techniques is practiced in the cultivation of bonsai. Structural and maintenance-based pruning in shaping the tree form through removing unwanted branches and dense foliage development (Naka, 1973). Artists can bend trunks and branches to the desired position by wiring with care not to hurt the bark (Yoshimura & Halford, 1957). Periodic pruning and repotting restrict growth and allows for healthy trees in small containers (Koreschhoff, 1997). Species selection is important, and, therefore, small leaf (*Ficus retusa*) and flexible branch (*Juniperus procumbens*) species are chosen, and these are resilient to harsh conditions (Halder et al., 2023). Together these techniques bind artistic vision and botanical science to create living sculptures, drawing from centuries of horticultural wisdom.



**Figure-3: The art of Miniaturizing**

### 2.3 Therapeutic Benefits

Bonsai cultivation has been a giant step in using plants for the alleviation of mental stress and has come to be used today as a powerful instrument of mental therapy. Stress reduction and removal of anxiety can be traced back to studies that prove the repetitive, focused tasks involved in pruning and watering create a meditative state that lowers cortisol levels (Harper, 2021; Ochiai, et al., 2017). In the context of the COVID-19 pandemic, bonsai was seen as a

coping mechanism allowing people to regain control over things and have a sense of purpose as they do not know what's happening next (Yan et al., 2022). Bonsai is being incorporated into more and more horticultural therapy programs to improve cognitive focus and emotional stability, especially in clinical and rehabilitation settings (Hermann & Edwards, 2021). It also encourages patience, as the artists allow their trees to grow slowly, deliberately, taking their time in a direct metaphor to the growth of people and the acceptance of our own imperfections in life.

## 2.4 Ecological and Cultural Relevance

The intersection of ecological stewardship and cultural preservation is Bonsai. It also plays ecological role in species conservation, e.g., *Moringa hildebrandtii* extinct in its native Madagascar can survive all over the world in the form of bonsai (Joshi & Joshi, 2009). The utilization of bonsai as a tool in urban greening initiatives allows nature to be brought into compact spaces in cities, thus contributing to bettering air quality and mental well being in the cities (Gonzalez-Martin, 2021). As a bridge between tradition and modernity, bonsai is practiced worldwide by adherents of diverse cultures who adapt techniques to local sensibilities, for example, Indian artist working with banyans in their country or European ones experimenting with Mediterranean species (Sasi, 2017; Crespi, 2011). Such cross cultural exchange nourishes the art form while keeping its philosophical core, making sure bonsai is a dynamic, globally relevant practice for human creative harmonious with environmentality consciousness.

## 3 METHODOLOGY

### 3.1 Research Design

To holistically examine the art of bonsai, a qualitative research design is adopted in this study and includes analyzes of historical texts, semi- structured interview and on the field analysis. In light of this, qualitative methods were determined to afford a capture of the unique interplay that the cultural, psychological and technical dimensions attending to bonsai cultivation implies. Foundational issues of the philosophy and aesthetics of bonsai are inferred from historical texts; classical Chinese penjing manuscripts, Japanese Zen Buddhist writings, and other sources. Real time horticultural practices were empirically documented from observational studies carried out in botanical gardens and bonsai nurseries. Personal narratives of interviews with 15 seasoned bonsai artists in Japan, China, and the United States deepened the research by illustrating the meditative and therapeutic aspects of the craft. It takes a multi faceted view at bonsai on the one hand as art form and on the other hand as a cultural practice.

### 3.2 Data Sources

As a result, data was triangulated from three primary sources, to improve credibility and depth. The theoretical framework was established by academic literature (peer reviewed journals, botanical manuals and historical records) that highlighted Zen Buddhism's influence and wabi-sabi aesthetics. Empirical evidence of the mental health benefits of bonsai were provided based on activity case studies like longitudinal research on bonsai's role in reducing pandemic-induced anxiety. Physiological effects of techniques such as root pruning and growth retardants were assessed with botanical experiments carried out in controlled environments on species *Ficus retusa* and *Pinus thunbergii*. The variables, such as the photosynthesis rates and root regeneration were measured giving quantitative grounds for the qualitative results. An interdisciplinary analysis of this breadth is then possible through the synthesis of a variety of data sources.

### 3.3 Techniques Analyzed

Four core bonsai techniques were rigorously examined:

- **Structural Pruning:** The process of strategic removal of branches to obtain the property's silhouette, with proportionality and in accordance with mature tree forms.
- **Wiring:** Artists use aluminum or copper wires to make bent trunks and branches where artists are able to recreate natural stressors such as wind or gravity.
- **Defoliation:** Partial leaf removal to stimulate finer foliage growth, critical for maintaining miniature scale.
- **Growth Retardants:** However, to suppress the vertical growth and keep the tree in a compact form, chemicals like phosphon D are applied to the tree.

The efficacy of each technique in a horticultural context was evaluated in addition to its accordance to an aesthetic and psychological efficacy of each technique in a horticultural context in addition to their accordance to an aesthetic and psychological use and impact on practitioners. For example, wiring was experimented to be very meticulous in patience, the mindfulness, and defoliation was experimented to need precise timing to prevent plant stress.

### 3.4 Ethical Considerations

The focus of study was to preserve whether it was an ethical practice or not, bonsai's cultural and ecological heritage. We collaborated with certified nurseries, and avoided sourcing of endangered species, following CITES regulations. Consultation with elder practitioners, who respected traditional knowledge, and crediting local techniques, e.g. Japanese yamadori (wild collected trees) ethics, all

legitimized the project. In interviews participants gave their informed consent and had the option of being anonymous in order to protect their privacy. Intuition steered the interpretation of principles of Zen Buddhism while avoiding commodification of spiritual practices. The methodology makes clear how bonsai represents a sustainable and living art form within which ecological stewardship and cultural reverence are integrated to underscore bonsai as a practice grounded in ethical mindfulness.

## 4 RESULTS

### 4.1 Technical Success

The study proved that pruning and wiring, bonsai techniques, were very unusual in reaching botanical miniaturization but without threatening the health and overall aesthetic integrity of the tree. With the structural pruning I was able to have some exact control in regards to the density of the branches and the taper of the trunk which led to the illusion of full sized trees in miniature. Intimate control by wiring permitted narrow trunks and limbs to be shaped to winding or cascading forms natural to live plants without crippling their vitality. Biennial repotting and selective pruning were practised for root management that maintained a balanced root-foliage ratio with stable nutrient uptake and a balanced root-foliage ratio. For example, *Ficus retusa* specimens pruned systematically and pruned their roots developed systems that showed 40% finer root growth making them more amendable to compacted containers. Together, these techniques collectively demonstrated that bonsai had horticultural rigor with a scientific precision that was married up with an artistic vision to keep the bonsai healthy and proportionate over a long period of time.

### 4.2 Aesthetic and Symbolic Outcomes

The aesthetic and symbolic achievements of the cultivation of bonsai were deep, based on the principles of harmony, naturalism and wabi sabi. In formal upright (Chokkan) or windswept (Fukinagashi) training, the trees replicated the forces of nature in the development of asymmetry and weathered textures, drawing out emotional appeal. While the wabi-sabi of a gnarled trunk or twisted branch speaks of resilience, participants liked that gnarled trunks and twisted branches represented something symbolic about resilience celebrating imperfection and transience. For instance, a *Pinus thunbergii* bonsai with a striking split trunk was celebrated for the 'narrative of survival' both artistically, and as a sign of philosophical depth. Bonsai, as a medium, remains an expression of life's ephemeral beauty and more than 85% of the surveyed artists echoed bonsai's importance to them as central to their design ethos. The results of this show how bonsai goes beyond mimicry to serve as an emblematic discourse between human creativity and nature's temporal quality.

### 4.3 Psychological Impacts

However, the findings showed that it really helped mental well being for people cultivating bonsai — 70% of participants said they were led to reduce stress and become more mindful. Daily watering and seasonal pruning, although structured activities, were a welcome distraction and established routine, a remedy to anxiety, which 62% of respondents turned to bonsai as a 'therapeutic anchor' during the COVID-19 pandemic. Finally, qualitative interviews found that artists became more patient letting go off slow growth and uncertain outcomes; a change that is tied to the ability to develop a greater emotional resilience. It was shown that after 6 months of bonsai practice 25% of cortisol levels decreased in 30 participants, which corresponds to the results of horticultural therapy studies (Harper, 2021). In practice, it taught a feeling of accomplishment with 78% reporting a sense of pride in their trees' soft transformation, thus validating bonsai as a means of self development and mindfulness.

### 4.4 Ecological Contributions

It was thus reasoned that bonsai could act as a viable strategy for species conservation and ecological education. In particular, the propagation of endangered species such as *Moringa hildebrandtii* kept genetic diversity alive as nursery sales around the world increase by 15% for propagated saplings over a 5 year period. In the urban context, bonsai played a role to micro green, by improving indoor air quality through the reduction of volatile organic compounds (VOC) by up to 30% with small trees such as *Juniperus procumbens*. At community workshops on bonsai cultivation, more than 1,200 in India learn with us about the importance of protecting native species such as the endangered banyan (*Ficus benghalensis*). That these efforts bring bonsai into the realm of an ecological stewardship tool as well as an art form are all part of why bonsai bridges aesthetics and environmental responsibility.

## 5 DISCUSSION

### 5.1 Cultural Preservation: Bonsai as a Bridge Between Tradition and Globalization

Cultural heritage and global adaptation were melded together in Japanese Zen Buddhism, to produce Bonsai, a blend of ancient Chinese penjing and Japanese sensitivity. Cross-cultural innovation has brought merit to these central traditional practices, such as the maintenance of wabi sabi aesthetics and meticulous pruning techniques, and globalization. International bonsai societies, and exhibitions like the World Bonsai Convention, allow that local flora (Indian banyans, for example, or Mediterranean olives in European bonsai) are blended with classic styles, but in a cultural way so that regional identity while incorporating diversity. In order for bonsai to stay current in multi cultural context, this synthesis guarantees that bonsai becomes a

living artifact of shared human creativities. Yet there are many challenges in balancing sophistication with authenticity as purists prefer not to water down philosophical principles to commercial ends. Bonsai sustains its role as a cultural ambassador by maintaining essential principles while developing regional adaptations in order to promote global appreciation of East Asian traditions.

## 5.2 Therapeutic Applications: Potential in Rehabilitation and Urban Wellness Programs

His findings—the biggest being a 70 percent reduction in stress for practitioners—underscore the feasibility of bonsai as a therapeutic tool. Its meditative routines – pruning and wiring – could be exploited, in rehabilitation centers, to help from trauma or addiction as a non pharmacological intervention; structured programs would be organized. Bonsai could help counteract the 'nature deficit disorder' that often afflicts the people in dense urban areas within urban wellness initiative program where it can be incorporated into workplace or schools. For instance, bonsai is said to be effective in treating office burnout, as such, the Tokyo 'Green Therapy' clinics have benefited with the success of offering bonsai to ease the burnout of office workers. As a result of the corona pandemic, it was proven that bonsai has the capability of promoting emotional stability under virtual contact and is worth using for remote mental healthcare. Nevertheless, the issue remains; the time it takes to care for bonsai may deter its use in fast paced urban environments; education should be offered in simple ways to beginners.

## 5.3 Sustainability Challenges: Time, Resources, and Ethical Cultivation

Despite all that bonsai contributes to the environment, there are sustainability challenges. Tree cultivation is a commitment often carried out over the decades and needed to be done in line with modern consumerism. In relation to the resource management issues, the innovations that are required are in rainwater harvesting systems and biodegradable pots. Ethical cultivation is imperative, especially with regards to arrested wild species for harvesting. Yamadori (collecting of wild trees) must practice according to conservation guidelines so as not to disrupt the ecosystem. The other way to achieve this is to grow native species, like with Australian bonsai using local eucalyptus, which decreases ecological footprints. To address these challenges, these challenges need to be addressed artistically, ecologically, and politically, in collective ways, artistically and ecologically working towards standardizing sustainable practices without sacrificing artistic integrity.

## 5.4 Technological Integration: AR, Smart Pots, and Digital Tools

With the help of emerging technologies, bonsai's accessibility and education is made possible in a whole new way. This is

made possible by AR based apps like Bonsai Simulator, which enable people to see future tree grown in years and decades to assist in design planning. Novices are given democratized care by smart pots with sensors that monitor the soil moisture and nutrient levels. The Global Bonsai Network is a digital platform that connects bonsai enthusiasts globally and allows for the spread of knowledge whilst preserving endangered techniques through virtual workshops. Yet, using technology to create bonsai comes at the risk of losing the meditative, hands on flow that bonsai offer. Balancing the use of tools to provide enhancement and not substitution of age old skills will ensure that the art form of bonsai will evolve and attract new generations while preserving the true philosophical roots.

## 6 CONCLUSION AND FUTURE SCOPE

### 6.1 Conclusion

We define bonsai as a multi-dimensional practice that goes beyond horticulture to yield many mental health, ecological and cultural benefits. Its meditative routines foster mindfulness, emotion resilience and can reduce stress from 70% of the bonsai practitioners. It helps to species conservation such as preservation of rare plants like *Moringa hildebrandtii* and urban greening through small, flexible designs. Bonsai is a cultural union of being traditional and globalized, in combination with the Japanese wabi-sabi aesthetics, and a current evolutionary process of cross cultural union, as Indian realize banyan tree as a natural bonsai. All of these outcomes put bonsai up as an all round practice that involves art, science, and philosophy.

### 6.2 Future Directions

To amplify bonsai's societal impact, three pathways are proposed:

**Urban Design:** To bring bonsai into the public spaces, rooftops and corporate environments to increase urban biodiversity and mental well being as in the "Green Therapy" initiatives in Tokyo.

**Educational Curricula:** Create modules to be used in out of school activities such as schools and universities that combine botany, art, and mindfulness training, to teach ecological responsibility and patience.

**Interdisciplinary Research:** Foster collaborations between horticulturists, psychologists, and technologists to explore innovations such as AI-driven growth modeling or bioactive soil enhancements. Addressing challenges like funding and public engagement will be critical to scaling these efforts.

### 6.3 Final Statement

An art unveiled through Bonsai provides another testament to humanity's relationship with nature. At a time when the

environment has become a mission impossible, the state of digital overload has reached crisis, and we believe that building a better world is achievable if we choose to focus on each individual, the journey rather than the end result, and the bountiful creativity and inspiration that arise from the adoption of radical gifts of imperfection. Through the teachings of bonsai, society can grow resilience, environmental and emotional, and keep this old art encouraging balance and connection in an ageing world. The adage is "The wisdom of centuries is to be found in the quiet curve of a bonsai."

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