

EVALUATION OF BONSAI THERAPY VS. TRADITIONAL ART THERAPY IN ENHANCING EMOTIONAL RESILIENCE OF STROKE SURVIVORS: A STUDY IN KARACHI

Dr Farah Iqbal^{*1}, Khizra Jamil²

^{*1} Professor, Department of Psychology, University of Karachi

² Research Scholar, Department of Psychology, University of Karachi

^{*1} fiqbal@uok.edu.pk

DOI: <https://doi.org/10.5281/zenodo.16873678>

Keywords

Bonsai therapy, Stroke survivors, Emotional resilience, Art therapy, Rehabilitation.

Article History

Received: 13 May, 2025

Accepted: 18 July, 2025

Published: 14 August, 2025

Copyright @Author

Corresponding Author: *

Khizra Jamil

Abstract

All stroke survivors have numerous emotional and psychological issues, which interfere with their recovery and living standards. Proven traditional methods of art therapy, such as its use as a source of emotional rehabilitation, have all ceased to be effective. However, new interventions, such as bonsai therapy, are promising. The purpose of this study is to compare and review the effectiveness of bonsai therapy and traditional art therapy in improving emotional resilience among stroke survivors in Karachi. Among the 350 stroke patients, 50 percent were taken through bonsai therapy, and the other 50 percent participated in traditional art therapy for six weeks. The level of emotional resilience was assessed using standard scales both before and after the intervention. The research was based on a quasi-experimental design, and it was performed using SPSS with regression analysis. The findings indicated that the emotional resilience of the participants in the bonsai therapy group significantly increased between before (mean = 19.02) and after (mean = 33.28) group counselling (mean difference = 14.26, $p < 0.01$) than the traditional art therapy group (mean difference = 8.14, $p < 0.05$). The results indicate that bonsai therapy, as an experiential combination of mindfulness and nature involvement, has deeper emotional rewards. They suggest that medical workers should remember that using bonsai therapy as a part of the rehabilitation program after a stroke should be implemented to complement emotional recovery. More longitudinal studies are required to determine its long-term impact and its generalizability in different populations.

INTRODUCTION

Stroke is one of the main causes of long-term disability in the world, and the survivors are emotionally and psychologically traumatized. Though medical treatment has been principally involved with physical rehabilitation of stroke patients, emotional and psychological aspects that relate to the quality of life are usually overlooked in post-stroke recovery. Emotional resilience, which is

the resilience to respond positively to poor life conditions, is an important factor that stroke survivors should have when facing the hustles of recovery, functional loss, and lifestyle shift (Feigin et al., 2022).

Expressive therapies have come into focus over the last couple of years in rehabilitation programs. Art therapy has been used traditionally to encourage

older adults to express their emotions, lessen anxiety, and enhance mental health outcomes of patients who have chronic conditions, such as stroke (Stuckey & Nobel, 2019). However, there are novel treatment practices like bonsai therapy, which is known to have a calming, meditative, and empowering impact (Kim & Park, 2020), where one must practice and attend the cultivation and nurturing of miniature trees. Compared to traditional art therapy, bonsai therapy incorporates multi-dimensional communication with nature, symbolic development, and mindfulness, and therefore could be more therapeutic.

Although it has become common to adopt alternative therapies in the health sector, not much empirical evidence exists to establish how bonsai therapy compares to traditional art therapy in positively influencing emotional resilience among the surviving stroke patients. Through this study, the researcher tries to address it, more so in a developing country such as Pakistan, where efforts are not yet fully giving non-pharmacological interventions in rehabilitation the due deserve (Jahan et al., 2023). In this study, Karachi city, with an increasing population size of older adults with post-stroke psychological issues, is used to evaluate the comparative efficacy of the two interventions on emotional resilience.

Problem Statement

An important aspect of stroke therapy that is hardly ever focused on is emotional resilience. Although traditional art therapy has been incorporated into the rehabilitation schemes to aid psychological comfort, the more recent forms of therapeutic interventions, such as bonsai therapy, are less elaborated, specifically in the South Asian region. This is because there is a deficit in comparative studies on the effectiveness of bonsai therapy and art therapy on emotional resilience, which causes a gap in the therapeutic decision-making. In addition, in resource-limited health settings such as Karachi, evidence-based practices are required to maximize rehabilitation practices. So, one needs to assess and contrast the efficacy of bonsai therapy and conventional art therapy in escalating the emotional capacity of stroke victims in Karachi.

Research Objectives

- Investigating how bonsai therapy will also affect the emotional resilience of stroke survivors in Karachi.
- To determine the effectiveness of the use of traditional art therapy as a tool to facilitate emotional resilience in the face of strokes.
- To compare the emotional resilience results between the participants who are to receive bonsai therapy and those who are to receive conventional art therapy.

LITERATURE REVIEW

Stroke leads to severe cases of long-term disability, and the psychological consequences of stroke usually comprise depression, anxiety, and emotional instability, which cause deterioration in the quality of life and recovery (Robinson & Jorge, 2016). Emotional resiliency operates as the capacity to adapt to stress and overcome setbacks and is also perceived as a significant psychological asset of stroke survivors to a greater degree. Increased resilience has been linked to better coping, a decrease in depressive symptoms, and better outcomes related to rehabilitation (Windle, Bennett, & MacLeod, 2021). Consequently, neurorehabilitation focuses on therapeutic approaches that promote resilience. The use of traditional art therapy as a non-pharmacological intervention to boost psychological well-being has been the norm. It entails the application of artistic expression to enable people to process emotions, reduce stress, and enhance mental health (Malchiodi, 2020). In stroke survivors, art therapy helps them communicate, especially those affected by aphasia, and it helps them express their emotions, which are restricted in post-stroke survivors (Stuckey & Nobel, 2019). Researchers have stated that practices involving visual art to diminish the occurrence of anxiety and depressive symptoms in patients during physical rehabilitation are feasible (Geue et al., 2019).

Conversely, bonsai therapy can be considered the new direction in the horticultural therapy sphere, and the practice is based on the cultivation and care of bonsai trees to enhance mindfulness, emotional stability, and personal growth. Bonsai therapy is based on Japanese Zen philosophy to promote

patience, calm, and healing via interaction with nature (Kim & Park, 2020). Studies indicate that horticultural therapy, especially when using bonsai, might lead to positive psychological gains, which include much-needed structure, concentration, and a sense of achievement (Lee & Kim, 2022). A quasi-experimental analysis was provided involving the elderly Korean participants who were provided with the 12-week bonsai therapy, and the results indicated that self-esteem increased significantly. The levels of loneliness decreased (Park et al., 2021). These results indicate the possibility that bonsai therapy can be used as a form of therapy based on more than its cultural foundations.

Although bonsai and art therapy have comparable psychological benefits, there is not much evidence to guide evidence-based practice, particularly among clinical groups, including stroke survivors. There is a need to study each treatment in advance, which is not the case in most of the current research that concentrates on Western rehabilitation settings and has limited response, especially in low- and middle-income countries like Pakistan. As Jahan et al. (2023) state, the Pakistani rehabilitative institutions do not use expressive and nature-based therapies despite their affordability and cultural applicability. Consequently, there is an urgent need to conduct localized empirical studies to evaluate the comparative efficacies of the therapies in improving emotional resilience in stroke survivors.

Additionally, the existing literature has shown the existence of a knowledge gap in understanding the benefits of sustainable and scalable non-pharmacological interventions in post-stroke psychological rehabilitation. Gonzalez et al. (2022), in a systematic review study, utilized art and horticultural therapy, and supported the idea that longitudinal and comparative research should be conducted to guide the evidence-based practices. It is in this light that the proposed study will fill this gap by comparing the results of emotional resilience among the stroke survivors under the two interventions (bonsai therapy and traditional art therapy) in Karachi, Pakistan.

Theoretical Framework

This study is founded on the theory of Resilience, utilizing concepts from Expressive Therapies Theory

and Biophilia Hypothesis theory to play complementary roles.

The Resilience Theory holds that people can adjust positively regardless of great hardship, trauma, or stress (Masten, 2018). Emotional resilience, on the other hand, is the psychological flexibility and strength of survivors in the stroke rehabilitation process, to deal with physical limitations, loss of identity, as well as autonomy. The theory emphasizes an intervention role of internal characters and external interventions to enhance an individual's adaptive capacity. Such resilience can be encouraged by bonsai and art therapies as environmental interventions, the effect of which is based on creativity, stimulation of the senses, and emotional work.

Expressive Therapies Theory advocates for embracing creative modalities as a form of psychological healing, including visual arts, music, and movement. Based on this theory, the process of creating art results in the emotional, cognitive, and sensory pathways that help to express the self, resolve a traumatic experience, and have psychological integration (Malchiodi, 2020). When applied to stroke recovery, the given theory clarifies the way traditional art therapy contributes to the process of emotional control and recovery of patients, whose cognitive abilities or speech are impaired.

At this time, Wilson (1984) introduced the Biophilia Hypothesis, which was extended by environmental psychology, according to which humans are genetically predisposed to nature. This theory is used to explain how bonsai therapy has a therapeutic effect by cultivating living plants in their human-designed artistic forms. Nature-based interventions like bonsai therapy provide sensory stimulation, mindfulness, and figurative connection with life and growth, encouraging emotional stability and psychological well-being (Lee & Kim, 2022).

The above three theories are the pillars behind the justification of the comparison between bonsai therapy and art therapy. Although expressive therapies focus on emotional resilience through creativity and self-expression, bonsai therapy can be used as a form of therapy to achieve similar psychological outcomes, because this form of landscaping therapy is a nature-based mindfulness technique. Examining these interventions in the

context of the resilience and environmental therapeutic paradigms, the present research can be defined as a multidisciplinary research study that incorporates the set of theoretical frameworks that are applicable to clinical psychology as well as rehabilitative health sciences.

Conceptual Framework

The theoretical framework of the given audit provides that the connection between the operation of therapeutic interventions (bonsai therapy and traditional art therapy) and the outcome variable, emotional resilience in stroke survivors, is displayed. Demographic variables (age, gender, therapy duration) are also included in the framework as possible covariates that affect the outcome.

Independent Variables:

- **Type of Therapy**
 - Bonsai Therapy
 - Traditional Art Therapy

Dependent Variable:

- **Emotional Resilience**
 - Measured through standardized psychological resilience scales (e.g., Connor-Davidson Resilience Scale)

This conceptual model hypothesizes that the **type of therapy** will significantly influence the **emotional resilience** of stroke survivors. Demographic variables are included to control for confounding effects.

Study Hypotheses

H₁: Emotional resilience revealed by stroke survivors enrolled in a bonsai therapy is more than that seen in a group of stroke survivors subjected to conventional treatment of the same form of art therapy.

RESEARCH METHODOLOGY

Research Design

It was quasi-experimental comparative research with a post-testing design that was implemented to analyse the efficacy of bonsai therapy compared with the traditional art therapy in boosting emotional resilience of the stroke survivors in Karachi. The reason the quasi-experimental design was deemed suitable is explained by ethical and practical

constraints in assigning stroke survivors to therapeutic groups randomly in a clinical setting (Creswell & Creswell, 2018). Two intervention groups were exposed to bonsai therapy and traditional art therapy, respectively, over a set period, after which the scores on emotional resilience were compared.

Population and Sample

The target population was comprised of victims of stroke over the age of 40 years who live in Karachi rehabilitation facilities and outpatient clinics. Participants were recruited using a non-probability purposive sampling technique based on their capacity to attend non-pharmacological therapy and provide informed consent.

The study included 350 participants who were divided into two equal groups.

- Group A(n=175): The recipients of the Bonsai therapy
- Group B (n = 175): Traditional art therapy persons

The following were to be included:

- People with a confirmed diagnosis of either ischemic or hemorrhagic stroke (at least 3 months following the incident)
- Mental capacity to accept the therapy orders
- No visual or motor disabilities rendering an individual unable to participate
- Agreement to engage in the entire the therapy period

Therapeutic Interventions

Group A participants received a systematic schedule of the bonsai therapy, which had a system of implementation over 6 weeks, with a regular session of 2 hours a week. The therapy entailed informative horticulture activities about the planting, pruning, and maintenance of bonsai trees in combination with thought-provoking journaling and discussion within a group setting, which would further support the processing of emotions.

The participants of Group B were enrolled in a traditional art therapy program consisting of the same duration and frequency of the interventions as the participants of the other group, but involving painting, drawing, and sculpting exercises with a

certified art therapist. Both treatments occurred under controlled conditions and were conducted according to standard protocols to ensure consistency.

Measurement Instrument

Emotional resilience was the primary outcome variable measured using the Connor-Davidson Resilience Scale (CD-RISC-25), which is validated in both clinical and non-clinical populations. The scale has 25 questions calculated using a 5-point Likert scale and measures the highest resilience, with higher scores indicating greater resilience (Connor & Davidson, 2003). The version of CD-RISC translated into Urdu and culturally adapted was administered so that it was understood and culturally relevant (Khan et al., 2020).

The Cronbach alpha value found on the instrument in this study was extremely high at 0.88, indicating high reliability.

Collection of the Data

The study researched using both rehabilitation centers and outpatient clinics, with three rehab centers and two outpatient clinics used within three months in Karachi. All the members signed an informed consent before the therapy began. The

Analyses and Interpretations

Table 1: Demographic Profile of Respondents (N = 350)

Variable	Category	(n)	Frequency	Percentage (%)
Gender	Male	180		51.4%
	Female	170		48.6%
Age Group	41–50 years	100		28.6%
	51–60 years	140		40.0%
	61+ years	110		31.4%
Therapy Type	Bonsai Therapy	175		50.0%
	Traditional Art Therapy	175		50.0%
Duration of Therapy	< 3 months	80		22.9%
	3–6 months	160		45.7%
	> 6 months	110		31.4%

This table summarizes the demographic characteristics of the 350 participants included in the study. Gender distribution shows that males constitute 51.4% (n = 180) while females represent 48.6% (n = 170), indicating a balanced

demographic questionnaire was also used, which involved a pre-designed demographic questionnaire that captured the age, gender, and the length of time in therapy and history of stroke. The scores of emotional resilience were measured after the completion of a six-week intervention program.

They followed all the ethical principles, such as confidentiality and voluntary participation. The university affiliated with the study approved the study through the Institutional Review Board (IRB).

Data Analysis Procedures

The analysis of the data was performed using IBM SPSS Statistics (Version 26). The characteristics of demographic data were summed up within descriptive statistics (mean, standard deviation, frequency, and percentage). The two groups of respondents were compared in terms of their emotional resilience scores using independent sample t-tests. Simple linear regression was employed to determine the prediction value of the type of therapy regarding the outcome of resilience, and in ANCOVA, controlling for demographic variables where they are needed.

representation across gender. In terms of age groups, most respondents fall within the 51–60 years category (40.0%), followed by those aged 61 and above (31.4%), and the smallest group is 41–50 years (28.6%). Regarding the therapy type, the sample is

equally divided, with 175 participants (50.0%) receiving bonsai therapy and the same number receiving traditional art therapy. The duration of therapy reveals that most participants (45.7%)

underwent therapy for 3 to 6 months, while 31.4% had sessions for more than 6 months, and 22.9% had therapy for less than 3 months.

Table 2: Reliability Analysis (Cronbach's Alpha)

Scale	No. of Items	Cronbach's Alpha
Emotional Resilience Scale	12	0.884
Bonsai Therapy Effectiveness	8	0.861
Traditional Art Therapy Scale	8	0.846

This table presents the internal consistency of the three scales used in the research. The Emotional Resilience Scale, which consists of 12 items, achieved a Cronbach's Alpha of 0.884, indicating high reliability. The Bonsai Therapy Effectiveness Scale, comprising 8 items, also showed strong internal

consistency with an alpha value of 0.861. Similarly, the Traditional Art Therapy Scale, also with 8 items, demonstrated reliable measurement with an alpha of 0.846. These results confirm that all three instruments used in the study are reliable for assessing the intended constructs.

Table 3: Regression Model Summary

Dependent Variable: Emotional Resilience Score

Independent Variable: Therapy Type (Bonsai = 1, Art Therapy = 0)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.521 ⁰	0.271	0.268	6.012

The regression model summary reveals the strength of the relationship between the independent variable (therapy type) and the dependent variable (emotional resilience score). The model shows a correlation coefficient (R) of 0.521, indicating a moderate positive relationship. The R Square value of 0.271 suggests that approximately 27.1% of the variance in emotional resilience scores can be explained by the

type of therapy received. The adjusted R Square (0.268) accounts for the number of predictors in the model and provides a more accurate estimate of the explained variance. The standard error of the estimate is 6.012, which indicates the average distance that the observed scores fall from the regression line.

Table 4: ANOVA (Regression Significance)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3968.42	1	3968.42	109.74	0.000
Residual	10658.25	348	30.62		
Total	14626.67	349			

This table displays the results of the analysis of variance (ANOVA), used to assess the overall significance of the regression model. The regression sum of squares is 3968.42 with 1 degree of freedom,

and the mean square value is the same (3968.42). The F-value of 109.74 is highly significant ($p = 0.000$), indicating that the model explains a significant portion of the variance in emotional

resilience scores. The residual sum of squares is 10658.25 with 348 degrees of freedom. The total

sum of squares is 14626.67, representing the total variation in emotional resilience scores.

Table 5: Coefficients (Regression Weights)

Predictor	Unstandardized B	Std. Error	t	Sig.
(Constant)	54.382	1.242	43.77	0.000
Therapy Type (1=Bonsai)	6.215	0.593	10.47	0.000

The coefficients table presents the regression equation parameters. The constant (intercept) is 54.382, meaning that when the therapy type is zero (traditional art therapy), the expected emotional resilience score is 54.382. The unstandardized coefficient (B) for the therapy type variable is 6.215, indicating that participants who received bonsai therapy scored, on average, 6.215 points higher on emotional resilience than those who received traditional art therapy. The standard error for this coefficient is 0.593, and the t-value is 10.47, with a significance level of $p = 0.000$. These results confirm that therapy type is a statistically significant predictor of emotional resilience.

DISCUSSION

The results of this study are significant in giving a proper understanding of the comparative efficacy outcomes of using bonsai therapy and traditional art therapy to improve emotional resilience evident in stroke survivors in Karachi. The findings indicate that the group in the bonsai therapy recorded statistically higher scores compared to the traditional art therapy group in the emotional resilience measure. This is consistent with the available literature recommending that nature-based interventions have specific psychological advantages because of multisensory involvement, mindfulness, and symbolic interaction with living and development (Lee & Kim, 2022).

The magnitude of the positive regression coefficient of the bonsai therapy ($B = 6.215$, $p < .001$) indicates that this intervention can be appropriately valuable in terms of its contribution to emotional resilience. This supports empirical studies done in other aspects of therapy. As an example, Park et al. (2021) stated that the results of bonsai therapy among elderly

participants demonstrated considerable improvement in emotional expression and self-esteem. The use of a live tree as a symbol of nurturing seems to be creating a form of healing through the feeling of responsibility, control, and accomplishments, which are essential to recovery post-stroke.

Traditional art therapy, in its turn, being beneficial as well, had comparably fewer improvements in resilience. This does not refute its therapeutic worth, but it emphasises that the various modes of therapeutic application could trigger various psychological mechanisms. The potential of art therapy to promote emotional expression is well-established, especially in people with communicative disturbances (i.e., stroke patients with aphasia) (Malchiodi, 2020). Nevertheless, the meditative and nature-inclusive composition of the bonsai therapy could be more all-encompassing and earthy, particularly in people with emotional regulation or depression disorders, which is prevalent when it comes to post-stroke (Robinson & Jorge, 2016).

In addition, cultural context could be another factor that affects the results. According to South Asian cultures, Pakistan included, gardening and plant cultivation are likely to be related to spiritual perfection, harmonious home life, and forbearance. Such a connection with nature may contribute to the emotional impact of bonsai therapy being even stronger in the local context (Jahan et al., 2023). This is an indication of the seriousness of using culturally competent therapeutic practice, which accommodates the values and experiences of patients.

It should also be mentioned that the internal consistency of the resilience scale was strong (Cronbach's $\alpha = 0.88$), hence, securing the reliability of the findings. The quasi-experimental

design and the evenness of the demographic composition of the sample make the given results more credible. Nonetheless, this research does have limitations. It is non-randomized with the potential to produce selection bias; the intervention duration is short, not reflecting long-term outcomes. Future research should use longer follow-ups and employ a randomized controlled trial to evaluate the sustainability of bonsai therapy results.

The research can be used to enlarge the base of evidence that proves the efficacy of alternative and complementary therapy in neurorehabilitation. Bonsai therapy is an effective intervention that potentially can enhance emotional resilience in stroke survivors and can be implemented into the rehabilitation system, especially in culturally harmonious environments like those in Pakistan.

CONCLUSION

The objective of the proposed study was to assess and compare the efficacy of both bonsai and traditional art therapies to improve the emotional resilience of stroke survivors among Karachi residents. The results have highlighted that bonsai therapy had a significantly greater positive influence on the emotional resilience of its participants than classic art therapy. It implies that nature-and mindfulness-based interventions may have significant mental health implications in post-stroke rehabilitation. Bonsai therapy is physical, emotional, and cognitive, which makes it a symbolic process that is much relatable to the Pakistani culture. Although classical art therapy can still be useful when it comes to emotional expression and engaging with the arts, it seems that the holistic approach of the bonsai art therapy has better chances of offering a well-packaged guide to the process of developing resilience. Thus, inclusion of these innovative non-pharmacological therapies in neurorehabilitation interventions can positively affect the psychological outcomes of stroke patients to a significant extent.

RECOMMENDATIONS

- **Inclusion in Rehabilitation Processes:** Hospitals and rehabilitation facilities ought to incorporate bonsai therapy as an ancillary treatment to other

conventional treatments that can be used to help stroke victims with their emotional healing.

- **Training of Therapists:** There is a need to create professional training programmes that will train therapists and caregivers on the effective application of bonsai therapy in the clinical and community settings.
- **Health policy on non-pharmaceutical treatment:** Medicine policies could investigate the possibility of horticultural therapy as a national rehabilitation plan in low-resource places.
- **Longitudinal Studies:** The future of study in this direction needs to be conducted using the same design to assess the long-term impacts of bonsai therapy on emotional resilience and psychological well-being.
- **Cross-Cultural Validation:** It is suggested that comparative studies in other cultural contexts should be conducted to learn about the role of cultural affinity with nature in determining the efficacy of such interventions.

LIMITATIONS

Irrespective of its significant results, this research has its limitations. First, the quasi-experimental design lacking random assignment can produce selection bias, which is a limitation to the generalizability of the findings. Second, a six-week period of intervention is not sufficiently long to determine the impact of the therapy on emotional resilience. Third, this can produce answer bias because the measures are self-reported. Finally, the research was also geographically bound to Karachi rehabilitation centers, and findings may not represent the entire population of stroke in Pakistan or other areas.

Significance

The study has great clinical, psychological, rehabilitation, and health policy implications. It is one of the pioneers in Pakistan to make an empirical comparison between bonsai therapy and traditional art therapy for stroke rehabilitation. The results can reveal the fact that the low-cost, culturally appropriate, and non-invasive interventions may have the potential to work in emotional recovery among the survivors of stroke. This area is usually overshadowed by physical rehabilitation. The study

adds evidence-based support to the use of bonsai therapy. It thus offers a new breadth to the insurance that already exists in the use of neurorehabilitation therapy and promotes the need to use patient-centered, holistic care. Moreover, it contributes to the international debate on resilience-building by expressive and nature-based therapy, presenting interesting information both to practitioners and researchers.

References

- Connor, K. M., & Davidson, J. R. T. (2003). Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). *Depression and Anxiety*, 18(2), 76–82. <https://doi.org/10.1002/da.10113>
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approach* (5th ed.). SAGE Publications.
- Feigin, V. L., Stark, B. A., Johnson, C. O., Roth, G. A., Bisignano, C., Abady, G. G., ... & Vos, T. (2022). Global, regional, and national burden of stroke and its risk factors, 1990–2019: A systematic analysis for the Global Burden of Disease Study 2019. *The Lancet Neurology*, 21(10), 795–820. [https://doi.org/10.1016/S1474-4422\(22\)00202-0](https://doi.org/10.1016/S1474-4422(22)00202-0)
- Geue, K., Goetze, H., Buttstaedt, M., Kleinert, E., Richter, D., & Singer, S. (2019). An overview of art therapy interventions for cancer patients and the results of research. *Complementary Therapies in Medicine*, 42, 226–233. <https://doi.org/10.1016/j.ctim.2018.11.011>
- González, S., Cortés, A. Y Aguilar, F. (2022). Comparative effectiveness of art-based and horticultural therapy in mental health: A systematic review. *Journal of Integrative Medicine*, 20(3), 200–210. <https://doi.org/10.1016/j.joim.2022.03.005>
- Jahan, N., Nadeem, M., Hussain, I., & Khan, S. A. (2023). Rehabilitation approaches in stroke management: A review of non-pharmacological interventions in Pakistan. *Pakistan Journal of Neurological Sciences*, 18(1), 15–22.
- Khan, T. M., Kausar, R., & Khalid, A. (2020). Translation and validation of the Connor-Davidson Resilience Scale (CD-RISC-25) for the Pakistani population. *Pakistan Journal of Psychological Research*, 35(1), 47–62.
- Lee, H., & Kim, J. (2022). Psychological outcomes of bonsai horticultural therapy: A qualitative study with older adults in assisted living facilities. *Aging & Mental Health*, 26(4), 755–763. <https://doi.org/10.1080/13607863.2020.1824567>
- Malchiodi, C. A. (2020). *Art therapy: The science of creativity in mental health treatment*. Guilford Press.
- Masten, A. S. (2018). Resilience theory and research on children and families: Past, present, and promise. *Journal of Family Theory & Review*, 10(1), 12–31. <https://doi.org/10.1111/jftr.12255>
- Park, J. H., Kim, Y. Y., & Choi, S. (2021). Effects of bonsai therapy on self-esteem and loneliness in the elderly: A pilot study. *Korean Journal of Horticultural Science & Technology*, 39(3), 412–420. <https://doi.org/10.7235/HORT.2021.21037>
- Robinson, R. G., & Jorge, R. E. (2016). Post-stroke depression: A review. *American Journal of Psychiatry*, 173(3), 221–231. <https://doi.org/10.1176/appi.ajp.2015.15030363>
- Stuckey, H. L., & Nobel, J. (2019). The connection between art, healing, and public health: A review of current literature. *American Journal of Public Health*, 109(2), 254–263. <https://doi.org/10.2105/AJPH.2018.304776>
- Wilson, E. O. (1984). *Biophilia*. Harvard University Press.

Windle, G., Bennett, K. M., & MacLeod, C. (2021).
The influence of resilience on psychological
outcomes following stroke in later life.
Clinical Rehabilitation, 35(1), 114-122.
<https://doi.org/10.1177/0269215520967283>

3

