

I. Project Information*

Project Director	Dongying Li
Project Title	Nature-based therapy: A socioecological and RE-AIM approach to treating disaster-related PTSD in flood-vulnerable communities
Project Location	Texas A&M University
Project Summary	More than a third of individuals exposed to major disasters may develop posttraumatic stress disorder (PTSD). Although post-disaster PTSD prevalence generally decreases after a year, studies have reported delayed-onset PTSD and psychological distress in disadvantaged groups at a 5-year follow-up [1, 2]. Nature-based therapy (NBT) has potential as a low-cost multi-level intervention to reduce individual PTSD symptoms and enhance community resilience; however, existing evidence mostly involves veterans. The efficacy and longer-term maintenance of NBT in reducing symptoms in hurricane-affected communities remain unelucidated, especially for Hispanic populations in historically redlined neighborhoods, who have distinct cultural traits and face disproportionate environmental and social stressors that impact their relations with natural space [3]. This project aims to: 1) develop and assess an NBT program in the context of ethnic minority and flood-vulnerable neighborhoods using a RE-AIM (reach, effectiveness, adoption, implementation, and maintenance) framework, and 2) determine the efficacy of NBT at reducing PTSD and mental distress symptoms. To achieve these aims, we will use a mixed methods design to develop a locally appropriate NBT intervention using community engaged research (Phase I), carry out a randomized controlled trial (Phase II), and assess the implementation and sustainability using the RE-AIM framework (Phase III). Being grounded in a socioecological perspective at the human-place nexus, the results will advance science regarding NBT efficacy in mitigating PTSD and inform an integrative community resilience framework to combat climate-related natural disasters. The intervention is relatively low-cost and ecologically acceptable, and can be adopted in similar under-resourced ethnic minority communities.

II. Progress Report Questions

1. Please revisit your proposal and review your goals and the outcomes you were seeking to achieve through this grant. How successful were you in meeting your goals? Please assess your success against the criteria you set in your proposal and use any combination of anecdotes, stories, graphs, charts, visuals as well as data to explain your success. Upload supporting files if you choose.*

The objectives of this project are to determine the efficacy of nature-based programs in reducing disaster-related PTSD and mental disorder symptoms and to develop an implementation program that leads to successful adoption and maintenance. We have developed a set of nature-based therapy protocols and tested them across multiple community settings, including a self-directed nature walk protocol that includes site selection, time scheduling, activity planning, safety and accessibility considerations, facilitator guidance, and strategies for participant reflection and follow-up integration. Through reviewing the literature related to guided sensory awareness exercises, mindfulness or reflective practices, physical movement, family-based activities, and facilitated discussions, we have summarized best practices in activity structuring and organizations. We have also conducted extensive studies regarding the differences in preferences and activities of Hispanic/Latino groups in outdoor nature settings. Our findings show that these interventions are effective in reducing mental distress, lowering rumination, and providing meaningful restorative benefits. However, sustained engagement depends on a range of multilevel factors that influence individual behavior, including personal motivation, competing needs/priorities, social influences, and other factors.

We have carried out extensive community engagement, direct field observations, systematic data collection, and disseminated our results through conferences, public presentations, and community engagement events. This project was also integrated with a lecture/discussion course and a design studio, in developing community green space configurations that best support nature-based therapy programs. Articles and book chapters published or currently being prepared are included as follows.

Wells, N. M., Tralins, J., Li, D., Mateer, T. J., Eldermire, E., le Roux Ohm, H., ... & Kibbee, M. R. (2025). The effect of the natural environment and greenness on behavior, function, and well-being among individuals with autism spectrum disorder: A Scoping Review. *Journal of Environmental Psychology*, 102619.

Yen, M. H., Li, D., Weng, P. Y., & Chiang, Y. C. (2024). Impact of natural views on mental health during COVID-19 quarantine: A natural experiment. *Journal of environmental psychology*, 100, 102455.

Lee, C., Park, A. H., Lee, H., Bratman, G. N., Hankey, S., & Li, D. (2024). Measuring urban nature for pedestrian health: Systematic review and expert survey. *Landscape and Urban Planning*, 250, 105129.

Zhang, Y., Li, D., Li, X., Zhou, X., & Newman, G. (2024). The integration of geographic methods and ecological momentary assessment in public health research: A systematic review of methods and applications. *Social Science & Medicine*, 354, 117075.

Li, D., Zhang, Y., Li, X., Zhang, K., Lu, Y., & Brown, R. D. (2023). Climatic and meteorological exposure and mental and behavioral health: a systematic review and meta-analysis. *Science of the Total Environment*, 892, 164435.

Li, D., Lee, C., Park, A. H., Lee, H., & Ding, Y. (2023). Contextual and environmental factors that influence health: A within-subjects field experiment protocol. *Frontiers in public health*, 11, 1019885.

Ayodeji Iyanda; Temilola Salami, PhD; Dongying Li, PhD; Xiao Huang, PhD; Xinyue Ye.

Exploring the Link Between Social Identity and Depressive Symptoms Among Emerging Adults: The Dual Mediating Roles of Greenspace Utilization and Direct/Digital Social Networks. Submitted to Journal of Medicine, Surgery, and Public Health

Li, D., Li, X., Zhang, Y. Granular Assessment of Characteristics of Urban Nature and Momentary Assessment of Anxiety: An Ecological Momentary Assessment. In preparation for Environment and Behavior.

Ayodeji Iyanda; Temilola Salami, PhD; Dongying Li, PhD; Xiao Huang, PhD; Xinyue Ye.

Using Structural Equation Model to Explore the Link Between Social Identity and Depressive Symptoms Among Emerging Adults in the United States. In preparation for Psychiatry Research

Li, D., Zhang, Y., Li, X., Peng, J., & Brown, R. D. (2024). Capturing Psychological Conditions Using Real-Time Geographically Mental Explicit Health Ecological Momentary Assessment. Contemporary Landscape Performance Methods and Techniques: Lessons from the Houston Arboretum and Nature Center.

Optional File Upload

2. How has your work benefited your organization, professional field, community, or other stakeholders?*

Professional Design Guidelines (for environmental planners/landscape designers/park managers)

Through a series of service-learning design studios, our team created general prototypes and site-specific design proposals that illustrate how neighborhoods in the Gulf region can better leverage their existing parks, trails, and open-space systems to support nature-based solutions in improving community mental health. These guidelines translate study results, along with field observations, community needs, and environmental analysis into practical recommendations for accessibility, activity zones, facilities and amenities, vegetation and planting design, and permanent and temporary programming. The resulting materials provide communities and local planners with actionable design concepts that support healthier, more resilient outdoor environments.

Self-Directed Nature Walk Guide

We developed a user-friendly guide to help individuals and families in the Greater Houston area to incorporate regular nature walks into their daily routines. The guide assists users in identifying local natural resources and selecting routes that offer the most engaging and restorative experiences. It outlines steps for planning nature-based activities and provides thematic prompts—such as bird-watching, plant identification, mindfulness exercises, and seasonal observations—to deepen engagement with the landscape. The guide also encourages participants to track their experiences, reflect on benefits, and adapt their routines to maximize personal and family well-being.

Training Materials for Community Health Workers

We produced a set of training materials designed to equip community health workers with the knowledge and tools needed to become nature walk guides. These materials cover fundamental concepts related to environmental health, how to work with individuals and families with mental health needs such as post-traumatic stress disorders, safe outdoor engagement during heat events, and approaches for guiding residents in using the nature walk guide and related resources. Together, these resources strengthen the capacity of community health workers to promote nature-based health practices across diverse neighborhoods.

3. Are there any other successes related more broadly to this project that you would like to share with us?*

Trainee Development and Recognition

Trainees participating in the project received comprehensive training in human subjects research, implementation research methods, community engagement and meaningful participation. This grant partially supported the dissertation of two PhD students and the Final Studies of three Masters students, along with other student researchers. Several trainees earned awards and recognition for their work. Our team received the EDRA Core Certificate for advancing evidence-based environmental design research, and PhD trainees secured competitive scholarships that supported their academic and professional growth.

Strengthening Community Relationships

During this project, we strived to develop community partnerships. We collaborated closely with local leaders, such as Charity Productions, to support outreach and assess community needs. We also broadened our network to include organizations that steward public green spaces, such as the Houston Arboretum and Nature Center and the Houston Botanic Garden, enabling us to use these sites as settings for community interventions. In addition, we partnered with Texas A&M Forest Service to jointly plan and conduct evaluation activities, strengthening the collaborative foundation of our work.

Synergistic Research on Nature-Based Solutions

We conducted several complementary research focused on the adverse effects of disasters on human mental health or nature-based solutions and their impacts on mental health. Our team contributed to the development of the Texas A&M–Houston Methodist Nature and Health Center and the Hazard Reduction and Recover Center, shaping its research agenda on evaluating nature as solutions and educational opportunities. We partnered with other PIs (e.g., Dr. Lei Zou) who received the Gulf Mental Health grant to improve research designs and brainstorm ideas. In addition, we worked with Cornell University and the Center for Discovery, NY to design nature-based interventions for individuals with profound autism as an increasing mental health priority.

4. What did you learn (positive or negative) as a result of this grant? What lessons would you share with other organizations or the field at large?*

For behavioral interventions aimed to improve mental health, like nature-based solutions, it is essential to understand participants' needs and urgent priorities – safety, financial stability, health issues. People may expect solutions targeting structural barriers or providing external financial or medical resources. Stronger awareness and alignment of the program and the participants' needs will lead to better results.

5. How do you characterize your relationship with the GRP and what suggestions do you have for improvement?*

GRP served not only as our funder but also as a source of mentoring and inspiration through its network of researchers, webinars, and published reports. The networking opportunities strengthened our work, broadened our perspectives, and allowed us to build connections with other teams supported by the same program or other related grants.

6. Please provide any other feedback or comments you have for the GRP.*

This GRP grant made it possible for us to pursue a line of inquiry that is both high-risk and potentially high-impact. The support allowed us to explore innovative research potential to advance the field in meaningful ways. Beyond the scientific contributions, this opportunity has also strengthened our team's capacity for interdisciplinary collaboration and community engagement. We are sincerely grateful for the flexibility, vision, and support that this grant provided, and for the chance to investigate questions that hold substantial promise for long-term societal benefit.

7. If applicable, please identify and describe the ways you or your organization leveraged GRP's grant (e.g., other funders, volunteers who worked on the program, in-kind donations etc.) Please specify the value and/or number/hours of volunteers if possible.

Our team has developed strong research collaborations, developed other external grant proposals, and contributed to students' education, leveraging GRP's grant and our research.