On an Attempt to Establish the Inter-relationships amongst the Benefactors of Forest therapy through ISM Methodology

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ABSTRACT

Forest has an alluring effect on the minds of humans. Forest therapy also known as forest bathing stems from the idea that humans have an innate longing to be surrounded by trees, which is why we immediately feel an overwhelming sense of warmth and calm when in a forest. Forest therapy is a combination of healing forest techniques that merge the benefits of mindfulness , creativity and nature to create a calm mind, a healthy body, and a peaceful life and thereby improving your well-being . Learn the secrets of healing in nature, with nature. The visitors can indulge in several activities at the center including forest walking, tree-hugging, forest meditation and sky gazing. These programs and activities aims at creating change leaders and compassionate communities through the Forest Friends program. Present research work presents the interrelationships amongst the various success factors for the successful conduct of forest bathing or forest therapy with the help of qualitative approach of ISM methodology.

Keywords
Forest therapy; ISM methodology

1. INTRODUCTION

Forest therapy also known as forest bathing draws upon awakening our senses with mindfulness meditation practices and Qi Gong meditation along with Deep Breathing exercises. Initially originated in Japan, forest therapy [1-11] is an accepted part of Japanese preventative health care therapy which stresses on the need to be with nature and feel that connection. This therapy draws on the thousands of years of intuitive knowledge and the scientists there continue to conduct a large amount of research into its benefits, concluding that it deserves its place in the Japanese health-care system. More general research into the area of nature connections suggests that the real and long-term benefits include, among other things, reduced stress, improved immunity, lower blood pressure and accelerated recovery from illness or trauma. This therapy works with loads of multiple distractions of modern life and frees up our mind with the help of its meditative nature .

2. LITERATURE REVIEW ON MEASURING THE EFFECT OF SOCIAL MEDIA

Below are the benefactors which have made forest bathing a success amongst all age groups [1-25].

2.1 Stress reduction [SR]: Forest therapy has proved itself good for physical and mental well-being. Proven to have reduce stress hormone Cortisol production, boosting feelings of happiness and freeing up creativity as well as lowering heart rate and blood pressure, it has also proven to accelerate recovery from illness.

2.2 Mood improvement [MI]: As per academics of Derby University, spending time in nature releases hormones that relate to the pursuit of joy, connecting to calm and avoiding threats.

2.3 Creativity improvement [CI]: In one study by David Strayer, a Psychology Professor at the University of Utah, participants saw a 50% improvement in creative problem solving after three days immersed in nature with all access to modern technology removed.

2.4 Immune system boosting [ISB]: The natural chemicals secreted by evergreen trees, collectively known as Phytoncide, have also been associated with improvements in the activity of our frontline immune defenders. This is an interesting finding in the context of the century-old reports on the success of the so-called forest cure in tuberculosis treatment.

2.5 High blood pressure reduction [HBPR] : Forest Bathing has been proven to reduce blood pressure, a crucial factor in maintaining a healthy heart. A recent meta study in Japan reviewed 20 trials, involving 732 participants, which demonstrated that blood pressure levels in the forest environment were significantly lower than those in the non-forest environment.

2.6 Recovery from illness [RFI]: Nature can be a powerful catalyst in the recovery process. The most well-known study in this area by Dr. Roger Ulrich, an architect specializing in healthcare building design, showed that even a natural view from a window reduced convalescence time by a day, compared to an urban view.

2.7 Protection against Obesity and Diabetes [POD]: Forest therapy has proven to reduce blood glucose levels, even in diabetics. Diabetic patients did a forest bathe walk every eight months for six years. Even though their time spent forest therapy was very spaced out, their blood glucose levels still showed significant improvement.

2.8 Decrease in inflammation [DII]: Forest air is noticeably fresher than city air, or even other nature environments, since the trees are busy converting CO_2

into fresh oxygen for our lungs. Not only is the air is fresher, but the compounds naturally released by the trees decrease inflammation. There are over 40,000 known terpene structures and they have a wide variety of positive effects on the body. Osteoarthritis relief, reduced joint pain and inflammation, and decreased neck and back pain are just some of the proven benefits. Inflammation is the cause of many issues in the body, including certain skin disorders. Those with eczema and psoriasis can see benefits after taking forest therapy. Terpenes are some of the main anti-inflammatory components expressed by trees into the forest air and are mainly found in conifers like cypress, fir and pine trees.

2.9 More energy and better sleep [MEBS]: Many of us notice the revitalized feeling we get from taking a deep breath in a natural location. Forest therapy has been shown to increase vigor and fight fatigue. At the same time, it triggers hormones and processes in our body that improve sleep. It's also been shown to reduce dopamine and cortisol levels, meaning it reduces stress and calms the body and mind.

2.10 Enhanced experience with Earthing [EEE]: Grounding or barefoot shoes helps improve your heart beat , relieves from stress and enhances our perception of surroundings and helps improve your experience

3. INTERPRETIVE STRUCTURAL MODELLING METHODOLOGY [ISM]

Interpretive Structural Modeling methodology a.k.a ISM [Warfield, 1974] is a known technique to map the relationships amongst the relevant elements as per decision maker's problems in a hierarchical manner. It begins with a series of events starting from the identification of elements, it moves to establishing the

contextual relationships between elements through pair wise examination and then further moving on towards developing the structural self-interaction (SSIM) matrix using VAXO [Warfield , 1974] and then initial reachability matrix and final reachability matrix and rearranging the elements in topological order using the level partition matrices . Finally, a diagraph can be obtained.

4. DEVELOPMENT OF ISM MODEL: CASE EXAMPLE

Around 10 success factors described in the above section 2 are being further studied for the possible inter-relationships amongst them. These are : Stress reduction [SR]; Mood improvement [MI]; Creativity improvement [CI]; Immune system boosting [ISB]; High blood pressure reduction [HBPR]; Recovery from illness [RFI] ; Protection against Obesity and Diabetes [POD] ; Decrease in inflammation [DII] ; More Energy and Better Sleep [MEBS]; Enhanced experience with Earthing [EEE] .

4.1 Construction of Structural self- interaction Matrix (SSIM)

This matrix gives the pair-wise relationship between two variables *i.e. i and j* based on VAXO. SSIM has been presented below in Fig 1.

4.2 Construction of Initial Reachability Matrix and final reachability matrix

The SSIM has been converted in to a binary matrix called the Initial Reachability Matrix shown in fig. 2 by substituting V, A, X, O by 1 or 0 as per the case. After incorporating the transitivity, the final reachability matrix is shown below in the Fig 3.

Fig 1: SSIM matrix for pair wise relationship amongst success factors of Forest Therapy

S.No.	Success factors	1	2	3	4	5	6	7	8	9	10
		SR	MI	CI	ISB	HBPR	RFI	POD	DII	MEBS	EEE
1	SR		V	V	V	V	V	V	V	V	V
2	MI			V	V	V	V	V	V	V	V
3	CI				A	A	A	A	A	A	A
4	ISB					X	X	X	X	X	X
5	HBPR						X	X	X	X	X
6	RFI							X	X	V	A
7	POD								X	V	V
8	DII									V	V
9	MEBS										A
10	EEE										

Fig 2: Initial reachability matrix

S.No.	Success factors	1	2	3	4	5	6	7	8	9	10
		SR	MI	CI	ISB	HBPR	RFI	POD	DII	MEBS	EEE
1	SR	1	1	1	1	1	1	1	1	1	1
2	MI	0	1	1	1	1	1	1	1	1	1
3	CI	0	00	1	0	0	0	0	0	0	0

4	ISB	0	0	1	1	1	1	1	1	1	1
5	HBPR	0	0	1	1	1	1	1	1	1	1
6	RFI	0	0	1	1	1	1	1	1	1	0
7	POD	0	0	1	1	1	1	1	1	1	1
8	DII	0	0	1	1	1	1	1	1	1	1
9	MEBS	0	0	1	1	1	0	0	0	1	0
10	EEE	0	0	1	1	1	1	0	0	1	1

Fig 3 : Final reachability matrix

S.No.	Success factors	1	2	3	4	5	6	7	8	9	10	D.P
		SR	MI	CI	ISB	HBPR	RFI	POD	DII	MEBS	EEE	
1	SR	1	1	1	1	1	1	1	1	1	1	10
2	MI	0	1	1	1	1	1	1	1	1	1	9
3	CI	0	00	1	0	0	0	0	0	0	0	1
4	ISB	0	0	1	1	1	1	1	1	1	1	8
5	HBPR	0	0	1	1	1	1	1	1	1	1	8
6	RFI	0	0	1	1	1	1	1	1	1	0	7
7	POD	0	0	1	1	1	1	1	1	1	1	8
8	DII	0	0	1	1	1	1	1	1	1	1	8
9	MEBS	0	0	1	1	1	1	1	1	1	1	8
10	EEE	0	0	1	1	1	1	1	1	1	1	8
	De.P	1	2	10	9	9	9	9	9	9	8	

D.P : Driving power ; De.P : dependence power

4.3 Level Partition

From the final reachability matrix, reachability and final antecedent set for each factor are found. The elements for which the reachability and intersection sets are same are the top-level element in the ISM hierarchy. After the identification of top level element, it is separated out from the other elements and the process continues for next level of elements. Reachability set, antecedent set, intersection set along with different level for elements have been shown below in table 1 to table 4.

Table 1: Iteration I

S.No.	Reachability set	Antecedent set	Intersection set	Level
1.	3	1,2,3,4,5,6,7,8,9,10	3	I
2.	3,4,5,6,7,8,9,10	1,2,4,5,6,7,8,910	4,5,6,7,8,9,10	
3.	2,3,4,5,6,7,8,9,10	1,2	2	
4.	1,2,3,4,5,6,7,8,9,10	1	1	

Table 2: Iteration II

S.No.	Reachability set	Antecedent set	Intersection set	Level
2.	4,5,6,7,8,9,10	1,2,4,5,6,7,8,9,10	4,5,6,7,8,9,10	II
3.	2,4,5,6,7,8,9,10	1,2	2	
4.	1,2,4,5,6,7,8,9,10	1	1	

Table 3: Iteration III

S.No.	Reachability set	Antecedent set	Intersection set	Level
3.	2	1,2	2	III
4.	1,2	1	1	

Table 4: Iteration IV

S.No.	Reachability set	Antecedent set	Intersection set	Level
4.	1	1	1	IV

4.4 ISM diagraph for hierarchical inter-relationships
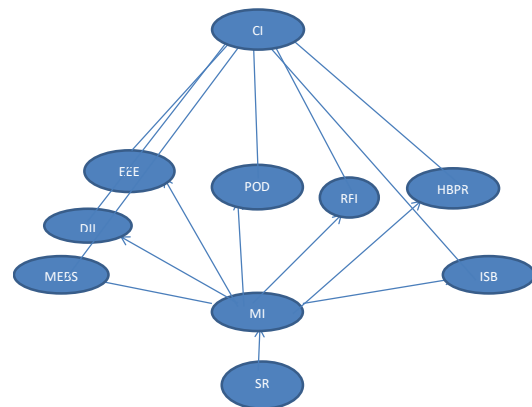
4.4 ISM diagraph for hierarchichal interrelationships

5. ACKNOWLEDGEMENTS

6. REFERENCES

[1] Beyer KM, Kaltenbach A, Szabo A, Bogar S, Nieto FJ, Malecki KM. Exposure to neighborhood green space and mental health: evidence from the survey of the health of Wisconsin. Int. J. Environ. Res. Public Health 2014, 11(3), 3453-3472.

[2] Vries, Sjerp De, et al. 2013. Streetscape Greenery and Health: Stress, Social Cohesion and Physical Activity as Mediators." Social Science & Medicine, 94, pp. 26–33., doi:10.1016/j.socscimed.2013.06.030.

[3] South, Eugenia C., et al. 2018. Effect of Greening Vacant Land on Mental Health of Community-Dwelling Adults." JAMA Network Open, 1(3), doi:10.1001/jamanetworkopen.2018.0298.

[4] Mceachan, R R C, et al. 2015. The Association between Green Space and Depressive Symptoms in Pregnant Women: Moderating Roles of Socioeconomic Status and Physical Activity." Journal of Epidemiology and Community Health, 70(3), 253–259, doi:10.1136/jech-2015-205954.

[5] South, Eugenia C., et al. 2015. Neighborhood Blight, Stress, and Health: A Walking Trial of Urban Greening and Ambulatory Heart Rate. American Journal of Public Health, 105(5), pp. 909–913., doi:10.2105/ajph.2014.302526..

[6] Kondo, Michelle C., et al. 2018. Does Spending Time Outdoors Reduce Stress? A Review of Real-Time Stress Response to Outdoor Environments." Health & Place, 51, pp. 136–150., doi:10.1016/j.healthplace.2018.03.001.

[7] Nooshin Razani, Saam Morshed, Michael A. Kohn, Nancy M. Wells, Doug Thompson, Maoya Alqassari, Amaka Agodi, George W. Rutherford. 2018. Effect of park prescriptions with and without group visits to parks on stress reduction in low-income parents: SHINE randomized trial. PLoS One;13(2):e0192921.

[8] Wang K, Lombard J, Rundek T, Dong C, Gutierrez CM, Byrne MM, Toro M, Nardi MI, Kardys J, Yi L, Szapocznik J, Brown SC. Relationship of Neighborhood Greenness to Heart Disease in 249 405 US Medicare Beneficiaries. J Am Heart Assoc. 2019 Mar 19;8(6):e010258.

[9] Kardan, Omid, et al. "Neighborhood Green space and Health in a Large Urban Center." Scientific Reports, vol. 5, no. 1, 2015, doi:10.1038/srep11610.

[10] Donovan, G. H., Michael, Y. L., Butry, D. T., Sullivan, A. D., & Chase, J. M. (2011, 01). Urban trees and the risk of poor birth outcomes. Health & Place, 17(1), 390-393. doi:10.1016/j.healthplace.2010.11.004

[11] Dzhambov, A. M., Dimitrova, D. D., & Dimitrakova, E. D. 2014. Association between residential greenness and birth weight: Systematic review and meta-analysis. Urban Forestry & Urban Greening, 13(4), 621-629. doi:10.1016/j.ufug.2014.09.004 25 B.

[12] Kondo, Michelle C., et al. 2017. "The Association between Urban Trees and Crime: Evidence from the Spread of the Emerald Ash Borer in Cincinnati." Landscape and Urban Planning, 157, pp. 193–199., doi:10.1016/j. landurbplan.2016.07.003.

[13] Garvin EC, Cannuscio CC, Branas CC. 2013. Greening vacant lots to reduce violent crime: a randomised controlled trial. Inj Prev. , 19(3):198-203.

[14] Shanahan, Danielle F., et al. "Health Benefits from Nature Experiences Depend on Dose." Scientific Reports, vol. 6, no. 1, 2016, doi:10.1038/srep28551.

[15] Hunter, Marycarol R., et al. 2019. "Urban Nature Experiences Reduce Stress in the Context of Daily Life Based on Salivary Biomarkers." Frontiers in Psychology, 10, doi:10.3389/fpsyg.2019.00722. 33. White, Mathew P., et al. "Spending at Least 120 Minutes a Week in Nature Is Associated with Good Health and Wellbeing." Scientific Reports, 9(1), 2019, doi:10.1038/s41598-019-44097-3.

[16] Wen, Ming, Xingyou Zhang, Carmen Harris, James Holt, Janet Croft. 2013. "Spatial Disparities in the Distribution of Parks and Green Spaces in the USA." Annals of Behavioral Medicine, 45(1), pp. 18–27., doi:10.1007/s12160-012-9426-x.

[17] Mitchell, Richard, and Frank Popham. 2008. Effect of Exposure to Natural Environment on Health Inequalities: an Observational Population Study. The Lancet, 372(9650), pp. 1655–1660, doi:10.1016/ s0140-6736(08)61689-x.

[18] T. Yang, K. Chunwei 2003. A hierarchical AHP/DEA methodology for the facilities layout design problem", European Journal of Operational Research, 147(1), 128–36.

[19] Warfield, J., N. 1974. Developing interconnection matrices in structural modeling. IEEE Transactions on System, Man, and Cybernetics (SMC) .4 (1), 81-87.