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The Role of Therapeutic Landscape in Improving Mental Health of People with PTSD

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Abstract

Post-traumatic stress disorder (PTSD) as a complex disorder, with serious consequences, affects the quality of life of the individual, the family, as well as the community. Therefore, the subject of this chapter is to study how to reduce stress and improve the quality of life of these people and consequently the community. This chapter is based on documentary studies including the foundations of the theory, the study of the results of experiments in the world, and case studies in this field, which shows that the interaction of individuals with PTSD and therapeutic landscapes can act as a therapeutic mechanism. In the following, features from therapeutic landscapes that help to optimize mental health levels are reviewed in people with PTSD, briefly.

Keywords: mental health, therapeutic landscape, PTSD, stress, physical space, nature

1. Introduction

Stress control improves health, prevents diseases, enhances the quality of life, and reduces health costs [1]. To date, little research has been conducted on the positive and negative effects of the physical environment for people with post-traumatic stress disorder (PTSD), and in particular, little is known about what types of outdoor spaces, and what elements and activities in those outdoor spaces, will be of greatest benefit. The complex combination of physical and neurological injuries interwoven with long-lasting emotional challenges may call for unique design concepts [2]. The notable point about research on quality of life and improving the health of people with PTSD is that so far, many studies have been done about them, however, few studies have been conducted on the role of therapeutic landscape in improving the health of people with PTSD, since this object is a very important disorder that can affect the overall life of a person and affect the work, psychosocial, and physical activity, so that stress relief is highly effective in determining the effectiveness of healthcare and rehabilitation. This chapter first gives a brief overview of PTSD and its levels and attributes then investigates the foundations of the theory and philosophy of association with the nature and effects of nature on health in therapeutic landscape form; the next section is about therapeutic landscapes backgrounds for people with PTSD; also, we discuss the need for a therapeutic landscape to improve

the health of people with PTSD and finally introduce some effective environmental factors in the effectiveness of the therapeutic landscape for PTSD.

2. PTSD

Trauma exposure leads to various psychiatric disorders including depression, anxiety, bipolar disorders, personality disorders, psychotic disorders, and trauma-related disorders, especially post-traumatic stress disorder [3]. Post-traumatic stress disorder is classified in the new class of traumatic and stress disorder [4]. The term post-traumatic stress disorder was first coined in the 1970s to replace post-Vietnam syndrome. The condition was formally recognized in 1980 in the DSM-IV [5].

PTSD generally appears within 3 months after a traumatic experience such as sexual or psychological abuse or assault, a serious accident, natural disaster, or war-related event(s) [6] or a non-war traumatic event such as a terrorist attack, family violence, and serious injury [7]. It often occurs with—and may be exacerbated by or contribute to—related disorders, including depression [8, 9] substance abuse [10], memory loss, and other physical, mental health problems, and suicidal ideation [11, 12]. Although the majority of PTSD cases in the US are caused by non-combat trauma [13, 14], the lifetime prevalence of the disorder is higher in combat-exposed cases [15].

Individuals with PTSD continue to experience the psychological effects of trauma, including re-experiencing symptoms, avoidance of similar stimuli, negative cognition and mood, and increased physical arousal, long after being removed to a safe environment [7]. They may also suffer a wide range of consequences of revealing their problems, such as a higher likelihood of losing jobs or being discriminated against in the workplace, social exclusion, lower income, difficulties in renting residences, exclusion from social communities, and legal difficulties [16]. In addition to the patients themselves, family members, friends, community members, colleagues, and employers are also indirectly affected by PTSD. Currently, more than 2% of the US population (about 7.7 million people) is known to suffer from PTSD, and 8–9% of the US population reports experiencing lifetime PTSD [17].

More than 60% of men and 51% of women face a major stressful event during their lifetime [18, 19]. Of course, the prevalence of PTSD in the typical population is reported to be between 5 and 10% [20, 21], which shows that only a small group of people with a major incident eventually have PTSD [22] which, of course, is highly dependent on stress. According to the World Health Organization, 450 million people in the world are suffering from vascular and psychiatric illness [23]. About 65% of patients with mental disorders live with their families [24]. The overall prevalence of PTSD is about 8% in general, which is 10–12% in women and 5–6% in men. Also, the prevalence of diseases associated with PTSD is high, with about two-thirds of these patients having at least two other disorders [25, 26]. Over 40% of the risk for PTSD may be genetically heritable [27]. Post-traumatic stress disorder (PTSD) stands out as a major mental illness and is becoming a serious public health challenge.

3. The role of nature in improving physical and mental health

In health geography and environmental psychology, substantial literatures on green space environments emphasize their potential to promote health and well-being [28–31]. Fortunately, there is a recently rediscovered body of evidence

that supports the view that nature generally, and everyday living environments in particular, can have a profound effect on health and well-being. Connecting with nature can restore cognitive attention [32, 33], improve blood pressure and self-esteem [34], support pro-environmental behaviors [35], decrease symptoms of attention deficit disorder [36], and improve community resilience [37]. Contact with nature is an effective “upstream health promotion” tool for whole populations. That is, it is useful in prevention of mental health conditions [38]. Studies have shown that exposure to natural environments enhances our ability to recover from stress, illness, and injury, and provides a wide range of social, psychological, and physiological benefits [39, 40]. Across our towns and cities, a connection with nature has been found to be a vital, albeit often unconscious, part of being human.

In the late 1970s, the environmental psychologist Ulrich began research on the emotional and psychological effects of environmental esthetics on individuals with a special experience in terms of psychological challenges. In 1984, his paper, “The View through a window” can be effective in restoring the patient after surgery,” posed a serious discussion about access to nature in hospitals, which was published in the journal *Science*. The outcomes data revealed that patients with the nature view had shorter hospital stays, suffered fewer postsurgical complications, needed fewer doses of potent narcotic pain medication, and received more positive written comments in their medical records from staff [41].

Ulrich’s study, cited in thousands of publications—from books to scholarly journals to newspaper and magazine articles—was, and continues to be, signify for two reasons. First, it demonstrated to the medical community—using the same empirical, quantitative methods that they used and respected—that the physical environment, and specifically views of nature, had a measurable positive effect on patient health. Second, it established a business case for providing access to nature. All of the improved health outcomes for patients—duration of hospital stay, amount of pain medication, degree of strain on nursing staff, and level of patient satisfaction—translated directly to potential cost savings [6].

Physical settings can play a role in coping with stress; in particular, experimental research has found strong evidence between exposure to natural environments and recovery from physiological stress and mental fatigue, giving support to both “stress recovery theory” and “attention restoration theory” [42–44]. In fact, exposure to natural environments protects people against the impact of environmental stressors and offer physiological, emotional, and attention restoration more so than urban environments. Natural places that allow the renewal of personal adaptive resources to meet the demands of everyday life are called “restorative environments.” Natural environments elicit greater calming responses than urban environments, and in relation to their vision there is a general reduction of physiological symptoms of stress. Exposure to natural scenes mediates the negative effects of stress reducing the negative mood state and above all enhancing positive emotions. Moreover, one can recover the decrease of cognitive performance associated with stress, especially reflected in attention tasks, through the salutary effect of viewing nature. Giving the many benefits of contact with nature, plans for urban environments should attend to restrictiveness [45].

The neuroscientist Esther Sternberg suggests that part of nature’s benefit is derived from the multitude of simultaneous positive sensory experiences [46, 47]. Proximity to nature, especially trees, was also found to have a beneficial effect on the amount of domestic violence in Chicago public housing households [48], women’s ability to cope with major life issues [49], and amount of inner-city crime [50]. A study by team of Li [51] showed that nature therapy increases the activity of natural lethal cells that are part of the immune system against cancer risk. This in turn

helps to increase resistance to stress. Past research demonstrates that naturalistic settings may offer benefits in terms of stress reduction and improved mental states within corrections environments [52].

4. Theoretical and philosophical foundation

In stress reduction theory, Ulrich is emphasized on health positive results by reducing stress based on two main reasons. First, many people who are ill or caring for a patient experience stress. Second, many people—someone who are not aware of this sign—are demanding environments in order to reduce stress where is predominant in nature [53]. There is powerful evidence that indicates (1) sensory control, (2) social support, (3) physical movement, (4) natural positive distractions help reduce stress [44, 54, 55].

Attention restoration theory was developed by Rachel and Stephen Kaplan in the decade 1980 in their book “Nature Experience: One Psychological Approach” was introduced to describe environmental impacts [32, 56] on humans and emphasizes the role of the natural environment for the physical, psychological recovery of the individual as a factor in the restoration of thought. According to this view, placing in the environment can reduce people’s psychological pressure and improve the fatigue of the audience. This theory claims that people after spending time in nature, or even looking at the scenes of nature can focus better. The natural range is with many soft charms that a person can show in “simple and instant attention,” such as moving clouds across the sky, the sound of leaves in mild wind, or the sound of flowing water in a stream full of rock. Kaplan’s theory defines two-related systems: directed attention, engaging in a particular task, which is often difficult and stressful (like taking a test, doing surgery), requires simultaneous removal of the sensory stimulus. Psychological restoration can be described as the ability to perceive recovery and restoration, so that the observer can understand environmental properties that reduce mental fatigue and stress **Figures 1 and 2** [57].

Since Gesler introduced the concept in 1992, the notion of “therapeutic landscape” has been productively employed to better understand the dynamic between place and wellness [58], a therapeutic landscape includes both the



Figure 1. Low-cost, edible garden interventions in a public park can be added as a temporary or permanent feature [57].

natural, built, symbolic, and social environments [59]. Moving from its initial application of understanding places reputed for their healing qualities, the therapeutic landscape concept today also encompasses everyday landscapes [60]. Collectively, therapeutic places are culturally constructed, experienced differently by different people, and not necessarily ideal or romantic landscapes [61]. As Gesler and Kearns [62] contend, landscapes are multi-dimensional: the sites of human-environment interaction, products of social processes, and individual or personal constructs. Similarly, contemporary definitions of health include multiple aspects of wellbeing: emotional, spiritual, physical, and social. Gesler's concept suggests that specific landscapes not only provide an identity, satisfying a human need for roots, but can also act as the location of social networks, providing settings for therapeutic activities. This is based on an understanding of the ways in which environmental, societal, and individual factors can work together to preserve health and well-being. Hence, place is understood as being relational, influenced not only by the physical environment, but also by the human mind and material circumstances—reflecting both human agency (through intentions and actions) as well as the structures and constraints imposed by society [63]. Stress, a complex, documentary, and very important



Figure 2.
London: a calm, communal public space, with edible planting, in a therapeutic garden for people living with post-traumatic stress [57].



Figure 3.
PT-guided: performance physical Therapy's "PT guided fitness program" [57].

health issue, points to the importance of the issue of natural regeneration as a key advantage for PTSD to use for healing therapeutics.

According to above, one of the best ways to avoid tension from patient with PTSD treatment is to take refuge in nature. Studies have shown that the presence of plants in the environment reduces blood pressure, heart rate, muscle tension, stress, fatigue, and aggressive behavior, and factors such as level of comfort, tolerance and self-esteem, sense of well-being, life expectancy and enjoy the work environment. As defined by the World Health Organization (WHO), health is a physical, psychological, and social well-being, not just a lack of illness or illness, so the therapeutic landscape is a setting whose maximum design is trying to create healing properties in space. In fact, healing gardens through connection through human senses can heal and reduce the stress of everyday life. Evidences show that the following factors are effective in reducing stress in such spaces: good feelings from the nature, exercise and activity, social support, sense of control **Figure 3**.

5. Conclusion

Based on the above sections , in **Table 1** provides indicators status in a therapeutic landscape for people with PTSD.

How impact on health	Indicators status in a therapeutic landscape for people with PTSD	Therapeutic landscape Indicators
Stress reduction	Not too open and not too close	Balance between open and enclosed spaces
Reduced illness/positive distraction	Planting diversity, the use of short and long plants in combination with the use of green, blue and colorful landscapes	Vegetable diversity
Reducing stress and anxiety	Flexibility in various scales and elements such as paths, furniture activities, etc.	Flexibility
Reducing stress/decreasing blood pressure/decreasing anger	Abstraction and complexity for patients who are stressed are unacceptable	Minimizing ambiguity
Reducing stress/making sense of security for more mobility	Providing road safety for patients with mobility problems [slope, stairs, floors], proper lighting for the area	Create a sense of security
Reduce stress and calm down	The bird's attraction, the sound of the wind flow among the foliage, the sound of water	Decrease undesirable environmental noise and increase natural sounds
Positive distraction/stress reduction	The limited presence of some animals in some spaces [for example, the presence of fish in a pond or domestic birds]	Create a small ecosystem
Reduced heart rate/reduced anger/concentration	Use of water in ponds, lakes, etc.	Proper use of water
Positive effect on memory and navigation/decreased heart rate and blood pressure/decreased depression	Flora and plant species diversity, fruit trees	Spread flowers and plants of colorful and fragrant

How impact on health	Indicators status in a therapeutic landscape for people with PTSD	Therapeutic landscape Indicators
Reduce anger and depression/improve general state/increase cognitive capacity	Creating ground-level pots suitable for people with PTSD with physical restrictions [like wheelchairs]	Creating a workplace for horticulture
Reduce stress/decrease depression/improve memory, concentration and senses	The presence of attractive elements along the way to increase motivation and proper flooring, as well as the creation of shadows is essential	Create spaces for strolling

Table 1.
Conclusion.

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References

- [1] Smeltzer SC, Brenda G. Brunner and Suddrath's Text Book of Medical Surgical Nursing. 10th ed. Philadelphia: Lippincott; 2002
- [2] Ann Sloan D. Environmental Psychology and Human Well-Being Effects of Built and Natural Settings. Cambridge: Academic Press; 2018, 482 p
- [3] Compeanab E. Hamnerab: Posttraumatic stress disorder with secondary psychotic features (PTSD-SP): Diagnostic and treatment challenges. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*. 2019;**88**:265-275
- [4] Naderi Y, Moradi AR, Hasani J, Noohi S. Effectiveness of emotional schema therapy on cognitive emotion regulation strategies of combat-related post traumatic stress disorder veterans. *Iranian Journal of War and Public Health*. 2015;**7**(3):147-155
- [5] Shalev AY, Yehuda R, McFarlane AC. *International Handbook of Human Response to Trauma*. New York: Kluwer Academic/Plenum Press; 2000
- [6] Cooper Marcus C, Naomi S. *Therapeutic Landscapes: An Evidence Based Approach to Designing Healing Gardens and Restorative Outdoor Spaces*. New York :John Wiley & Sons Inc; 2014
- [7] US Department of Veterans Affairs. PTSD: National Center for PTSD [Internet]. 2016. Available from: <http://www.ptsd.va.gov/professional/PTSD-overview/index.asp> [Accessed: 07 April 2016]
- [8] Campbell DG, Felker BL, Liu C-F, Yano EM, Kirchner JE, Chan D, et al. Prevalence of depression-PTSD comorbidity: Implications for clinical practice guidelines and primary care-based interventions. *Journal of General Internal Medicine*. 2007;**22**(6):711-810
- [9] Ginzburg K, Ein-Dor T, Solomon Z. Comorbidity of posttraumatic stress disorder, anxiety and depression: A 20-year longitudinal study of war veterans. *Journal of Affective Disorders*. 2010;**123**(1):249-257
- [10] Breslau N, Davis GC, Schultz LR. Posttraumatic stress disorder and the incidence of nicotine, alcohol, and other drug disorders in persons who have experienced trauma. *Archives of General Psychiatry*. 2003;**60**(3):289-294
- [11] Jakupcak M, Cook J, Imel Z, Fontana A, Rosenheck R, McFall M. Posttraumatic stress disorder as a risk factor for suicidal ideation in Iraq and Afghanistan war veterans. *Journal of Traumatic Stress*. 2009;**22**(4):303-306
- [12] Goodnight J, Ragsdale K, Sam R, Rothbaum BO. Psychotherapy for PTSD: An evidence-based guide to a theranostic approach to treatment. *Progress in Neuro-psychopharmacology Biological Psychiatry*. 2019;**10**(88):418-426
- [13] Purtle J. Heroes' invisible wounds of war: Constructions of posttraumatic stress disorder in the text of US federal legislation. *Social Science & Medicine*. 2016;**149**:9-16
- [14] Prigerson HG, Maciejewski PK, Rosenheck RA. Population attributable fractions of psychiatric disorders and behavioral outcomes associated with combat exposure among US men. *American Journal of Public Health*. 2002;**92**(1):59-63
- [15] Kessler RC, Chiu W, Demler O, Walters EE, Revalence P. Severity, and comorbidity of 12-month DSM-IV disorders in the national comorbidity survey replication. *Archives of General Psychiatry*. 2005;**62**(6):617-627

- [16] Hatzenbuehler ML, Phelan JC, Link BG. Stigma as a fundamental cause of population health inequalities. *American Journal of Public Health*. 2013;**103**(5):813-821
- [17] Ghaffarzadegan N, Ebrahimvandi A, Jalali MS. A dynamic model of post-traumatic stress disorder for military personnel and veterans. *PLoS ONE*. 2016;**11**(10):e0161405
- [18] Ahmadizadeh M, Khodabakh A, Jafar A. The effectiveness of problem solving and prolonged exposure therapy methods and a combination of both on the adjustment of veterans suffering from war-related post-traumatic stress disorder. *Journal of Military Medicine*. 2012;**14**(3):178-185
- [19] Noohi AM, Tavallaei SA, Karami GR. Post-traumatic stress disorder (PTSD) among aggressive patients attending to Baqiyatallah psychiatric clinic in 2005. *Journal of Military Medicine*. 2006;**8**(3):175-181
- [20] Davidson J. Trauma: The impact of posttraumatic stress disorder. *Journal of Psychopharmacology*. 2000;**14**(2):S5-S12
- [21] Cao H, McFarlane AC, Klimidis S. Prevalence of psychiatric disorder following the 1988 Yun Nan (China) earthquake. *Social Psychiatry and Psychiatric Epidemiology*. 2003;**38**(4):204-212
- [22] Galea S, Vlahov D, Resnick H, Ahern J, Susser E, Gold J. Trends of probable post-traumatic stress disorder in New York City after the September 11 terrorist attacks. *American Journal of Epidemiology*. 2003;**158**(6):514-524
- [23] Parandeh A, Khaghanizadeh M, Karimi Zarchi A. The effect of training conflict resolution on quality of life's on spouses of war veterans post traumatic stress disorder. *Journal of Military Medicine*. 2006;**8**(1):45-51
- [24] Halligan SL, Yehuda R. Risk factors for PTSD. *PTSD Research Quarterly*. 2000;**11**(3):1-3
- [25] Kozaric-Kovacic D, Kocijan-Hercigonja D. Assessment of post-traumatic stress disorder and comorbidity. *Military Medicine*. 2001;**166**(8):677-680
- [26] Kozaric-Kovacic D, Kocijan-Hercigonja D, Grubisic-Ilic M. Posttraumatic stress disorder and depression in soldiers with combat experiences. *Croatian Medical Journal*. 2001;**42**(2):165-170
- [27] Sharma S, Ressler KJ. Genomic updates in understanding PTSD. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*. 2019;**90**:197-203
- [28] Korpela K, Hartig T. Restorative qualities of favorite places. *Journal of Environmental Psychology*. 1996;**16**:221-233
- [29] Mitchell R, Popham F. Green space, urbanity and health: Relationships in England. *Journal of Epidemiology and Community Health*. 2007;**61**:681-683
- [30] Richardson E, Mitchell R. Gender differences in relationships between urban green space and health in the United Kingdom. *Social Science & Medicine*. 2010;**71**(3):568-575
- [31] Mitchell R, Pearce J, Shortt N. Place, space and health inequalities. In: Smith K, Bambra C, Hill S, editors. *Health Inequalities: Critical Perspectives*. Oxford: OUP; 2015
- [32] Kaplan S. The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*. 1995;**15**(31):69-182
- [33] Kaplan R, Kaplan S. Adolescents and the natural environment: A time out? In: Kahn PH Jr, Kellert SR, editors. *Children*

and Nature: Theoretical, Conceptual, and Empirical Investigations. Cambridge, MA: MIT Press; 2002

[34] Pretty J, Peacock J, Sellens M, Griffin M. The mental and physical health outcomes of green exercise. *International Journal of Environmental Health Research*. 2005;15:319-337

[35] Hartig T. Issues in restorative environments research: Matters of measurement. In: Fernández B, Hidalgo C, Salvador C, Martos MJ, editors. *Psicología Ambiental: Entre los Estudios Urbanos y el análisis de la Sostenibilidad*. Almería: PSICAMB; 2011

[36] Kuo FE, Taylor AF. The potential natural treatment for attention deficit/hyperactivity disorder: Evidence for a national study. *American Journal of Public Health*. 2004;94:1580-1586

[37] Moore M, Townsend M, Oldroyd J. Linking human and ecosystem health: The benefits of community involvement in conservation groups. *EcoHealth*. 2006;3:255-261

[38] Maller C, Townsend M, Pryor A, Brown P, St Leger L. Healthy nature healthy people: 'Contact with nature' as an upstream health promotion intervention for populations. *Health Promotion International*. 2006;21(1):45-54

[39] Ulrich R. View through a window may influence recovery from surgery. *Science Journal*. 1984;224(4647):420-421

[40] Kofler W. *Ecology and Forests for Public Health*. Munich: International Council for Scientific Development; 2010

[41] Marberry SO. A Conversation with Roger Ulrich. *Healthcare Design*. 2010. Available from: www.healthcaredesignmagazine.com/article/

[conversation-rogerUlrich?Page=show](#) [Accessed: 01 November 2010]

[42] Taheri S, Shabani A. Conceptual and practical principles in designing healing gardens for veterans with PTSD with a focus on reducing stress—A narrative review. *Journal of Molecular Medicine*. 2016;18(3):230-241

[43] Hartig T, Evans G, Jamner LD, Davis DS, Garling T. Tracking restoration in natural and urban field settings. *Journal of Environmental Psychology*. 2003;23:109-123

[44] Ulrich R. Effects of gardens on health outcomes: Theory and research. In: Cooper Marcus C, Barnes M, editors. *Healing Gardens: Therapeutic Benefits and Design Recommendations*. New York: John Wiley; 1991

[45] Berto R. The role of nature in coping with psycho-physiological stress: A literature review on restorativeness. *Behavioral Sciences (Basel)*. 2014;4(4):394-409

[46] Sachs NA. Interview with Dr. Esther Sternberg, Author of *Healing Spaces: The Science of Place and Well-Being* [Internet]. 2009. Available from: www.healinglandscape.org/blog/2009/09/interview-with-dr-esthersternberg-author-of-healing-spaces-the-science-of-the-place-and-well-being [Accessed: 01 September 2009]

[47] Sternberg EM. *Healing Spaces: The Science and Place of Well-Being*. Cambridge, MA: Harvard University Press; 2010

[48] Kuo FE, Sullivan WC. Environment and crime in the inner city: Does vegetation reduce crime? *Environment and Behavior*. 2001;33(3):343-367

[49] Kuo FE. Coping with poverty: Impacts of environment and attention in the inner city. *Environment and Behavior*. 2001;33(1):5-34

- [50] Kuo FE, Sullivan WC. Aggression and violence in the inner city: Impacts of environment via mental fatigue. *Environment and Behavior*. 2001;**33**(4):543-571
- [51] Li Q, Morimoto K, Nakadai A, Inagaki H, Katsumata M, Shimizu T, et al. Forest bathing enhances human natural killer activity and expression of anti-cancer proteins. *International Journal of Immunopathology and Pharmacology*. 2007;**20**:3-8
- [52] Lindemuth AL. *Greening in the Red Zone: Disaster, Resilience, and Community Greening*. Netherland: Springer; 2014
- [53] Francis C, Cooper Marcus C. Places people take their problems. In: *Proceedings of Annual Conference of Environmental Design and Research Association*. 1991;**22**:178-84
- [54] Ulrich R. Effects of healthcare environmental design on medical outcomes design and health. In: *Proceedings Design and Health World Congress and Exhibition*; Stockholm: 2001. pp. 49-69
- [55] Ulrich R. Health Benefits of Gardens in Hospitals. Paper for conference, *Plants for People International Exhibition Florida*; 2002
- [56] Kaplan R, Kaplan S. *The Experience of Nature: A Psychological Perspective*. Cambridge: Cambridge University Press; 1989
- [57] Souter-Brown G. *Landscape and Urban Design for Health and Well-Being: Using Healing, Sensory and Therapeutic Gardens*. London:Routledge Press; 2015
- [58] Williams A. *Therapeutic Landscapes: The Dynamic between Place and Wellness*. Lanham, MD: University Press of America; 1999. pp. 1-11
- [59] Baer LD, Gesler WM. Reconsidering the concept of therapeutic landscapes in JD Salinger's *The Catcher in the Rye*. *Area*. 2004;**36**(4):404-413
- [60] Thorsen RS. Conceptualizations of pluralistic medical fields: Exploring the therapeutic landscapes of Nepal. *Health and Place*. 2014;**31**:83-89
- [61] Dunkley CM. A therapeutic taskscape: Theorizing place-making, discipline and care at a camp for troubled youth. *Health and Place*. 2008;**15**:88-96
- [62] Gesler W, Kearns RA. *Culture/Place/Health*. London and New York: Routledge; 2002
- [63] Milligan C. 'Cultivating health': Therapeutic landscapes and older people in northern England. *Social Science and Medicine*. 2004;**58**:1781-1793