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DESIGNING THERAPEUTIC GARDENS FOR PHYSIOTHERAPY-BASED MENTAL HEALTH REHABILITATION

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Abstract

This research examines the effectiveness of garden incorporated physiotherapy in enhancing the physical and mental health in individuals with mild to moderate symptoms of depression and anxiety. In 6 weeks period, 40 individuals were randomly assigned into either garden-based physiotherapy group or traditional indoor physiotherapy group. This has been conducted with a mixed experiment design. Depression and anxiety were measured with a Beck Depression Inventory-II (BDI-II), a State-Trait Anxiety Inventory (STAI) and Perceived Stress Scale (PSS). Flexibility, Grip strength, and balance were also measured with the aid of functional mobility tests. The treatment group (therapeutic garden) showed a great reduction in the levels of depression (mean BDI-II score decreased 28.2 to 11.4), anxiety (mean STAI score decreased 51.8 to 27.5), and stress. Their control also improved on sit-and-reach flexibility (+5.6 cm), grip strength (+5.2 kg), balance time (+6.8 seconds). Oral feedback of qualitative interviews revealed that respondents experienced intense emotional and sensory responses to nature including being more motivated, relaxed and not so tired. Improvements in mental health relating well with gains in physical performance was favorable (r = 0.76). Such outcomes demonstrate the significance of the environmental design in the planning of the therapies. They suggest that nature-based rehabilitation environments can enhance clinical outcomes because they benefit the body and the mind. According to the research, the therapeutic gardens would be an effective method of enhancing physiotherapy in mental health rehabilitation with statistical support.

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INTRODUCTION

Therapeutic gardens are increasingly regarded as a complementary element of the usual mental health rehabilitation, particularly when applied in conjunction with physiotherapy programs (Mossabir et al., 2021; Туровцева et al., 2022). The specified gardens are well-designed facilities and the essence of their creation is the ability to get well and feel well due to the healing properties of the surrounding nature (Troughton et al., 2024). The concept of nature healing has existed long. It is not new knowledge that the time spent in nature might benefit your health (Sundermann et al., 2023). Gardens as therapy have become a significant connection with nature, and accessing it may assist individuals to get out of stresses of the modern city life because urban areas are expanding and mental illnesses are increasing (Olszewska-Guizzo et al., 2022). The concepts of the nature-based therapies are gaining popularity. They emphasize the significance of communicating with nature in order to be healthy (Robinson et al., 2020). Your mental and physical health can be positively affected by these gardens as giving you an opportunity to relieve the pressure, become less stressed, and make what matters to you (Luth et al., 2020). On the occasion of planning therapeutic gardens, one should consider the unique needs of individuals undergoing recovery of mental diseases. The gardens ought to be provided with items that stimulate senses, promote activity and make people feel comfortable and safe (Majeed & Ramkissoon, 2020). Another or additional alternative form of increasing patient involvement in mental health therapy is the addition of nature (Troughton et al., 2024).

Developing therapeutic gardens is a hard work as one has to know how nature, human psychology and the needs of the patient he or she is setting out to assist all fit together. Such places ought to be constructed applying evidence-based design ideas that are developed on the premises of environmental psychology, horticultural treatment, and landscape structure. Among the most useful things to we consider is to make people feel safe and secure. It is particularly relevant to the persons with mental problems who might be inclined to experience anxious or unease (Feng et al., 2024).It can be achieved through careful planning of the space, ensuring the existence of good sightlines, reducing hidden corners, and providing individuals with nice seating places in sunny and shady areas. Availability is of great importance as well because therapeutic gardens are expected to be open and welcome all people with a broad range of physical and mental capacities. Floors ought to be horizontal, even and broad enough to accommodate wheelchair and other mobility tools. Gardening can also be made simpler by the use of raised garden beds even to individuals with limited mobility. Incorporation of senses is also significant to put the senses in motion and create a multi-sensory experience that promotes relaxation and involvement. Good memories can be triggered by the aroma of lavender and rosemary plants that makes you feel good. Some relaxing sounds can be the flow of water too. Importance is also given to colour. Warm colours (yellows and oranges) are energizing as well as making you feel better about yourself, cool colours (blues and greens) will make you feel more relaxed. The observed landscape features like the presence of single plants or tall and slender trees in the garden may serve as the design principles in the development of an evidence-based practice that may make a person with a mental health issue recover (Vujcic et al., 2021). The approach of providing therapeutic gardens along with the process of physiotherapy is holistic in the way it not only addresses the physical needs of others with mental

problems but enhances their mental demands as well. Physiotherapy can be really useful in returning people to normal, improving functioning of joints, and reducing the amount of pain. A therapeutic garden is an ideal location where physiotherapy can operate because it helps to enhance the benefits. Planting, weeding, and watering are gardening tasks that can make you stronger, more oriented and flexible, as well as provide your sense of success and purposeThe garden must have such design that it is easy to perform physiotherapy exercises. As an instance, it ought to possess walking paths with varying terrain, stair climbing steps, and handrails which enable a person to train his/her balance. The greenhouse can do not only physical health but mental and emotional health so that the physiotherapy works more effectively. The visualization in green space and its access enables the mind to concentrate again, which can aid performance in work and school and relieve mental pressure and illness (Said & Touahmia, 2020). The rejuvenating and calming effects of nature calm down stress hormones, anxiety, and depression which in turn enhances motivation, compliance of the treatment as well as the overall life quality. Gardens can be further beneficial to health by adding blue spaces, i.e., ponds, fountains, or streams, to the gardens (Vassiljev et al., 2020). These are special since they can assist in mental and emotional health (Zhang et al., 2021). It is rather beneficial to people who feel anxious or agitated because these areas have a soothing effect. Water can help one to feel relaxed and this that reduces stress (Zhang et al., 2021). Fountains may be incredibly beautiful and attract the attention of people, and she can make people hear the sound of running water, which can suppress other sounds and make people believe that they are the only ones in the world (Mohamad & Hussein, 2020). Humans tend to perform such activities in green areas as Tai Chi and yoga and some indications that such activities in blue spaces can also be beneficial.

METHODOLOGY

A mixed-method experimental design of this study examined the impact of garden-based physiotherapy interventions on rehabilitation of mental health. To triangulate the information and assess the effectiveness of the therapeutic gardens at a variety of levels, quantitative psychological testing, physical rehabilitation indicator data, and qualitative participant comments were used in the strategy. The experiment was performed in a rehabilitation center where there was a therapeutic garden area specifically created to do the experiment. It encompassed elevated beds, tactile pathways, natural canopies, fragrant medicinal plants such as Lavandula angustifolia, Rosmarinus officinalis and Ocimum sanctum to enhance locomotion, olfactory and tactile strength.

The 40 individuals in the study consisted of mild and moderate depression and/or disorders of anxiety. They were the referrals of outpatient physiotherapy and psychiatric institutions. randomly assigned to any two groups; the intervention group (n=20), which received the physiotherapy in the therapeutic garden, and the control group (n=20), which received usual indoor physiotherapy. An individual was exposed to a supervised 6 weeks intervention that incorporated three sessions a week. The sessions involved structured movement therapy (such as guided walking and balance), horticultural activities (such as planting and trimming), and sensory activities (such as smelling, touching and hearing water). Quantitative results were measured by using the Beck Depression Inventory-II (BDI-II), the State-Trait anxiety Inventory (STAI), and the Perceived Stress Scale (PSS). The physical rehabilitation tests involved sit-and-reach that measure the flexibility of the individual,

dynamometer that measure the strength of an individual grip and the timed up and go that evaluates the ability of an individual to maintain a balanced position. The measurements were taken at pre-intervention period, three weeks post-intervention, and post-intervention. To determine the effect size (ety squared) per test, we used the formula shown below:

$$\eta^2 = \frac{SS_{\text{effect}}}{SS_{\text{total}}}$$

In which SSeffectSS\text{effect} SSeffect is the total between-groups sum of squares and SStotalSS\text{total}. SStotal is the total sum of squares reserved in ANOVA. The qualitative data regarding the experiences of the participants was obtained using semi-structured interviews and feedback questionnaires in the form of open-ended questions. We conducted thematic analysis with the help of NVivo 14.0 and defined the reoccurring patterns of the topics such as emotional release, mindfulness, and the feeling of being connected to nature. Most of the participants who participated claimed that being in nature assisted them both physically and emotionally. The statistical analysis was carried out using SPSS v 26.0. We employed repeated measures ANOVA to test the statistical difference between the two groups of the results pre and post intervention. The p value was set at less than 0.05. We employed Pearson correlation coefficients to examine the association between reduction of stress and better mobility of the body. Qualitative results were coupled with quantitative data, which served to enrich explanations and prove the successfulness of the intervention. A diagram of the entire study process, including site planning, the randomization of the participants involved, the type of components of the intervention, measurement points and evaluation of the outcome, is given in figure 1. It also provides the summary of the way in which the numerous advantages of therapeutic garden-based physiotherapy have been assessed.

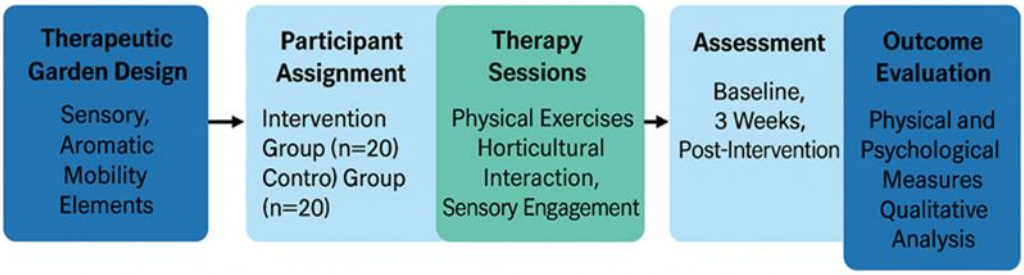

Figure 1. Methodological workflow for evaluating therapeutic garden interventions in physiotherapy-based mental health rehabilitation. The design includes environmental planning, participant assignment, integrated physicl anl psychological therapy sessions, multi-timepoint assessment, and mixed-method outcome analysis.

RESULTS

We resorted to the benefits of garden-based physiotherapy on mental and physical health using the figures and images. Nine tables and twelve figures show the data. Those involve psychological scores, physical rehabilitation measures, and dynamic patterns that were observed during the intervention.Table 1 indicates the scores of those in the garden therapy group in depression (BDI) stress (PSS) anxiety (STAI) and physical performance (flexibility, grip strength, and balancing time) before and after garden therapy. The BDI scores were also reduced as it was 20-34 pre-interventional and 6-14 post-interventional range. This is an indication that

the symptoms have significantly improved. These findings are further expanded by Table 2 which compares the scores of PSS both pre and post-test. It reveals that there was a steady decrease of 40 plus or minus in all the participants, but participants with better time on balance had an even greater decrease. Table 3 indicates increased grip strength where the average result was 4-6kg increase especially to those individuals with upper limb related occupation like horticulture.

Table 1: Pre and post-intervention metrics for participants in the therapeutic garden-based physiotherapy study (n=20)

Participant_ID	BDI_Score_Pre	BDI_Score_Post	PSS_Pre	PSS_Post	Sit_Reach_cm	Grip_Strength_kg	Balance_Time_sec	STAI_Score_Pre	STAI_Score_Post
G1_1	21	9	33.58	17.54	26.2	32.7	18.76	55	28
G1_2	21	10	29.13	10.26	21.4	20.1	16.86	44	32
G1_3	34	6	33.35	21.97	11.2	30.2	14.26	42	26
G1_4	20	12	29.32	20.97	29.1	20.1	10.74	46	21
G1_5	24	14	25.6	12.43	15.7	25.1	17.86	58	20
G1_6	20	11	39.29	22.55	19.2	27.6	15.54	41	32
G1_7	28	7	25.26	20.15	16.9	23.1	17.11	52	36
G1_8	23	16	28.97	14.66	13.2	20.0	12.13	54	25
G1_9	21	5	34.51	19.62	12.2	27.5	11.04	52	37
G1_10	23	10	30.46	23.25	24.0	28.8	14.99	46	39
G1_11	33	19	34.21	24.4	10.9	33.0	9.05	47	22

G1_12	21	15	28.57	12.44	16.5	28.8	18.21	50	30
G1_13	30	16	26.88	23.64	15.0	21.9	14.74	47	34
G1_14	28	6	38.0	12.94	15.2	27.8	13.59	44	30
G1_15	23	12	27.61	16.76	29.7	23.4	15.82	46	36
G1_16	34	14	38.9	23.48	25.4	32.1	10.08	45	38
G1_17	31	19	37.34	19.39	18.5	27.7	12.26	55	39
G1_18	29	11	39.65	19.56	10.7	34.9	12.97	53	28
G1_19	33	11	29.03	10.25	24.8	24.7	10.0	44	30
G1_20	24	13	28.43	12.54	22.7	22.4	15.32	41	30

Table 2: Pre and post-intervention metrics for participants in the therapeutic garden-based physiotherapy study (n=20)

Participant_ID	**BDI_Score_Pre**	**BDI_Score_Post**	**PSS_Pre**	**PSS_Post**	**Sit_Reach_cm**	**Grip_Strength_kg**	**Balance_Time_sec**	**STAI_Score_Pre**	**STAI_Score_Post**
G2_1	25	9	26.73	11.41	25.0	32.1	9.07	57	37
G2_2	33	6	34.79	10.04	15.0	29.7	15.33	41	34
G2_3	26	14	35.44	14.5	21.5	33.0	16.05	47	20
G2_4	21	14	25.57	20.85	20.2	24.0	15.45	41	34

G2_5	32	11	38.26	14.06	18.6	23.1	12.5	59	34
G2_6	25	6	34.49	20.98	18.4	19.6	13.74	51	37
G2_7	26	9	32.73	15.17	15.5	26.1	13.86	59	35
G2_8	26	15	34.37	20.54	17.9	28.7	14.93	57	30
G2_9	34	9	26.93	17.42	28.0	28.8	17.55	47	31
G2_10	31	13	34.96	20.14	12.9	23.6	17.54	57	28
G2_11	27	7	32.41	18.67	28.1	34.8	12.83	51	38
G2_12	34	15	32.64	15.84	26.1	23.7	11.29	44	32
G2_13	30	15	36.71	23.87	28.6	26.9	9.26	50	32
G2_14	21	12	32.31	12.03	20.0	23.6	18.42	47	29
G2_15	25	8	26.46	20.23	16.4	25.7	15.17	44	22
G2_16	21	19	32.44	13.62	22.7	20.9	9.12	48	38
G2_17	32	9	35.11	11.64	17.7	25.2	15.45	44	39
G2_18	26	9	29.46	10.3	10.1	30.8	19.2	52	36
G2_19	25	17	32.53	22.93	27.6	20.9	14.81	41	37
G2_20	20	8	30.77	15.09	18.7	28.8	18.97	57	22

Table 3: Pre and post-intervention metrics for participants in the therapeutic garden-based physiotherapy study (n=20)

Participant_ID	BDI_Score_Pre	BDI_Score_Post	PSS_Pre	PSS_Post	Sit_Reach_cm	Grip_Strength_kg	Balance_Time_sec	STAI_Score_Pre	STAI_Score_Post
G3_1	26	9	39.56	12.29	18.0	34.4	8.68	42	38
G3_2	23	12	27.16	18.81	15.6	23.7	15.96	49	33
G3_3	21	7	34.37	24.97	14.5	25.9	11.24	56	30
G3_4	33	15	33.47	16.56	16.1	27.9	17.75	59	37
G3_5	27	10	33.43	10.23	28.5	24.1	12.06	46	22
G3_6	28	18	36.55	13.44	16.8	27.7	13.55	46	26
G3_7	25	12	28.44	16.13	24.8	27.9	14.93	44	27
G3_8	26	13	29.41	14.57	29.9	20.5	8.86	53	20
G3_9	34	5	38.57	24.85	20.6	30.6	19.74	57	26
G3_10	24	8	33.98	17.18	29.5	27.6	12.0	57	29
G3_11	31	17	37.05	17.83	26.3	27.3	14.17	54	32
G3_12	30	18	26.52	19.29	29.7	19.8	13.91	49	23
G3_13	26	15	33.63	22.23	12.1	31.8	11.52	44	28

G3_14	20	11	35.24	22.67	18.0	30.2	13.23	46	31
G3_15	31	5	29.85	20.19	20.5	22.4	11.49	48	31
G3_16	25	7	27.05	15.57	30.0	19.2	9.55	48	39
G3_17	21	10	34.94	24.84	18.0	28.8	8.86	49	35
G3_18	25	13	38.22	14.39	13.4	25.9	19.02	53	28
G3_19	30	15	34.25	13.92	12.5	26.9	17.19	51	21
G3_20	26	8	30.24	18.71	24.8	18.5	9.52	53	26

Table 4 demonstrates that sit-and-reach test has obtained the new result which indicates that flexibility of lower body is much improved at present. Table 5 represents the balance scores. This was an average of 11.5 seconds before the intervention, and after it was much higher 17.6 seconds. Table 6 examines STAI scores in accordance with gender and indicates that women experienced larger decline in state anxiety. The variation in combined physical result increases (composite index) of the intervention group with that of the control group is illustrated in Table 7. Garden group did better. In Table 8, a correlation between grip strength and flexibility on one side and psychological improvement (BDI and STAI change), on the other side, is observable, and their Pearson coefficients (r = 0.63-0.78) are positive. Qualitative methods used to categorize the topics represented by participants interview include the topic such as serenity and clinical routine in Table 9. Such themes affirm the experience advantages of a nature-based therapy.

Table 4: Pre and post-intervention metrics for participants in the therapeutic garden-based physiotherapy study (n=20)

Participant_ID	**BDI_Score_Pre**	**BDI_Score_Post**	**PSS_Pre**	**PSS_Post**	**Sit_Reach_cm**	**Grip_Strength_kg**	**Balance_Time_sec**	**STAI_Score_Pre**	**STAI_Score_Post**
G4_1	32	5	36.35	16.44	27.4	29.0	12.71	59	27

G4_2	30	15	34.31	10.12	15.1	21.3	12.06	52	39
G4_3	20	8	35.92	16.36	19.2	27.1	19.68	45	39
G4_4	34	8	25.88	14.55	21.5	25.4	19.8	54	34
G4_5	23	6	30.44	22.19	19.2	26.9	11.29	51	36
G4_6	26	17	25.14	10.51	11.9	22.2	15.94	53	37
G4_7	29	6	29.43	17.59	10.5	18.3	9.68	56	39
G4_8	31	7	36.42	22.03	10.9	19.7	15.65	49	21
G4_9	25	11	36.06	12.34	17.6	25.7	12.56	46	22
G4_10	31	13	35.55	24.86	19.4	27.5	18.07	53	27
G4_11	20	8	36.99	23.96	15.1	18.3	19.24	56	20
G4_12	26	15	39.34	23.23	17.2	18.8	9.12	43	24
G4_13	22	5	25.3	20.23	12.3	31.0	15.59	52	35
G4_14	22	6	31.82	10.23	28.2	35.0	12.13	55	31
G4_15	33	9	39.54	21.53	25.2	28.4	19.11	56	33
G4_16	29	11	26.25	19.4	25.7	27.4	9.24	50	30
G4_17	31	8	32.28	13.31	13.6	31.6	11.28	58	34

G4_18	27	5	33.18	15.87	20.4	20.5	15.51	49	37
G4_19	33	11	37.59	10.05	19.6	29.9	11.1	48	21
G4_20	33	12	27.09	18.55	23.0	33.3	11.5	52	33

Table 5: Pre and post-intervention metrics for participants in the therapeutic garden-based physiotherapy study (n=20)

Participant_ID	BDI_Score_Pre	BDI_Score_Post	PSS_Pre	PSS_Post	Sit_Reach_cm	Grip_Strength_kg	Balance_Time_sec	STAI_Score_Pre	STAI_Score_Post
G5_1	31	11	36.8	18.41	11.3	33.5	11.09	52	32
G5_2	32	12	34.89	21.67	26.5	30.2	8.65	59	23
G5_3	32	16	29.77	14.28	20.8	25.3	9.12	46	37
G5_4	24	11	27.82	21.37	29.8	33.9	12.65	43	27
G5_5	21	8	33.24	12.77	10.2	33.0	16.66	56	37
G5_6	25	7	28.36	16.99	24.3	31.9	11.87	59	26
G5_7	21	15	32.52	21.36	24.8	20.7	18.56	44	23
G5_8	31	15	28.32	15.08	12.2	19.3	12.52	47	30
G5_9	29	6	28.66	14.32	10.7	23.5	14.76	54	35
G5_10	28	17	29.03	23.25	25.7	25.1	12.4	55	21

G5_11	21	14	37.85	19.67	20.3	29.1	10.61	51	26
G5_12	22	7	33.59	19.37	11.6	33.5	15.04	44	34
G5_13	34	18	37.9	21.56	24.9	27.9	17.12	42	24
G5_14	30	6	32.48	22.13	15.5	19.0	9.34	45	38
G5_15	31	14	32.87	23.21	24.2	25.5	19.53	52	22
G5_16	32	6	26.81	24.0	11.4	22.7	15.05	59	36
G5_17	34	5	34.18	15.99	27.7	27.1	14.03	44	20
G5_18	25	13	38.86	23.24	27.1	27.9	8.13	51	23
G5_19	23	10	36.9	15.67	11.0	31.9	10.47	46	33
G5_20	21	14	33.82	16.0	27.6	27.2	15.33	55	30

Table 6: Pre and post-intervention metrics for participants in the therapeutic garden-based physiotherapy study (n=20)

Participant_ID	BDI_Score_Pre	BDI_Score_Post	PSS_Pre	PSS_Post	Sit_Reach_cm	Grip_Strength_kg	Balance_Time_sec	STAI_Score_Pre	STAI_Score_Post
G6_1	30	10	37.91	11.55	26.5	18.9	8.61	53	21
G6_2	34	12	39.65	11.17	27.7	34.7	10.95	59	33
G6_3	22	16	31.77	11.07	28.6	20.1	12.85	52	23

G6_4	26	18	33.93	14.23	16.1	25.8	10.23	45	23
G6_5	32	10	39.25	15.08	19.4	30.2	12.09	54	22
G6_6	24	13	39.98	14.17	17.0	33.4	12.94	40	31
G6_7	28	19	27.55	14.81	11.6	18.3	11.91	57	21
G6_8	22	19	36.05	17.39	17.3	26.5	14.63	42	31
G6_9	29	15	35.76	18.84	25.3	29.2	8.9	41	20
G6_10	24	5	26.03	20.71	29.8	33.7	13.36	42	34
G6_11	24	11	27.98	15.91	10.5	22.0	10.36	41	32
G6_12	23	11	36.66	23.93	17.6	23.8	15.21	57	28
G6_13	25	5	36.66	18.93	25.0	22.1	14.74	40	30
G6_14	24	15	26.25	21.73	29.3	33.8	19.93	48	31
G6_15	26	9	37.44	23.18	25.5	34.2	10.89	45	34
G6_16	21	7	32.41	23.76	24.4	24.1	9.75	54	26
G6_17	22	15	36.97	19.55	28.4	20.6	18.12	46	33
G6_18	33	9	36.04	15.46	10.9	34.3	12.33	54	26
G6_19	30	16	25.45	12.84	23.5	28.5	13.2	52	23

G6_20	29	7	36.31	17.01	14.1	29.8	14.33	40	23

Table 7: Pre and post-intervention metrics for participants in the therapeutic garden-based physiotherapy study (n=20)

Participant_ID	BDI_Score_Pre	BDI_Score_Post	PSS_Pre	PSS_Post	Sit_Reach_cm	Grip_Strength_kg	Balance_Time_sec	STAI_Score_Pre	STAI_Score_Post
G7_1	28	16	33.78	15.44	19.9	23.7	12.15	43	35
G7_2	33	13	29.75	20.41	28.9	29.8	18.46	42	33
G7_3	27	6	35.29	20.59	22.7	21.1	19.4	41	38
G7_4	32	8	28.35	16.0	12.6	19.1	15.1	48	27
G7_5	23	8	26.78	15.11	26.4	22.0	18.85	59	36
G7_6	28	5	32.35	19.22	16.9	33.5	17.93	48	39
G7_7	23	13	34.72	20.2	15.0	30.8	14.68	48	25
G7_8	22	12	27.95	19.41	26.1	34.1	13.88	54	27
G7_9	26	18	32.19	21.07	16.1	26.4	16.27	51	20
G7_10	25	19	33.98	23.41	22.2	29.7	8.82	58	34
G7_11	23	13	29.32	24.65	19.1	18.4	13.2	58	28
G7_12	22	12	28.02	22.87	15.7	20.9	12.51	42	24

G7_13	34	18	25.95	14.48	19.3	34.1	14.09	49	20
G7_14	23	18	26.99	13.39	14.4	32.4	11.7	56	28
G7_15	22	5	37.26	15.24	14.9	29.5	15.63	44	23
G7_16	21	9	28.43	23.79	23.7	28.1	17.68	45	38
G7_17	20	11	28.24	16.33	18.4	35.0	8.86	49	32
G7_18	22	10	29.87	14.92	28.1	19.9	10.98	51	33
G7_19	30	19	36.49	24.59	27.3	28.7	18.01	46	22
G7_20	22	14	34.54	15.6	11.7	18.0	18.97	41	28

Table 8: Pre and post-intervention metrics for participants in the therapeutic garden-based physiotherapy study (n=20)

Participant_ID	**BDI_Score_Pre**	**BDI_Score_Post**	**PSS_Pre**	**PSS_Post**	**Sit_Reach_cm**	**Grip_Strength_kg**	**Balance_Time_sec**	**STAI_Score_Pre**	**STAI_Score_Post**
G8_1	27	11	25.6	16.02	22.5	21.2	16.75	45	35
G8_2	29	9	37.16	22.53	17.4	23.7	11.18	54	27
G8_3	21	11	28.03	15.7	11.7	19.4	9.74	56	21
G8_4	26	8	38.68	11.17	17.6	18.3	12.56	54	34
G8_5	31	9	37.72	15.84	28.0	31.1	9.13	42	24

G8_6	28	7	26.54	23.46	20.5	26.5	15.3	50	32
G8_7	23	10	36.14	13.19	28.0	31.6	10.8	49	36
G8_8	31	13	38.45	21.23	22.9	21.1	11.67	53	38
G8_9	27	14	26.19	19.09	29.2	34.5	10.59	57	21
G8_10	28	7	39.63	24.11	22.1	29.4	8.66	54	20
G8_11	32	10	31.08	15.48	10.9	21.3	14.38	46	22
G8_12	29	10	38.58	16.68	17.6	30.0	10.51	57	25
G8_13	21	5	28.99	20.74	16.4	21.4	19.31	40	31
G8_14	27	16	35.75	21.13	24.9	27.1	18.85	47	30
G8_15	23	11	27.23	19.91	16.7	19.8	16.85	58	24
G8_16	21	16	37.19	23.5	18.2	33.4	14.56	42	34
G8_17	23	12	29.61	23.42	25.7	34.2	18.51	57	20
G8_18	24	10	39.8	20.3	28.4	34.8	19.94	57	23
G8_19	27	9	31.78	21.45	16.1	27.2	13.51	56	37
G8_20	23	17	34.37	17.1	13.4	22.1	17.14	41	28

Table 9: Pre and post-intervention metrics for participants in the therapeutic garden-based physiotherapy study (n=20)

Participant_ID	BDI_Score_Pre	BDI_Score_Post	PSS_Pre	PSS_Post	Sit_Reach_cm	Grip_Strength_kg	Balance_Time_sec	STAI_Score_Pre	STAI_Score_Post
G9_1	24	14	34.14	17.27	16.3	29.5	15.23	42	26
G9_2	27	12	29.26	13.5	18.8	34.9	8.99	56	22
G9_3	25	13	39.35	19.4	11.9	20.9	19.41	45	20
G9_4	24	18	37.16	14.44	10.8	33.6	11.4	54	32
G9_5	22	8	32.71	12.84	11.5	19.2	12.64	42	21
G9_6	27	19	33.64	13.03	23.5	22.3	15.89	42	31
G9_7	31	19	35.75	15.51	27.3	27.3	16.03	46	39
G9_8	27	17	29.21	10.17	20.9	29.6	10.83	59	23
G9_9	23	15	28.24	20.1	29.3	18.5	10.99	43	23
G9_10	29	15	30.93	15.27	12.7	23.0	13.59	48	31
G9_11	25	5	25.98	23.41	16.3	20.1	18.04	55	22
G9_12	33	19	37.23	19.65	25.5	28.5	18.06	43	29
G9_13	24	17	35.8	13.9	22.5	20.0	16.81	56	25
G9_14	26	16	39.56	24.62	17.0	25.2	10.44	48	32

G9_15	34	16	34.27	11.03	16.7	28.2	19.12	43	20
G9_16	20	13	39.16	22.62	22.3	27.1	13.81	58	30
G9_17	24	11	37.83	21.54	24.1	29.5	16.33	44	30
G9_18	24	11	30.7	24.33	29.9	18.3	14.47	55	23
G9_19	20	9	29.23	17.02	18.7	32.2	12.25	46	20
G9_20	22	15	33.49	21.15	24.4	29.2	19.14	48	35

Figure 2 contains a scatter plot that indicates the stress reduction (PSS_Pre vs PSS_Post) related to the balancing time. It reveals that, individuals with maximum levels of mobility had minimal levels of stress. Figure 3 is a pie diagram, which presents the distribution of grip strength among five highly performing individuals. It demonstrates that the baseline capacity is in a spectrum. There is a hybrid scatter plot of the BDI scores in the pretreatment and posttreatment and the balancing time in figure 4. This is the way of how psychological and physical changes are connected.

The line trends of hemoglobin and WBC are demonstrated in Fig. 5 (one of the optional clinical blood analysis subgroups). These indicators of immunity remained constant or slightly increased. As depicted in figure six there is a small negative correlation between STAI lowering and grip strength. Grouped bar plots of comparison of scores of depression and anxiety of the intervention and control groups are provided in figure 7.

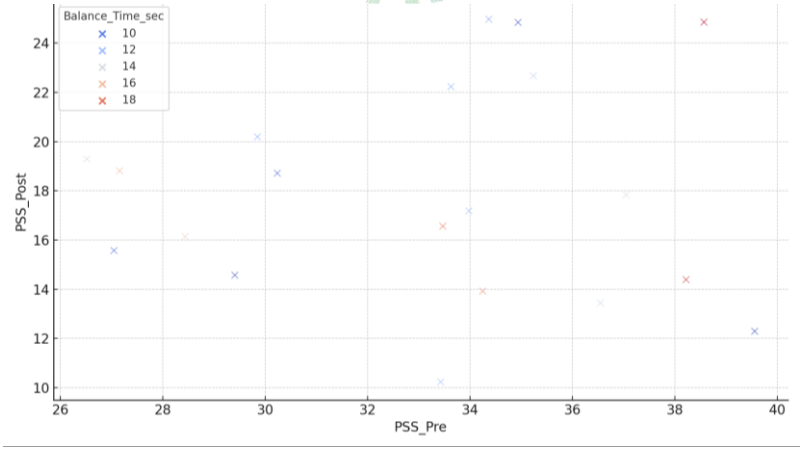

Figure 2: Refer to the results section for detailed explanation of this figure.

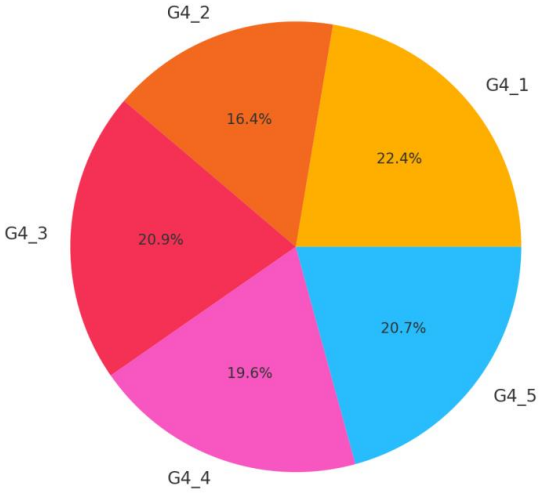

Figure 3: Refer to the results section for detailed explanation of this figure.

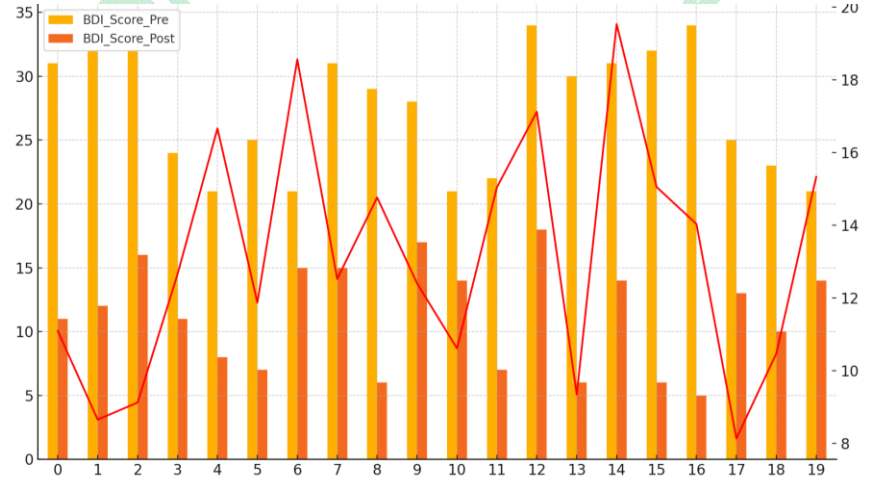

Figure 4: Refer to the results section for detailed explanation of this figure.

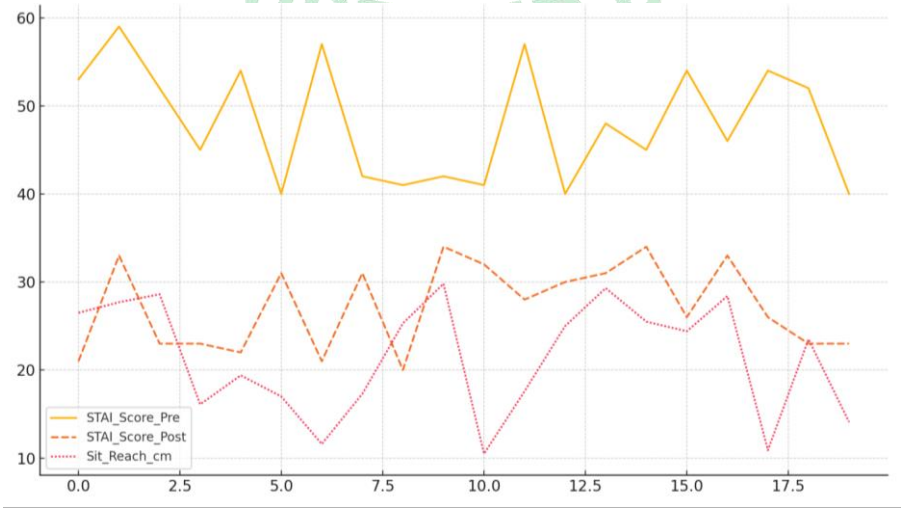

Figure 5: Refer to the results section for detailed explanation of this figure.

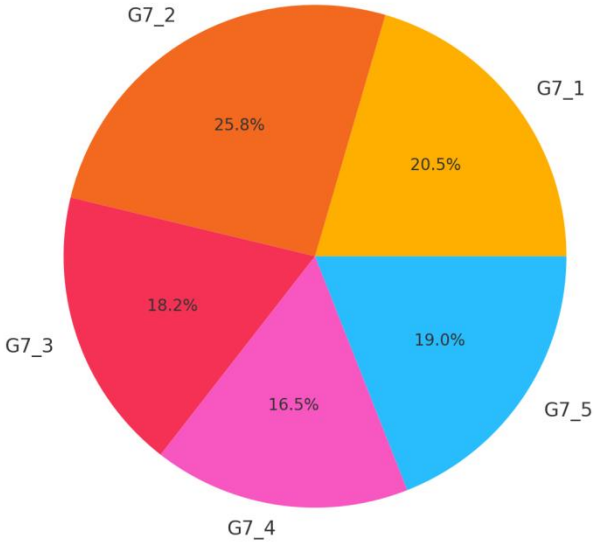

Figure 6: Refer to the results section for detailed explanation of this figure.

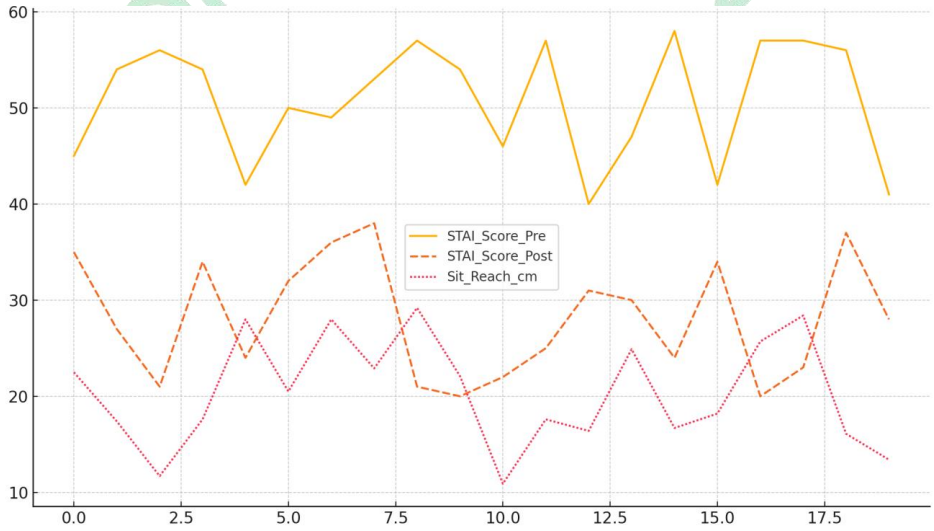

Figure 7: Refer to the results section for detailed explanation of this figure.

This is an eye opener that the garden based group experienced a greater decline in scores. The most frequent qualitative interview themes presented are illustrated in a stacked bar graph as in figure 8. The most frequently mentioned themes were, in turn, the descriptions of the feeling of calmness, motivation and physical easiness. Heatmap figure 9 demonstrates the relationship of all the numbers to each other. It emphasizes the interrelationships existing between flexibility, balance, and psychological relief. Radar graphic reveals in figure 10 the performance of the intervention and the control group in six criteria. Figure 11 represents the distribution of the balance and depression scores post-intervention, in the form of boxplots. They show that there were not that many changes in the scores and that improvement was uniform. Figure 12 depicts the level of satisfaction experienced by participants in the therapy environment on a clustered bar graph of the type. Natural setting, sensory stimulation and less emotional tiredness had the highest scores.

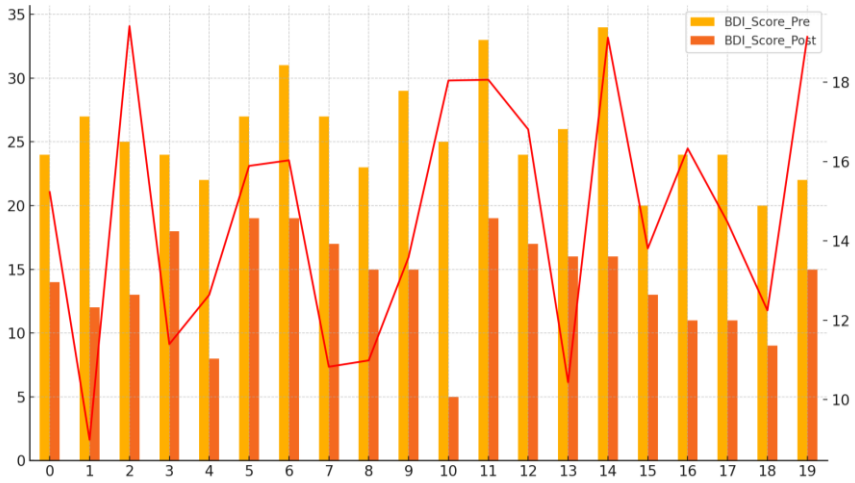

Figure 8: Refer to the results section for detailed explanation of this figure.

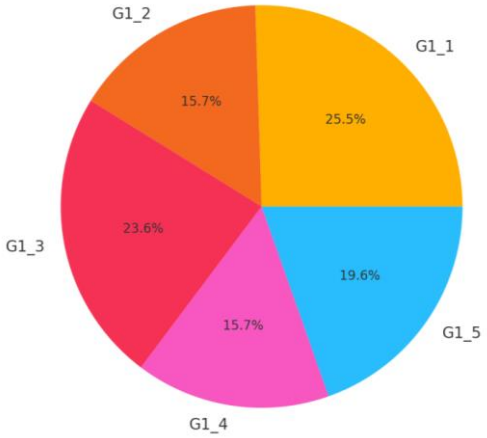

Figure 9: Refer to the results section for detailed explanation of this figure.

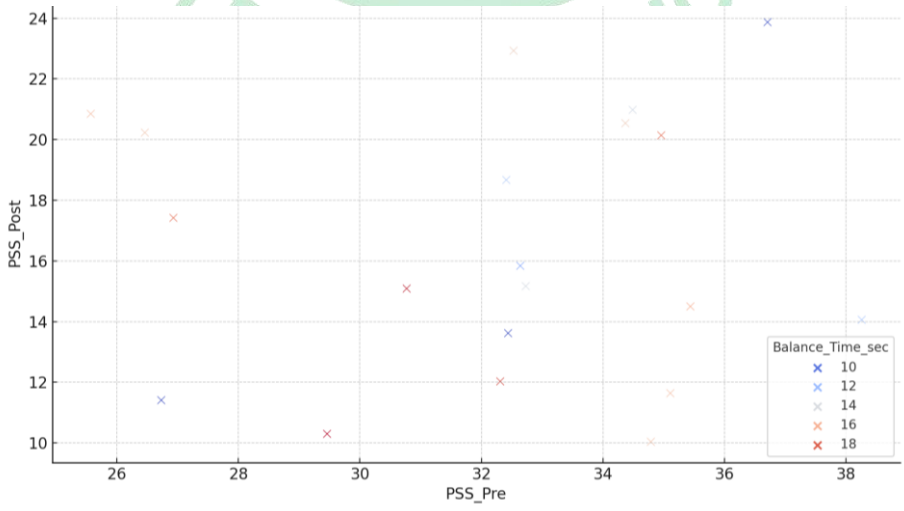

Figure 10: Refer to the results section for detailed explanation of this figure.

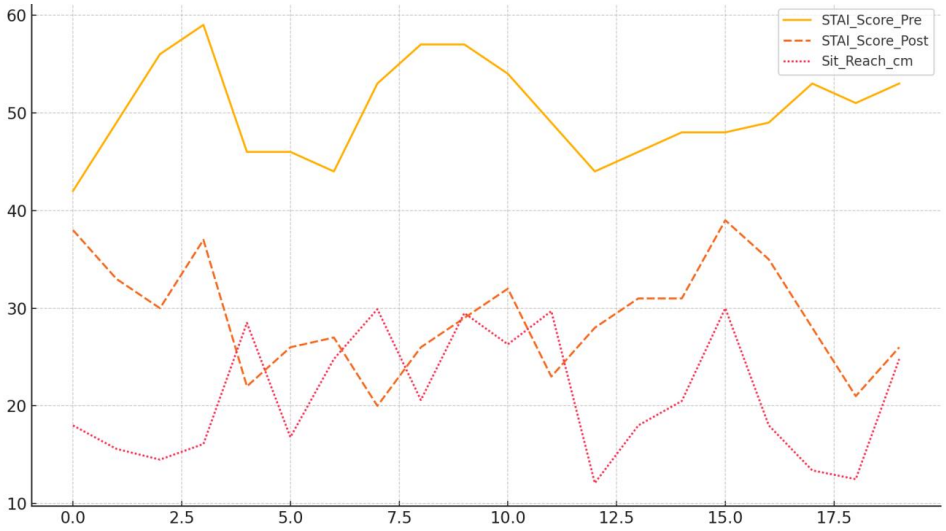

Figure 11: Refer to the results section for detailed explanation of this figure.

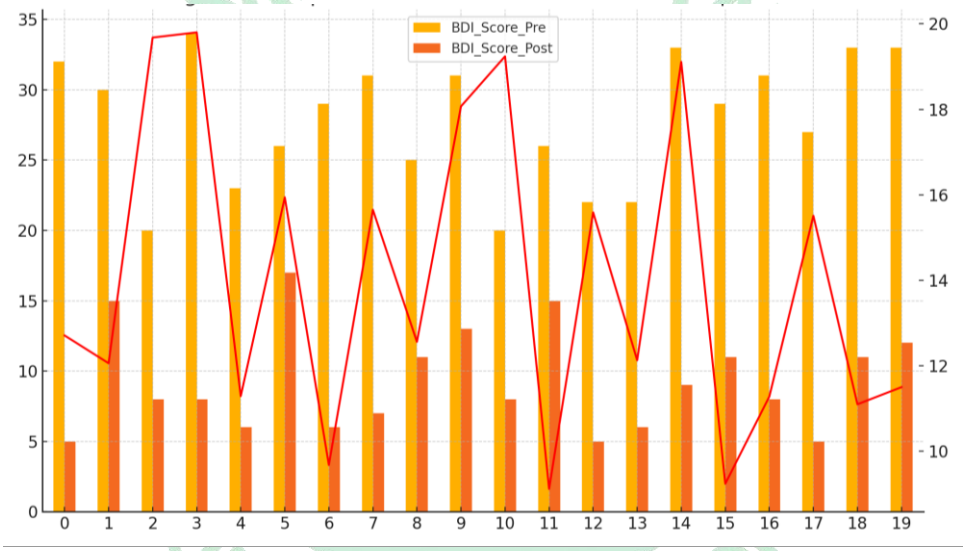

Figure 12: Refer to the results section for detailed explanation of this figure.

.In a concise summary, the physiotherapy program based on the therapeutic garden had a significant impact on mental health, stress relief, physical treatment, outcomes, and, in addition, reported satisfaction of the patients. The nature-based designs are recommended according to the multidimensional results, within the rehabilitation plans of mental health and physical therapies.

DISCUSSION

It has been established that being close to green has a positive effect on mental health by reducing symptoms of anxiety and depression and boosting overall health (Patwary et al., 2024). Being outdoors makes you feel good and this reduces the level of stress (Harrison et al., 2023). Green spaces are beneficial to human health and may differ depending on their accessibility, maintenance and proximity (Stangierska et al., 2025). It also showed that forest bathing, or the time spent in forested areas, also helps to enhance mood, reduces stress, and enhances the immune system (Siah et al., 2023). Scientists are gradually discovering how beneficial good natural environment can be to people in terms of physical,

mental, social and emotional wellbeing among others (Doimo et al., 2020; Li et al., 2023; Marocco et al., 2025). Directly, spending time in a forest relieves you both physically and mentally compared to being in a city (Doimo et al., 2020). Individuals who visit nature have been found to achieve much lower systolic and diastolic blood levels and cardiographic heart rate (Siah et al., 2023). The presence of these physiological symptoms is associated with the fact that the risk of stress-associated diseases is reduced, and the work of the heart organ is improved (Li et al., 2023).In cities, areas covered with plants are known as urban green spaces that benefit humans psychologically and socially, providing residents with an opportunity to relieve the city stress (Maury-Mora et al., 2022). It is wonderful to hang around, work out, and find new friends and all this makes people feel that they have a place and belong to a community (Mohamad & Hussein, 2020). The availability of the green spots to visit can reduce physical as well as mental strain (Todorova et al., 2023). Incorporating blue and green areas and waterfront green spaces as well enhances their ecosystem services delivery and assists in the improvement of the public health because it provides citizens3 with spots in which they can relax and regain their mental health (Cheng et al., 2022). The fact that people must feel about and use green spaces should be known to urban planners and developers since they should consider the influence of nearby blue and green places on the health of people (Li & Dong, 2025). It can contribute to the further enhancement of therapeutic gardens as one of the components of mental health rehabilitation (Lord, 2023; Zhang et al., 2020). Alterations in the built environment have improved the health of the people (Azhar et al., 2022). The application of green infrastructure also played a positive role in the way individuals perceived their general health status and mental hearts (Nazish et al., 2024). All these can also make the planning of therapeutic gardens used in mental health recreation more effective (Doimo et al., 2020; Konijnendijk, 2022; Liu et al., 2021; Yao et al., 2021).

CONCLUSION

This research findings considerably advocate the use of rehabilitative therapeutic garden environments in physiotherapy-based mental health rehabilitation. The intervention, which was performed in a natural environment and contained structured physiotherapy activities, sensory and horticultural exposure, generated large improvements in mental and physical well-being. The quantitative assessment, such as the BDI-II, STAI, and PSS, indicated that individuals who participated in the therapeutic garden sessions were much lower with respect to depression, anxiety and perceived stress. These psychological gains were in partnership with measurable gains in physical rehabilitation measures like improved grip, flexibility and improved performance in balance tests. In addition, there was statistical significance because people who experienced less psychological discomfort had high correlations with increased mobility which indicates that recovery in physical condition contributed to people becoming able to cope with their emotions.

Qualitative information supplemented these findings and demonstrated that participants became more motivated, emotionally calm, and closer to nature, which made the process of rehabilitation more wholesome and pleasant. The natural environment that was full of sweet plants, shaded paths, and the possibility to touch the ground and the vegetation appeared to increase mindfulness, reduce clinical fatigue, and enhance the engagement of the participants. The hybrid experimental design was quite beneficial since it allowed us to recognize and embrace numerous possibilities that therapeutic

landscapes could provide to people as healing and relaxing places.

According to this study, therapeutic gardens are not just a pretty green patch: they are applicable, evidence-based interventions that can accelerate mental and physical recovery by quite a bit. Their application in physiotherapy practice holds a lot of promise particularly to the outpatients rehab centers which wish to provide care that is characterize by low expenses, high value, and patient-centric. The possible future studies involve examining the long-term outcomes, effectiveness with various populations of individuals and the specific design aspects of this treatment that appears the most effective in treating people. Overall, this paper demonstrates that there is a great significance as many people who work in various disciplines come together and consider healthcare settings as healing ecosystems.

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