



## REVIEW ARTICLE

# Use of Warmth for the Treatment of Blues

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## Abstract

Current rise in depression leading to high disease burden and economic strain demands more research and proposals towards effective and practical treatment protocols for Major Depressive Disorders. Heat therapies have gained its reputation as an effective alternative treatment from various psychiatric, medical, and cultural studies which is significantly relevant in view of consideration of the gap between provision and adherence for treatment and ineffectiveness of current treatment choices.

Heat therapies lead to thermoregulatory cooling by increasing the core body temperature which is achieved through various modalities such Whole Body Hyperthermia, Heated Yoga, Sauna and Waon Therapy.

This paper extends the proposal for consideration towards psychoeducation, research, innovations, and inclusion of heat therapies in the treatment of depression especially in light of its rapid and steady results with minimal adverse effects.

## Keywords

Depression, Heat therapies, Whole body hyperthermia, Heated yoga, Sauna, Waon therapy

## Introduction

Depression is a mood disorder characterized by consistent low mood, loss of interest and decline in daily adaptive functioning along with associated emotional and physical symptoms. Over the years, depression is gaining constant attention due to its rapidly growing prevalence [1-3]. It is also predicted to be a major contributory factor to high disease burden [1] leading to pressures on medical and mental health facilities. Attributed to its symptoms, impact on functionality and comorbid disorders, long-term and extensive treatment modules often lead to economic strains as well [2,4].

To tangle things further, there is also a complex gap to

bridge between provision and adherence to treatment [5] which is enhanced due to various reasons such as: 1) Queries around effectiveness of antidepressants [2,6] with 60% success rates [3]; 2) Concerns and understanding of various side effects of medications [2]; 3) Beliefs of ethnic communities regarding treatment modules as well as perceived need and preference for treatment [7]; 4) Prolong, emotionally consuming and exorbitant therapeutic processes and 5) Long waitlists to conventional treatment methods; 6) Patients' perception of not receiving satisfactory clinical output [8] and a significant percentage of treatment-resistant cases [5] and 7) Complications with comorbid physical and mental disorders which make administration of conventional treatment methods questionable. Further due to the uncertainty and treatment choice of milder forms of depression there are many guidelines from agencies such as NICE [6], European Medicines Agency Scientific Committee, the Committee for Medicinal Products for Human Use [9] who have queried the use of SSRIs and SNRIs especially for children and adolescents and advocated for non-pharmacological first-line treatment.

The current exigency hence calls for more innovations, recognitions, researches, and proposals around new and effective treatment modalities [5,10,11].

Derived from Greek, the word 'Hyperthermia' translates to mean a rise in heat. Hyperthermia/Heat treatment can be implemented in the form of application to a specific part of the body or the whole body. History of psychiatry has witnessed many pioneers such as Hippocrates, Galen, Sydenham, Boerhaave, Neuburger and Maudsley, discovering the positive impact of fevers in the treatment of "insanity",

epilepsy, and mental illnesses in terms of remissions of symptoms, complete recovery [12]. During the 19th century, Alexander Rosenblum and later Julius Wagner-Jauregg observed the impact of infectious and recurring fevers leading to recovery from mental illnesses in many patients [10,13]. Later with these observations, there were many other methods introduced such as fever cabinets, hot water baths etc which led to further understandings of changes in circulations depending on temperature and skin as a thermal regulator. Hot and cold Hydrotherapy was then adopted as a treatment method for various mental illnesses such as psychosis, insomnia due to neurasthenia or melancholia, mania, delirium with the function of sedatives and to improve appetite and sleep [13].

Other than the research taking place in psychiatry, last 40 years of research in treatment of oncology and other chronic illness have also established that the use of heat through many different methods has led to alterations in symptoms of depression and had positive side effects such as increasing the sense of wellbeing in patients [10,13].

Even though the research has resulted in the development of heat therapies to include more specific, localized, systemic, advanced, and effective methodological protocols, the use of these techniques are still not widely accepted and remains to be controversial due to many unknown factors related to the mechanisms behind the workings of these therapies [13].

### Mechanisms of Heat Therapy in Depression

Numerous studies and research have shown the association between thermoregulatory alterations, temperature, and depression. A study conducted by Bär, et al. [14] concluded that there is an evidence of altered heat pain perception in patients suffering from depression. An animal study conducted with rats has shown that psychological stressors can cause hyperthermia along with correlated depression-like behaviors [15]. The Cultural connotation of peoples' perceptions of heat/feeling hot during episodes of depressive disorders in various ethnic groups has also been observed [16,17].

Further explorations into this subject matter have concluded that there are abnormalities in thermoregulatory cooling and skin conductance in patients suffering from depression [2]. Increased daytime, as well as night-time temperature [2], has also been found which may further reflect on the disturbances of circadian rhythms and sleep cycles [18,19] ultimately impacting on levels of functioning, quality of life and feelings of well-being. The dysregulation of the thermoregulatory afferent pathway [2] contributing to the somatosensory system and thermal homeostasis [20] is closely associated with serotonergic sensory cells,

epithelial lines of the body, and other regions in the brain which are responsible for the regulation of mood [2,10].

According to research, heat therapy leads to thermoregulatory cooling through many correlated mechanisms such as increased levels of stimulation of immune systems [10], increased levels of Plasma  $\beta$  endorphins [13], induced synaptic release of serotonin in the dermal membrane [2], altered activity in spinoparabrachial pathways [2,13], activated brainstem serotonergic neurons [21] which further leads to changes in brain systems responsible for mood regulations [10].

### Treatment Modalities Using Heat Mechanism

#### Whole body hyperthermia (WBH)

WBH has been one of the most investigated the methodology of using heat therapy to treat depression often gaining evidence [22] from cancer and medical research. WBH is a method through which heat is applied through three techniques: 1) Contacting the skin with surrounding hot fluid; 2) Irradiation of body surface to extend heat to local blood perfusion; 3) Compassing heat through extracorporeal perfusion [23].

Earlier studies of treatment of cancer with WBH have shown promising results in terms of relief of pain, increased sense of well-being, and decreased score of depression postulated to being mediated by an increase in plasma levels of  $\beta$ -endorphin, prolactin, ACTH, and cortisol [24]. Similar results were replicated by another study wherein mood states of cancer patients undergoing WBH treatment were assessed using the Profile of Mood States questionnaire demonstrating significant improvement in depression 72 hours post-treatment [25].

In a study with 16 medically healthy adults diagnosed with Major Depressive Disorder (MDD), acute antidepressant effects of WBH were observed wherein rapid and sustained reduction in symptoms was observed after a single session of WBH along with significant and persistent thermoregulatory cooling which was reflected by a drop in mean core body temperature. Majority of the participants were receiving no other intervention, except for three participants who were being persistently treated with SSRIs, and no change in dosage was made during the period of the study [26].

In a follow-up and extended; randomized, double-blind design with patients with MDD, WBH was compared to a sham treatment with a 6-week follow-up period without any other antidepressant treatment. Reduction in symptoms of depression was observed within one week of the treatment and across six weeks post-intervention period with no significant adverse effects [27].

Animal studies have demonstrated WBH activating

dorsal raphe nucleus implicated in mood regulation and antidepressant-like responses [27]. Additionally, Hale, et al. [28] conducted a study with adolescent rats wherein WBH was shown to have increased core body temperature and act synergistically with citalopram to reduce depression as seen in behaviours such as increased swimming and decreased immobility in the forced swim test.

A systematic literature review by Hanusch and Janssen [29] studied outcome measures for mood and depression in pre/post intervention design of clinical studies utilizing hot baths and infrared heating. They concluded that WBH for depression is a promising alternative treatment with low risk of adverse effects providing a framework for clinical application. However, a call for further research and sufficient evidence is also indicated.

Mason, et al. [30] examined the efficacy of commercially available infrared sauna device in producing changes in core body temperature and reduced symptoms of depression in a pre-post intervention design using self-report measures in twenty-five healthy adults. Results showed a reduction in negative affect and symptoms of depression and an average of 82.12 minutes to achieve the target core body temperature of 38.5 °C indicating the practical utility of WBH and a novel protocol for treatment of MDD.

## Heated yoga

Yoga has time and again shown its beneficial impact on mental and physical illnesses promoting an overall sense of good health, happiness, well-being, and optimum functioning through various physical poses, breathing exercises, and meditational practices [31]. Heated Yoga (HY), also known as Bikram Yoga (BY) is

a form of Hatha yoga practice performed in a room heated up to 40 °C [32,33].

One of the initial survey studies conducted in 2016 found that out of 157 participants recruited in a convenience sample, 58 percent of participants had reported an improvement in mood [34]. Other psychological benefits reported with the practice of HY are-increased mindfulness, better sleep cycles, and decreased levels of perceived stress [32]. In another case study by Sakurai, et al. [11], a woman with treatment-resistant depression showed complete remission after 8 weeks of biweekly HY practice for 90 minutes each session. Another study by Parkin and colleagues showed similar encouraging results prompting further investigations [10].

Nyer, et al. [35] researched the impact of 8 weeks HY intervention with 28 depressed participants and found significant improvements in symptoms of depression and overall scores on Hamilton Rating Scale for Depression as well as Beck Depression Inventory. They also found secondary positive effects on factors such as hopelessness, anxiety, functioning, and quality of life. Out of the participants who completed intervention, 56.5% attained remission and there was a linear relationship between regular attendance of sessions and improvement on self-reported depression scores. Another study with 53 habitual Bikram Yoga Participants showed statistically significant positive results in state anxiety and negative affect through impact on perceived stress, postulating for HY to be beneficial for people experiencing high daily stress levels (Table 1) [36].

## Sauna therapy

Sauna therapy carries ancient traditions and wellness techniques of many cultures across the world [37,38]. It's a form of passive heat therapy implemented in

**Table 1:** Studies investigating psychological impact of Heated (Bikram) Yoga.

Researchers	Study	Participants	Areas of improvement
Abel [51]	60 days BY challenge with pre and post measurements	N = 22; 17 Females, 5 Males	Core self-evaluation, intrinsic motivation, life satisfaction.
Hewett, et al. [53]	8-week BY program in an uncontrolled study	51 participants aged 20-54 years recruited through snowball sampling.	Mindfulness and perceived stress.
Medina, et al. [54]	8-week BY intervention in a randomized control study	52 Women high in emotional eating in response to stress.	Distress tolerance (with specific reductions in distress absorption), reduction in emotional eating.
Hopkins, et al. [54]	8 weeks BY intervention in a randomized control trial	52 Women at risk for obesity and related illness.	Reduction in cortisol reactivity to stress and affective eating- decreased binge eating frequency and eating to cope with negative affect.
Hewett, et al. [55]	16 weeks BY intervention in a randomized control trial	63 participants: Sedentary, physically inactive, stressed adults.	Perceived stress, general self-efficacy, and health related QOL.
Rocque, et al. [56]	8 weeks BY intervention in a randomized controlled trial	53 women with unipolar depressive disorder.	Significant decrease in scores of hamilton rating scale for depression mediated with reductions in ruminations.

rooms with temperatures varying between 70 °C - 100 °C with diverse humidity levels. It is often known for its relaxation, pleasure, and medical benefits [38].

Hayasaka, et al. [39] conducted a study with 45 subjects who visited the sauna facility and found the overall mood state as well as the related factors of mood (Tension-Anxiety, Depression-Dejection, Anger-Hostility, Vigor, Fatigue, and Confusion) on Profile of Mood States- shortened version to have improved along with state and trait anxiety scores measures on STAI. In another study, a slight differential impact on mood was found to be one of the psychological after effects of sauna treatment [40].

A cross-sectional survey with 482 valid responses of regular sauna bathers has revealed the motivation behind the use of sauna to be relaxation, stress relief or reduction, pain relief, and socializing. Respondents have reported improvements in mental issues, sleep benefits, and higher mental and physical well-being [37]. Health-related QOL has also been found to have improved in obese Korean patients post sauna therapy without any adverse effects [38]. Repeated sauna therapy has also been proven to be an effective intervention for improving mental health in patients with Chronic Heart Failure [41]. Other studies have found significant pain relief and improvement in subjective wellness after the use of sauna therapy [42,43].

### Waon therapy

'Waon' (therapy), meaning soothing, was developed in 1989 as a form of healing thermal approach. This technique uses a stepped method of 1) Introduction of far-infrared-ray dry sauna at 60 °C temperature for 15 minutes increasing the core body temperature by 0.8 to 1.2 °C; 2) Replaced by being covered in a blanket for 30 minutes to maintain the core temperature; 3) Oral hydration to recover from perspiration [44].

In a longitudinal study conducted by Beever [45], patients suffering from type II diabetes were assessed after receiving Waon therapy over a period of 3 months. The observations from the study concluded improvements in terms of quality of life, social functioning, fatigue, physical and general health, and stress.

Similar positive results were found in a study conducted by Soejima, et al. [46], where ten inpatients having chronic fatigue syndrome were treated with Waon therapy for 4 weeks. Results of this study showed positive impacts and improvements in variables such as perceived fatigue, negative affect, anxiety, depression, and performance status.

Waon therapy has been beneficial for many elements mediating mental health such as lifestyle-related diseases, hypertension [44], pain [13,44,47], chronic fatigue syndrome [13,44], quality of life [13,48]

and general well-being [49]. It has been found to have a favourable impact on cases of mild depression with symptoms such as somatic complaints of fatigues and appetite loss [44,49] and has been advantageous in increasing a relaxation effect after 4 weeks intervention [44]. Implementation of Waon therapy has also been found to increase the cerebral blood flow in prefrontal, orbitofrontal, and right temporal lobe regions of the brain indicating improvement in related syndromes [50].

### Conclusion

With the growth in research regarding the use of heat therapies for treatment of depression, it brings back our attention to research studies in the past as well as acceptable cultural beliefs regarding the cure for depression. With prompt and steady results, significantly minimal adverse and side effects, and practicality of utilization, heat therapies do demand further psychoeducation, research and investigations, and development of intervention protocols for the treatment of depression. Further, it is also a proposal for use of heat therapies as an alternative/ conjunctive intervention with a lot of potential for consideration specifically in primary healthcare facilities. Due to safety of use of heat therapies, this approach can also be implemented as a first-line treatment specifically for mild to moderate forms of depression with access to relatively larger age groups, people with comorbid physical, mental, and neurological illnesses, and people with prolonged treatment trials/treatment-resistant depression.

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