

Review Article

Refreshing the Mind and Body: Exploring the Mental Health Benefits of Cold Water Immersion

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KEYWORDS:

Adjunctive Therapy
Anti-Inflammatory Effects
Cold Water Immersion
Mental Health
Sympathetic Nervous System

ABSTRACT:

Background:

Cold Water Immersion (CWI) has been historically utilized as a therapeutic practice. Recent interest in its applications for mental health has stimulated scientific inquiry into its potential benefits and mechanisms of action.

Methods:

This article systematically reviews the therapeutic applications of CWI for mental health conditions. Search engines such as PubMed, Google Scholar, and Cochrane Library were utilized. Key search terms included "Cold Water Immersion," "Mental Health," "Depression," "Anxiety," and "Stress." Articles were selected based on relevance, focusing on physiological and psychological responses to CWI and specific studies exploring its role in mental health. Safety considerations and precautions, therapeutic applications, and potential patient populations were also discussed.

Results:

CWI activates the sympathetic nervous system, releasing stress hormones and endorphins, improving mental well-being. Physiological benefits were observed, including anti-inflammatory effects, improved circulation, and enhanced immune function. CWI demonstrates potential as an adjunct treatment for depression, anxiety, pain-related disorders, and stress. However, safety considerations are essential, including the risk of hypothermia, cardiovascular, respiratory concerns, and cold shock response. CWI should complement, not replace, traditional treatments and is best suited for specific patient populations.

Conclusion: CWI presents a promising complementary approach to mental health, with initial studies indicating benefits for various conditions. Further research is necessary to understand its potential fully and integrate it effectively into therapeutic regimens.

INTRODUCTION

Cold Water Immersion (CWI) refers to immersing or exposing the body to cold water or temperatures. It can take various forms, including full-body immersion, such as swimming in cold water or taking cold showers, and localized immersion, like cold water foot baths or cold compresses applied to specific body areas. CWI has been utilized as a form of therapy for centuries

and has a rich historical background as a therapeutic practice, dating back to ancient times. Historically, physicians and prominent figures have recognized its beneficial effects. By the 1700s and 1800s, physicians Vincent Priessnitz and Sebastian Kneipp further developed CWI regimens to treat various ailments, including mental health conditions.¹ Even influential figures like Thomas Jefferson acknowledged the advantages of CWI for health and vitality.

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DOI: 10.58858/020104

Jefferson credited his robust health and energy to daily morning footbaths in cold water.² The growing interest in these practices among individuals and the medical community reflects a broader shift toward exploring non-pharmacological interventions for mental health.

This article explores the therapeutic applications of CWI for mental health conditions. While further research is needed to understand the underlying mechanisms and evaluate their effectiveness fully, initial findings indicate promising results for various mental health disorders. Understanding and incorporating non-pharmacological interventions like CWI into medical practice may offer additional options for patients seeking non-pharmacological approaches to mental well-being.

PHYSIOLOGICAL AND PSYCHOLOGICAL RESPONSES TO CWI

CWI is known to trigger a multitude of physiological responses that contribute to a range of observed health benefits. One of the critical responses is the activation of the sympathetic nervous system, which releases stress hormones like adrenaline and noradrenaline. This hormonal surge prepares the body for the sudden cold stressor and positively impacts mental well-being.³ Alongside the activation of the sympathetic nervous system, CWI also stimulates the release of endorphins. These natural chemicals, often called the body's "feel-good" hormones, have pain-relieving and mood-boosting properties. The release of endorphins during immersion contributes to an improved sense of well-being and mood, often promoting euphoria and relaxation.³

In terms of physical health benefits, CWI has demonstrated potent anti-inflammatory effects. The cold temperature causes blood vessels to constrict, which reduces blood flow and inflammation.⁴ This response is particularly beneficial for individuals with inflammatory conditions or injuries, as it may help alleviate pain and promote healing. Another health benefit relates to circulation. The rapid constriction and dilation of blood vessels during cold water exposure can improve circulation. This enhanced blood flow to muscles, organs, and the brain can positively impact overall health and cognitive function.⁴ CWI also plays a role in improving immune function. Exposure to cold temperatures activates immune cells, enhancing and boosting immune function and helping to create a more robust defense against pathogens.⁵

SAFETY CONSIDERATIONS AND PRECAUTIONS FOR PATIENTS

While CWI can yield physiological and psychological benefits, it's crucial to understand the possible risks and safety considerations associated with this practice.

Hypothermia: CWI can lead to hypothermia, especially in inexperienced individuals or those exposed to cold water for extended periods. Symptoms of hypothermia include intense shivering, confusion, and, in severe cases, loss of consciousness. Such symptoms may require immediate medical attention. Gradual exposure to cold water under professional guidance can help prevent this condition.

Heart Health: CWI can increase heart rate and blood pressure, leading to heart conditions such as arrhythmias or cardiac arrest. Individuals may experience symptoms similar to hypothermia, including confusion and loss of consciousness.

Respiratory Health: CWI can trigger bronchoconstriction, leading to shortness of breath or severe respiratory distress.

Risk of Drowning: The initial shock of CWI can lead to a cold shock response, which includes gasping, hyperventilation, and increased heart rate. This response and decreased muscle function can make swimming or staying afloat difficult, increasing the risk of drowning.

Cold Shock Response: The cold shock response is a physiological reaction to sudden exposure to cold water. It can be highly distressing and dangerous, leading to situations like those outlined above. Gradual exposure to cold water and professional guidance is critical to managing and mitigating the cold shock response.

THERAPEUTIC APPLICATIONS OF CWI FOR MENTAL HEALTH CONDITIONS

Overview of Research on CWI

Depression and Anxiety

CWI shows promise as an adjunct treatment for depression and anxiety. Activating the sympathetic nervous system and releasing endorphins and noradrenaline during cold water exposure may improve mood and reduce symptoms of these conditions. One of the groundbreaking studies in this field is "Adapted cold shower as a potential treatment for depression," conducted by Shevchuk, N.A. *et al.* (2008).⁶ The study suggests that taking cold showers may stimulate the brain's "blue spot" or locus coeruleus, the primary site for the brain's noradrenaline. This neurotransmitter plays a vital role in the mitigation of depression.

The research hypothesis proposes that adapted cold showers could be used as a treatment method for depression due to the expected stimulation of the dopaminergic transmission in the mesocorticolimbic and nigrostriatal pathways. These pathways regulate emotions, and increased activity has been associated with improved mood states.

In this feasibility study, Hjorth *et al.* (2023) investigated the possibility and safety of cold water swimming (CWS) as an add-on treatment for depression.³ Thirteen patients diagnosed with depression were initially recruited, and five patients regularly participated in the group-based CWS sessions. The results showed that all patients passed the somatic evaluation and were physically fit to engage in CWS. Patients who participated regularly experienced an improvement in well-being, with a significant increase in well-being scores from 39.2 to 54.0. Their PSQI (Pittsburgh Sleep Quality Index) scores improved, indicating better sleep quality. These findings suggest that regular, supervised CWS may be safe and potentially beneficial for patients with depression.³

Pain-Related Disorders

CWI can relieve pain in individuals with certain pain-related disorders, such as rheumatic diseases like arthritis and fibromyalgia.⁷ The cold water stimulation and activation of the body's natural pain-relieving mechanisms and anti-inflammatory effects may contribute to alleviating pain symptoms. The 2014 study by Ihsan *et al.*, "Postexercise Muscle Cooling Enhances Gene Expression of PGC-1 α ," explored the impact of CWI after exercise in conditions like arthritis.⁷ The researchers found that CWI could help manage pain associated with arthritis. This benefit was attributed to two critical effects:

1. Modulation of Inflammation: CWI helped reduce inflammation, a significant contributor to arthritis pain.⁷
2. Promotion of Mitochondrial Biogenesis: CWI enhances the gene expression of the PGC-1 α protein that promotes mitochondrial biogenesis. Mitochondria play a crucial role in cellular energy metabolism, and their increased production might enhance the body's overall capacity to heal and recover.⁷

Stress and Stress-Related Disorders

CWI can modulate stress responses and improve stress control. The hormonal changes triggered by cold water exposure, such as increases in norepinephrine and reductions in pain perception, can help individuals better manage stress and enhance their resilience. This may affect stress-related disorders and conditions characterized by maladaptive stress responses.

Leppaluoto J *et al.* (2008)⁸ investigated the effects of long-term whole-body cold exposures on various physiological markers in healthy women. The researchers found that cold directions led to significant increases in plasma concentrations of ACTH (a hormone produced in the pituitary gland that stimulates the adrenal glands), beta-endorphin (a natural painkiller), cortisol, and catecholamines.⁸ The cold exposures also affected cytokine levels, proteins that are critical in cell signaling during immune responses. The results of this study indicate that long-term whole-body cold exposure may play a role in stress response and immune function modulation.⁸

Néma J. *et al.* (2022)⁹ conducted a study to examine the impact of regular cold exposure on the psychological status and physical composition of healthy young soldiers in the Czech Army. Forty-nine soldiers were randomly assigned to an intervention or control group. Over eight weeks, the intervention group underwent regular cold exposure in outdoor and indoor environments. The researchers used life satisfaction questionnaires, body composition assessments, and anxiety scales to evaluate the effects. The results indicated that cold exposure did not induce anxiety and resulted in a significant increase in self-perceived sexual satisfaction and health satisfaction.⁹ The intervention group showed reduced waist circumference and abdominal fat among male participants.

Additionally, systematic exposure to cold significantly lowered perceived anxiety in the test group.⁹ These findings suggest that incorporating cold water exposure into military training regimens can positively affect mental well-being and physical composition, enhancing psychological resilience and reducing anxiety among soldiers.⁹

While each mental health condition presents unique challenges, CWI has shown promise as a supportive treatment across varied contexts. Its effects on physiological processes like endorphin release, sympathetic nervous system activation, and anti-inflammatory responses offer comprehensive benefits.^{3,6,7,8,9} However, the current body of research is still preliminary, and more extensive studies are needed to define better the role and efficacy of CWI in treating mental health conditions.

While there is a growing interest in the therapeutic applications of CWI for mental health, the number of rigorous, well-controlled studies in this area is still relatively small. Many existing studies are exploratory or feasibility studies, and more extensive research is needed to establish the effectiveness of CWI for specific mental health conditions.

USE OF CWI AS PART OF A COMPREHENSIVE TREATMENT PLAN

CWI should not be considered a standalone treatment but a supplement to a comprehensive treatment plan that includes other evidence-based interventions like psychotherapy and medication.

IDENTIFYING SUITABLE PATIENT POPULATIONS

When considering the application of CWI in clinical practice, it is crucial to identify suitable patient populations. CWI may benefit individuals experiencing various mental health conditions, such as anxiety, depression, stress-related disorders, and mood disorders. It may also help athletes or individuals seeking enhanced recovery, improved sleep, or overall well-being. Proper patient assessment and evaluation should be conducted to ensure that CWI is a suitable adjunctive intervention for their specific condition.

Specific contraindications and precautions

Cardiovascular Conditions: pre-existing cardiovascular conditions, such as heart disease, hypertension, or arrhythmias. Cold water immersion can increase heart rate and blood pressure, potentially exacerbating these conditions or leading to cardiac events.

Respiratory Disorders: including asthma or chronic obstructive pulmonary disease (COPD). Cold water immersion can trigger bronchoconstriction, leading to shortness of breath or severe respiratory distress in susceptible individuals.

Cold Intolerance: such as poor peripheral circulation or certain medical conditions. Cold water immersion in such cases may be uncomfortable, lead to excessive shivering, or increase the risk of hypothermia. Gradual exposure to cold water under professional guidance and monitoring can help individuals with cold intolerance safely engage in CWI.

Open Wounds or Infections: Open wounds, cuts, or bodily infections should be avoided during CWI. Cold water exposure can hinder wound healing and potentially introduce harmful pathogens, leading to infection.

Pregnancy: The effects of CWI on pregnancy are not well understood, and caution is warranted to ensure the safety of both the pregnant individual and the developing fetus.

Neurological Conditions: With epilepsy or other seizure disorders, cold water immersion can trigger seizures in susceptible individuals.

CONCLUSION

CWI has emerged as a promising complementary approach for mental health, offering promising benefits for a range of conditions. The existing body of research evidence indicates a favorable effect of CWI in alleviating symptoms associated with depression, anxiety, stress, and pain management.^{3,6,7,8} As a result, CWI's integration into multifaceted treatment plans presents an innovative avenue for physicians to augment patient care and promote mental wellness.

Despite these encouraging findings, our current knowledge landscape on CWI for mental health remains in the early stages. Further studies are needed to deepen our understanding of the underlying mechanisms, refine protocols, and identify specific patient populations that may benefit the most from this intervention. Continued research in this field may uncover new applications and expand our knowledge of the mental health benefits of CWI.

As the scientific community continues to push the boundaries of our comprehension, it is incumbent upon healthcare professionals to stay informed about the latest research developments and consider incorporating this complementary approach when appropriate for their patients. By conscientiously integrating evidence-based non-pharmacological modalities like CWI into clinical practice, physicians can diversify and expand treatment options, paving the way for a holistic, patient-centric approach to mental well-being.

AUTHOR DISCLOSURES:

No relevant affiliations or conflicts of interest.

REFERENCES:

1. Czeranko S. Vincent Priessnitz (1799-1851). *Integr Med (Encinitas)*. 2019 Aug;18(4):25. PMID: 32549827; PMCID: PMC7219461.
2. Battle JD Jr. The "periodical head-achs" of Thomas Jefferson. *Cleveland Clinic Journal of Medicine*. 1984;51(3):531-539.
3. Hjorth, P., Sikjær, M. G., Løkke, A., Jørgensen, A. M., Jørgensen, N., Kaasgaard, D. M., & Rasmussen, M. R. V. (2023). Cold water swimming as an add-on treatment for depression: a feasibility study. *Nordic Journal of Psychiatry*, 1-6. Advanced online publication. <https://doi.org/10.1080/08039488.2023.2228290>
4. Peiffer JJ, Abbiss CR, Nosaka K, Peake JM, Laursen PB. Effect of cold water immersion after exercise in the heat on muscle function, body temperatures, and vessel diameter. *J Sci Med Sport*. 2009 Jan;12(1):91-6. doi: 10.1016/j.jsams.2007.10.011. Epub 2008 Feb 20. PMID: 18083634.

5. Esperland D, de Weerd L, Mercer JB. Health effects of voluntary exposure to cold water - a continuing subject of debate. *Int J Circumpolar Health*. 2022 Dec;81(1):2111789. doi 10.1080/22423982.2022.2111789. PMID: 36137565; PMCID: PMC9518606.
6. Shevchuk NA. Adapted cold shower as a potential treatment for depression. *Med Hypotheses*. 2008;70(5):995-1001. doi:10.1016/j.mehy.2007.04.052.)
7. Ihsan M, Watson G, Choo HC, *et al*. Postexercise muscle cooling enhances gene expression of PGC-1 α . *Med Sci Sports Exerc*. 2014;46(10):1900-1907. doi:10.1249/MSS.0000000000000308.
8. Leppaluoto J, Westerlund T, Huttunen P, *et al*. Effects of long-term whole-body cold exposures on plasma concentrations of ACTH, beta-endorphin, cortisol, catecholamines and cytokines in healthy females. *Scand J Clin Lab Invest*. 2008;68(2):145–153.
9. Néma, J., Zdara, J., Lašák, P., Bavlovič, J., Bureš, M., Pejchal, J., & Schvach, H. (2022). Impact of cold exposure on life satisfaction and physical composition of soldiers. *Military Health*, 10.1136/military-2022-002237.