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THE EFFECTS OF COLD SHOWERS ON HEALTH – A REVIEW OF THE SCIENTIFIC LITERATURE

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ABSTRACT

Introduction: Cold water immersion (CWI), increasingly practiced through activities such as wild swimming, triathlon, and winter swimming, has gained attention for its potential health benefits. Recent scientific studies are beginning to substantiate traditional claims, indicating that regular cold exposure may yield positive physiological and psychological outcomes. These effects are mediated through both shivering and non-shivering thermogenesis, involving muscle activity and brown adipose tissue, which contribute to thermal homeostasis and may underpin longer-term adaptive health benefits.
Aim: The aim of this review paper is to evaluate the effects of cold showers on physical and mental health.
Materials and methods: A review of literature available in databases like PubMed, Google Scholar, Scopus and Web of Science conducted, using keywords including "cold showers", "health benefits", "immune system"
Summary: This review examines current research on the health effects of cold showers, focusing on immunity, cardiovascular health, mood, metabolism, and post-exercise recovery. Evidence suggests cold showers may enhance immune function, improve mood, increase metabolic rate, and support muscle recovery. However, cold exposure can pose risks for individuals with cardiovascular conditions, such as arrhythmias or hypertension. While the benefits are promising, further clinical studies are needed to confirm long-term effects and identify safe, effective protocols for different populations.
Conclusions: Regular cold showers may offer health benefits such as improved immunity, enhanced mood, and metabolic support. They can acutely raise blood pressure but may contribute to long-term cardiovascular regulation. Psychological and analgesic effects are likely mediated by sympathetic activation and hormonal responses. Despite promising findings, more rigorous studies are needed to confirm efficacy and safety across diverse populations.

KEYWORDS

Cold Showers, Blood Pressure, Health Benefits, Metabolism, Immune System, Cold Water Immersion

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Introduction

Recently, there has been a significant increase in the number of people practising cold water swimming, both in the context of competitions such as marathon swimming, winter swimming and triathlon, and as part of 'wild swimming'. With the growing interest came enthusiastic claims about the physiological and psychological health benefits of cold water immersion. Such practices, referred to in the scientific world as 'cold water immersion' (CWI), have grown in popularity. However, current scientific research is beginning to confirm many of these traditional beliefs, demonstrating the various health benefits of regular cold bathing. [1] There is no clear definition of 'cold water'. However, given that the discomfort associated with immersion in cold water appears to peak at temperatures between 10 and 15°C, cold water can be considered to be water below 15°C. [2] The physiological response to cold water immersion (CWI) (14°C) decreases rectal temperature and increases metabolic rate (by 350%), heart rate, and systolic and diastolic blood pressure (by 5%, 7% and 8%, respectively). Plasma norepinephrine and dopamine concentrations increased by 530% and 250%, respectively, while diuresis increased by 163%. [3] The body's response to cold also involves tremor and non-tremor thermogenesis. Muscle tremor generates heat through increased energy consumption, while frictionless thermogenesis relies on brown adipose tissue activity and is more effective in long-term cold adaptation. Both processes are important for maintaining thermal homeostasis and may have different applications in the context of health and adaptation to cold environments. [4]

Materials and methods

A review of scientific literature from databases such as PubMed, Google Scholar, Scopus and Web of Science was conducted, covering articles published up to 2024. The search included keywords: cold showers, health, cold water swimming, cold water immersion, blood pressure, immunity, circulation, metabolism, weight loss, depression, pain relief, health benefits, stress, immune system, CWI. The effects of cold showers on the immune system, circulation, mental health and metabolism were analysed. Results were synthesised, taking into account both positive and potentially negative effects, as well as individual differences and contraindications. The review identified current trends and research gaps, providing directions for further research.

State of knowledge

Impact on the immune response

In ancient times, Roman bathing in baths involved passing through a series of heated rooms and finally immersing oneself in cold water. A contemporary Dutch team, led by Buijze and colleagues (2016), conducted a randomised controlled trial (RCT) to assess the effects of regular cold showers on physical health including immunity, mental wellbeing and attendance at work. The study involved 3018 volunteers who were randomly allocated to the intervention or control group. The only exclusion criterion was a significant co-morbidity, including heart disease, lung disease or another serious ailment. The study method consisted of completing a standard shower (at any temperature) with cold water at approximately 10°C for a specified period of time. Participants took cold showers for 30 days and were assigned to one of three groups, depending on the duration of the cold shower: 30 seconds (group I), 60 seconds (group II) and 90 seconds (group III). A significant outcome of the study was a reduction in sickness absence in the group using cold showers. Participants in this group reported fewer days off work due to illness compared to the control group. There was a 29% reduction in sickness absence when showering (warm to cold) was used compared to the control group. The addition of regular physical activity resulted in an expected 54% reduction in sickness absence compared to those who did not use either method. The duration of cold showers did not affect the results, as there were no significant differences between the intervention groups. The second outcome of the study was a slight improvement in wellbeing, which was, however, considered too clinically insignificant. Although the vast majority of participants reported varying degrees of discomfort during cold exposure, the fact that 91% of them expressed a desire to continue this routine (and 64% actually did so) may be the most important indicator of health benefits. The most commonly reported benefit was an increase in perceived energy levels (including many comparisons to the effect of caffeine). [5] The mechanism for achieving immunity is not well understood. Some studies show an increase in white blood cell counts following exposure to cold immersion (CWI), while others show no change in their levels. One study shows that exposure to CWI results in changes in the profile of stress hormones and immunity following cold exposure. In particular, a delayed increase in the pro-inflammatory cytokines IL-6 and IL-1β was found after CWI. This may explain the reduced sickness absenteeism in people who regularly take cold showers. [6,7] In the study 'Effects of cold mist showers on

patients with inflammatory arthritis: a crossover controlled clinical trial', authors Hinkka, Väättänen, Ala-Peijari and Nummi evaluated the effects of cold mist showers on patients with arthritis. The results suggest that cold showers can lead to a reduction in inflammatory symptoms, such as joint pain and stiffness, in patients with arthritis. Participants in the study reported improvements in these symptoms following the therapy. Cold showers in the form of a mist were well tolerated by the participants, with no significant side effects. However, further research is needed to more fully understand the long-term benefits and durability of effects. [8]

Effects on the cardiovascular system

In the 1980s, the effects of cold stimuli on cardiovascular responses were analysed, particularly in the context of hand immersion in icy water. This study showed that cold exposure induced different responses in healthy coronary arteries and in atherosclerotic lesioned arteries. In response to cold stimuli, healthy arteries showed dilation, indicating an adaptive cardiovascular response to cold stress. In contrast, arteries affected by atherosclerosis constricted. This contrast highlights how temperature changes can affect vascular function depending on the health of the arteries.[9] Another study by Michael J. Shattock and Michael J. Tipton suggests that sudden immersion in cold water can activate sympathetic and parasympathetic responses simultaneously. Conflict between these two responses can lead to cardiac arrhythmias and even cardiac arrest. People with existing cardiac problems are particularly vulnerable. Cold water immersion (CWI) appears to be contraindicated in people with coronary heart disease, hypertension, arrhythmias or other heart conditions. Before starting cold showers, people with cardiovascular problems should consult their general practitioner to individually assess the feasibility of cold hydrotherapy. [10] These studies indicate that cold baths are not recommended for people with coronary heart disease, as they can worsen myocardial perfusion and cause stenocardial symptoms. In addition, there is a risk of arrhythmias in people with a predisposition to these disorders. Cold baths can initially lead to an increase in blood pressure. The body's initial response to cold, involving vasoconstriction and activation of the sympathetic nervous system, results in a temporary increase in blood pressure. The long-term effects of regular cold baths on blood pressure require further research. One study provides preliminary information on the long-term effects. In the long term, regular cold water immersion (CWI) may reduce median blood pressure (MAP). The observed decrease in MAP (median difference: -12 mmHg compared to the control group) in the CWI-treated group can be considered clinically relevant. Nevertheless, due to the methodological limitations of the present study, the effect of repeated CWI on resting blood pressure and heart rate remains inconclusive and requires further verification using appropriately adapted measurement protocols.[7] Based on the work of Kralov Lesna and colleagues, it is plausible that cold showers may reduce cardiovascular risk by reducing oxidative stress. Oxidative stress is associated with the development of atherosclerosis, vascular inflammation and endothelial dysfunction, so reducing oxidative stress may have beneficial effects on cardiovascular health. [11,12] Based on the available research, it can be suggested that cold showers, as a form of cold adaptation, may have cardiovascular health benefits. There is evidence to suggest positive effects of cold exposure, such as lowering blood pressure and reducing oxidative stress. However, there is a lack of studies reporting long-term preventive effects on the cardiovascular system. It is important to remember that caution should be exercised, especially in people with existing vascular conditions, due to the possible risks associated with cold exposure.

Improving mood and reducing pain

Depression is the leading cause of disability and incapacity worldwide and is also the most common mental disorder. A study conducted by Shevchuk NA. present the hypothesis that depression may be caused by two main factors: (A) a lifestyle that lacks certain physiological stressors, such as short-term changes in body temperature, that have been experienced by primates over millions of years of evolution, and (B) a genetic predisposition that makes some individuals more susceptible to this deficiency. To test these hypotheses, one study reported participants taking regular cold showers (20°C, 2-3 minutes, preceded by a 5-minute gradual adaptation), once or twice a day for several weeks to several months. Cold exposure is known to activate the sympathetic nervous system and increase blood levels of beta-endorphins and norepinephrine, which may contribute to the antidepressant effect. Due to the high density of cold receptors in the skin, a cold shower sends a large amount of electrical impulses to the brain, which can lead to improved mood. [13] Another study found that swimming in cold water in winter leads to an increase in norepinephrine levels in the blood. Frequent increases in norepinephrine levels may contribute to pain relief during winter swimming. A similar effect may be achieved through the use of cold showers. [14] Findings from practical trials suggest that cold hydrotherapy can be effective in relieving symptoms of depression and has a significant analgesic effect, without causing noticeable side effects or dependence. However, larger and more rigorous studies are needed to confirm this hypothesis.

Impact on weight loss

Cold showers can affect metabolism and weight loss processes, raising interest in their potential health benefits. One study, 'Effect of Cold Exposure on Fuel Utilisation in Humans: Plasma Glucose, Muscle Glycogen, and Lipids,' by François Haman and colleagues, conducted a test in which participants were in a 10°C water-flow suit. Three energy sources for thermogenesis were assessed: glucose and lipids, which were tested from the blood, and glycogen, which was checked by muscle biopsy. Measurements were taken before and after cold exposure. An increase in glucose combustion of 138%, glycogen combustion of 108% and lipid combustion of 376% was observed. Despite the increase in the oxygenation of glucose, this energy substrate played the smallest role, as it was only 10% responsible for heating the body. The main products of thermogenesis were lipids (50%) and glycogen (30%). The study by Haman and colleagues provides detailed data on the effects of cold on energy metabolism in humans. Controlled laboratory conditions and precise measurements of energy substrates provided an understanding of how cold showers and other forms of cold exposure can affect metabolic processes. Cold showers can create an energy deficit, thereby promoting weight loss and improving overall metabolic health. [15] Another study analysed a combination of moderate exercise and facial cooling that induced significant fat loss in men, associated with ketonuria, proteinuria and weight gain. This was associated with several factors, such as a small energy deficit, the energy cost of synthesising new muscle tissue, energy loss through storage and excretion of ketone bodies and a specific response to cold-induced dehydration. The mobilisation of free fatty acids suggests the possibility of using winter sports as an enjoyable treatment for obesity. However, the study acknowledges the limitations associated with implementing this as a clinical weight loss treatment due to possible pathological responses to cold and less pronounced fat mobilisation in female patients participating in winter swimming activities.[16] A study by Jimmy F. P. Berbée, entitled 'Brown fat activation reduces hypercholesterolaemia and protects from atherosclerosis development,' was performed on mice. It showed that brown fat activation is associated with increased energy expenditure and the burning of large amounts of fatty acids, which lowers blood triglyceride levels and reduces obesity. Studies also suggest that cold showers may reduce atherosclerotic lipoprotein levels and protect against the development of atherosclerosis. However, the results in mice cannot always be directly translated to humans due to species differences in metabolism and physiology. Further clinical studies in humans are needed to confirm these results. [17]

Impact on post-exercise muscle recovery

The use of cold water immersion (CWI) after intense sporting activity is becoming increasingly popular among athletes as it helps to reduce fatigue and speed up the recovery process. CWI works mainly by lowering tissue temperature and slowing blood flow, which aids recovery by alleviating hyperthermia and associated central nervous system changes, reducing cardiovascular stress, removing accumulated metabolic products in the muscles, minimising exercise-induced muscle damage (EIMD) and improving autonomic nervous system function. [18]

Conclusions

This review paper presented the current state of knowledge on the effects of cold showers on physical and mental health. The studies analysed showed that cold showers can provide a variety of health benefits, including improved circulation, increased immunity, accelerated metabolism and improved mental health, including a reduction in symptoms of depression and stress. Cold showers can also have benefits in terms of muscle recovery. The mechanisms through which cold showers affect health include stimulation of the nervous system, increased blood flow and the release of endorphins. Despite the many benefits, cold showers may not be suitable for everyone. People with certain medical conditions, such as heart disease, cardiac arrhythmias or hypertension, should consult their doctor before starting regular cold showers. Additionally, individual differences may affect the effects experienced, highlighting the need for further research to better understand who may benefit most from this practice. In conclusion, cold showers may be an effective and accessible method to support physical and mental health. However, further research is needed to fully understand their impact and to identify the optimal conditions for applying this practice in different population groups. In particular, randomised trials with larger samples are needed to confirm the results of existing studies and to identify possible contraindications. It is also important that new studies determine the long-term preventive effect on the cardiovascular system and the impact on insulin resistance.

Disclosure

All authors have read and agreed with the published version of the manuscript.

Author's contribution: All authors contributed to the article.

Conflict of interest: The authors deny any conflict of interest.

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