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Immediate and Long-Term Effects of Cold Hip Bath on Autonomic Variables among Healthy Individuals

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Abstract

Background: Naturopathy is a distinct system of Traditional and Complementary Medicine (T and CM) recognized by the World Health Organization (WHO). The concepts and practices of naturopathy are ingrained in Indian culture, which is continually expanding and changing while embracing components that increase our understanding of the workings of natural therapies and healing. Naturopathy is a cost-effective, non-invasive, drugless treatment method with no side effects. Hydrotherapy is one of the important treatment modalities in it. Studies related to the physiological effects of several treatment modalities in naturopathy are limited. The short and long term effect of cold hip baths is not elicited in any of the previous research. Hence it is essential to understand the underlying mechanisms of the treatment. So, the present study aims to evaluate the short and long-term effect of cold hip baths on autonomic variables among healthy individuals.

Methods: A total of 120 subjects were selected and randomly allocated into two groups using a computerized generated random number table. Group 1 is the study group and received cold hip bath for 10 days. Group 2 is the control group who had been asked to sit in the empty hip bathtub. The pre and post data was collected for both the groups.

Result: There was a significant ($p<0.05$) difference noted in all the hemodynamic variables through RM-ANOVA over pre, post 1 and post 2 in study group and the same change was seen in the variables of heart rate variability except SDRR with p value>0.05. But in the control group no significant difference was observed in both hemodynamic variables and heart rate variability when compared in between pre, post 1 and post 2 through RM-ANOVA. When both the study group and control groups were compared shows a significant ($p<0.05$) difference in all the hemodynamic variables and heart rate variability except SDRR, LF, HF and LF/HF.

Conclusion: The study result showed that the cold hip bath has tendency to regulate systolic and diastolic blood pressure immediately and effect was sustained in the study group after continuing cold hip bath for 10 days.

Keywords: Blood pressure; Cold hip bath; Heart rate variability; Hydrotherapy; Naturopathy

Introduction

Naturopathy can be defined as a drugless, non-invasive, rational and evidence-based system of medicine imparting treatments with natural elements based on the theories of vitality, toxaemia and the self-healing capacity of the body, as well as the principles of healthy living [1-3]. Naturopathy consists of therapies using natural elements; Hydrotherapy using water, heliotherapy using sun, mud therapy, chemotherapy using colours, magnetotherapy, manipulative therapy, fasting therapy, diet therapy (includes plant-based natural supplements), acupuncture, acupressure with reflexology, etc. [4]. Hydrotherapy is the external or internal use of water in its forms, such as water, ice, and steam, for the prevention of disease or the treatment of various illnesses at a variety of temperatures, pressures, durations, and locations. It is a common kind of therapy in ancient societies like India, Egypt, China, and so on [5].

Hip baths are administered at cold, hot, neutral, and alternating temperatures. Hip bath temperatures in cold hip bath should range from 10°C to 18°C. The average bathing session lasts 10 minutes, but in some conditions, it might last anywhere from one minute to 30 minutes. Typically, a hot hip bath is administered for 8 to 10 minutes at a temperature of 40°C to 45°C. Temperature should range from 32°C to 36°C for a neutral hip bath. Hot and cold water are alternately provided during an alternating hip bath [6].

Studies related to the physiological effects of several treatment modalities in naturopathy are limited. The short and prolong effect of cold hip bath is not elicited in any of the previous research. Hence it is essential to understand the underlying mechanisms of the treatment. So, the present study is aimed to evaluate the short and prolong effect of cold hip bath on autonomic variables among healthy individuals.

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Materials and Methods

Study design

A randomized controlled trial: The study subjects were screened by applying inclusion and exclusion criteria. A signed informed consent was obtained from entire subjects after an appraisal about study protocol. 120 subjects were randomly allocated into two groups using computerized generated random number table. Groups 1 were taken as study group and received cold hip bath for 10 days. Baseline and post intervention data was collected soon after the first session of cold hip bath and after 10 sessions of cold hip bath for the study group. Control group subjects were asked to sit in the empty hip bathtub and their pre and post data was collected.

Intervention and assessment

Group 1 (n=60) is the study group which received cold hip bath treatment for 10 days. Each session was for 15 min/day with a temperature of 10°C to 18°C, group 2 (n=60) the control group were asked to sit in the empty hip bathtub. The blood pressure was measured in a quiet, calm environment using mercury sphygmomanometer and HRV was taken. The assessment carried out on the first day of admission was considered as baseline (pre data) and soon after the intervention post 1 data and on the 10th day after intervention as post 2 data.

Statistical analysis

Using the Shapiro-Wilk test, the data's normality was evaluated. Data were presented as mean standard deviation. Repeated measurement ANOVAs (Rmanovas) were used to conduct the analyses. To determine whether the variances of the differences between the levels of the repeated measurements factor were equal, Mauchly's test of sphericity was performed. The Greenhouse-Geisser approach was employed to adjust the degrees of freedom in the F-tests because the results showed that the assumption of sphericity was violated ($p<0.001$). The significance level for all analyses was set at $\alpha=0.05$. We used the jamovi project. Jamovi. (Version 2.3) software for statistical analysis. $P<0.05$ was set as statistically significant.

Results

The present study aims to compare the effect of immediate and prolonged effect cold hip bath on blood pressure and heart rate variability in healthy volunteers. Sample size was calculated by G*power V 3.1.9.7 and 120 were enrolled in the trial because they matched the eligibility criteria. In the end, 60 people each were divided into two groups by randomization: Study group (n=60) and control group (n=60). No subjects were dropped out of the study. The final analysis included 120 participants in total, 60 participants each from both study and control group. The trial involved subject recruitment, randomization, evaluations, and intervention. The trial ended after completion of the expected study samples.

The mean age in study group was 21.4 while the mean age of control group was 21.4. Compared to control group, which had 35% male and 65% female volunteers, the study group had 35% male and 65% female volunteers (Table 1).

S. no	Variables		Study group	Control group
1	Age (Years)		21.4 ± 1.46	21.4 ± 1.46
2	Gender	Female (%)	65	65
		Male (%)	35	35

Table 1: Demographic characteristics.

There was a significant ($p<0.05$) difference was noted in all the hemodynamic variables through RM-ANOVA over pre, post 1 and post 2 in study group and the same change was seen in the variables of heart rate variability except SDRR with p value>0.05.

But in the control group no significant difference was observed in both hemodynamic variables and heart rate variability when compared in between pre, post 1 and post 2 through RM-ANOVA. When both the study group and control groups were compared shows a significant ($p<0.05$) difference in all the hemodynamic variables and heart rate variability except SDRR, LF, HF and LF/HF (Table 2).

Variables	Group	Within-group						Between-group	
		Pre Mean ± SD	Post 1 Mean ± SD	Post 2 Mean ± SD	F	η^2p	p-value	F	p-value
Hemodynamic variables									
SBP (mmHg)	Study	119.47 ± 11	118.4 ± 9.3	111 ± 9.28	30.8	0.343	<0.001*	25.1	<0.001*
	Control	116.08 ± 8.28	115.2 ± 9.35	115.7 ± 9.13	1.26	0.021	0.2		

DBP (mmHg)	Study	80.85 ± 14.11	81.33 ± 6.55	73.57 ± 10.38	12.3	0.173	<0.001*	8.99	<0.001*
	Control	74.07 ± 8.6	76.27 ± 8.86	75.6 ± 8.93	1.43	0.024	0.2		
Heart rate variability									
Average RR (ms)	Study	846.46 ± 133.04	886.76 ± 158.07	960.06 ± 139.23	24.8	0.296	<0.001*	14.3	<0.001*
	Control	904.97 ± 127.43	912.85 ± 161.35	901.79 ± 142.5	0.269	0.005	0.7		
SDRR (ms)	Study	35.43 ± 27.98	32.24 ± 13.82	39.25 ± 19.35	2.26	0.037	0.1	2.84	0.06
	Control	42.89 ± 34.04	38.08 ± 26.4	35.59 ± 17.51	1.89	0.031	0.1		
HR (b/min)	Study	72.76 ± 11.43	70.91 ± 12.74	63.92 ± 9.03	37	0.385	<0.001*	16.4	<0.001*
	Control	68.42 ± 11.08	68.99 ± 12.58	69.45 ± 14.01	0.262	4.00E-04	0.7		
RMSSD (ms)	Study	24.65 ± 17.53	27.54 ± 19.66	33.46 ± 18.68	5.31	0.083	0.01*	3.86	0.03*
	Control	30.68 ± 25.74	33.58 ± 36.72	28.74 ± 20.65	0.961	0.016	0.3		
pRR50 (% units)	Study	6.25 ± 10.39	7.56 ± 14.31	15.01 ± 17.65	9	0.132	<0.001*	5.07	0.007*
	Control	11.52 ± 20.39	10.09 ± 18.43	9.31 ± 14.84	0.317	0.005	0.7		
LF (nu)	Study	52.13 ± 21.47	48.3 ± 20.09	44.06 ± 20.45	4.96	0.078	0.009*	2.39	0.09
	Control	50.31 ± 22.16	50.67 ± 20.22	50.28 ± 21.53	0.013	0	0.9		
HF (nu)	Study	46.81 ± 19.36	50.49 ± 19.03	54.23 ± 19.37	5.08	0.079	0.008*	2.08	0.1
	Control	47.55 ± 19.26	46.88 ± 18.77	48.37 ± 19.95	0.209	0.004	0.8		
LF/HF	Study	1.66 ± 1.54	1.39 ± 1.35	1.15 ± 1.11	3.83	0.061	0.02*	1.79	0.1
	Control	1.6 ± 1.53	1.66 ± 1.84	1.69 ± 2.17	0.061	0.001	0.9		

Note: P*<0.05, All values are in Mean ± Standard Deviation; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; Average RR: Average of R-R Interval; SDRR: Standard Deviation of R-R Interval; HR: Heart Rate; RMSSD: The Square Root of the Mean of the Sum of the Squares of differences between adjacent RR intervals; pRR50: proportion derived by dividing RR50 by the total number of RR intervals; LF: Low Frequency band of HRV; HF: High Frequency band of HRV; LF/HF: Ratio of Low Frequency to High Frequency; SD: Standard Deviation

Table 2: Showing the results of RM-ANOVA within-group and between-group comparison of the study group and control group.

Discussion

The current study aimed to evaluate the immediate and prolonged effect of cold hip bath among healthy individuals' application. This study involved a randomized controlled trial comprising 120 participants who were divided into control and test groups through random allocation. The evaluation parameters encompassed Blood Pressure (BP) and Heart Rate Variability (HRV). No unfavourable effects were noted during or post the intervention.

Heart Rate Variability (HRV) reflects a dynamic equilibrium originating from the activation or suppression of the sympathetic and parasympathetic nervous systems [7].

Results of the individuals who underwent cold hip bath group showed a significant ($p<0.05$) difference in all the hemodynamic variables through RM-ANOVA over pre, post 1 and post 2 in the study group and the same changes were seen in the variables of heart rate variability except SDRR with $p>0.05$. When both the study group and control groups were compared study group showed a significant ($p<0.05$) difference in all the hemodynamic variables and heart rate variability except SDRR, LF, HF and LF/HF.

Within the spectrum of Heart Rate Variability (HRV), the Low-Frequency (LF) band is primarily associated with the balance of sympathetic and cardiac activity when expressed in normalized units. Conversely, the High-Frequency (HF) band is significantly influenced by efferent vagal activity. The ratio of LF to HF, known as the LF/HF ratio, corresponds to the balance between sympathetic and parasympathetic activity. This indicates that the power spectrum of HRV, particularly its LF component, is predominantly governed by the parasympathetic system [8,9].

Water immersion has demonstrated a straightforward and effective technique for enhancing parasympathetic function and reducing sympathetic influence while at rest. This effect is evident in changes observed in Heart Rate Variability (HRV) metrics. The application of head-out water immersion induces hydrostatic pressure that relocates peripheral blood to the thoracic vasculature, amplifying central blood volume, stroke volume, cardiac output, and central venous pressure. This elevation in central venous pressure likely stimulates arterial high pressure and cardiopulmonary low pressure baroreflexes. These responses are believed to intensify parasympathetic activity and dampen sympathetic activity, leading to a reduction in heart rate and an increase in HRV indices connected to vagal influence [10].

This may be due to an arterial vasoconstriction that can induce greater increases in central blood volume or faster reductions in core temperature [11].

The cold stimulation triggers peripheral vasoconstriction, leading to a shift in blood volume towards the core resulting increase in central pressure, in turn activates the baroreflex which is responsible for reducing sympathetic nerve activity and shifting autonomic heart rate control towards a parasympathetic dominance [12].

The present study tried to understand the physiological effects of cold hip bath in normal healthy volunteers, and it was observed that cold hip bath has relaxative and a cardioprotective effect by increasing the parasympathetic activity with a simultaneous sympathetic withdrawal as an after effect.

Conclusion

The results of this study showed that it is an effective method to increase parasympathetic activity as evidenced by the better sympatho-vagal balance without any side effects. Cold hip bath has the tendency to regulate systolic and diastolic blood pressure immediately and the effect was sustained in the study group after continuing cold hip bath for 10 days. Further its application can be extended in the prevention and management of cardiovascular and stress-related disorders by promoting parasympathetic activity at rest is classically associated with health and well-being.

Strengths of the Study

- It is a Randomized controlled trail with the clinical application.
- This is the first study done to evaluate the immediate and prolonged effect of cold hip on autonomic variables in healthy individuals.

Limitations of the Study

- The main limitation of the study was that it was not possible to record the assessments during the intervention to have a better understanding of the physiology.
- There was no follow up maintained to know further improvement.

Directions for Future Research

The duration of study can be increased, so that the result might show more significance, which would aid in understanding the full range of physiological changes.

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Conflict of Interest

There is no potential conflict of interest during the study.

Funding

No funding was received for this study.

Ethical Statement

This research was reviewed and approved by the Institutional Ethical Committee, SDM College of Naturopathy and Yogic Sciences (Registration number: EC-222). Informed consent was obtained from all participants.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

1. Bradley R, Harnett J, Cooley K, McIntyre E, Goldenberg J, et al. (2019) Naturopathy as a model of prevention-oriented, patient-centered primary care: A disruptive innovation in health care. Medicina 55: 603.
2. Brahmankar Y, Singh AS (2017) Promoting Naturopathy in India. Indian J Public Health res Dev 8.
3. Joseph B, Nair PM, Nanda A (2015) Effects of naturopathy and yoga intervention on CD4 count of the individuals receiving antiretroviral therapy-report from a human immunodeficiency virus sanatorium, Pune. Int J Yoga 8: 122-127.
4. Maheshkumar K, Venugopal V, Poonguzhali S, Mangaiarkarasi N, Venkateswaran ST, et al. (2020) Trends in the use of yoga and naturopathy based lifestyle clinics for the management of Non-Communicable Diseases (NCDs) in Tamilnadu, South India. Clin Epidemiol Glob Health 8: 647-651.
5. Fleming SA, Gutknecht NC (2010) Naturopathy and the primary care practice. Prim Care Clinics Office Practice 37: 119-136.
6. Bakhru HK (1996) The complete handbook of Nature cure. Jaico Publishing House.
7. Almeida AC, Machado AF, Albuquerque MC, Netto LM, Vanderlei FM, et al. (2016) The effects of cold water immersion with different dosages (duration and temperature variations) on heart rate variability post-exercise recovery: A randomized controlled trial. J Sci Med Sport 19: 676-681.
8. Pump B, Shiraishi M, Gabrielsen A, Bie P, Christensen NJ, et al. (2001) Cardiovascular effects of static carotid baroreceptor stimulation during water immersion in humans. Am J Physiol Heart Circ Physiol 280: H2607-H2615.
9. Reyes del Paso GA, Langewitz W, Mulder LJ, Van Roon A, Duschek S (2013) The utility of low frequency heart rate variability as an index of sympathetic cardiac tone: A review with emphasis on a reanalysis of previous studies. Psychophysiol 50: 477-487.
10. Al Haddad H, Laursen PB, Chollet D, Lemaitre F, Ahmaidi S, et al. (2010) Effect of cold or thermoneutral water immersion on post-exercise heart rate recovery and heart rate variability indices. Auton Neurosci 156: 111-116.
11. Buchheit M, Peiffer JJ, Abbiss CR, Laursen PB (2009) Effect of cold water immersion on postexercise parasympathetic reactivation. Am J Physiol Heart Circ Physiol 296: H421-H427.
12. Louis J, Schaal K, Bieuzen F, Le Meur Y, Filliard JR, et al. (2015) Head exposure to cold during whole-body cryostimulation: Influence on thermal response and autonomic modulation. PLoS One 10: e0124776.