

Title : Effect of Cold & Hot Temperature On Hand Grip Strength In Normal Individuals: Cross Sectional Study**Author :** *Miss. Tejashree Bhoir, **Dr. Deepak B. Anap, ***Dr. Ashish J. Prabhakar.

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Address for Correspondence : PDVVPF'S, College of Physiotherapy, Ahmednagar**Abstract-**

Background : Heating or cooling of muscle tissue has been used for decades to obtain specific therapeutic objectives. Hand grip strength can be quantified by measuring the amount of static force that the hand can squeeze around a dynamometer. Therefore, the purpose of this study was to determine the immediate effect of heat and cold application upon hand grip strength measured with dynamometer. **Procedure :** Written informed consent was obtained from all the participants. Skin sensation was checked. Pre-intervention grip strength was assessed for individual asked to dip hand in cold water (15°C) for 30sec then immediately after grip strength was assessed. Pre-intervention grip strength was assessed for both the groups individuals asked to dip hand in hot water (40°C -42°C) for 30sec then immediately after grip strength was assessed. **Result :** On comparing normal grip strength with warm water there was slight increase in grip strength which was statistically not significant. On comparing normal grip strength with cold water there was slight decrease in grip strength that was statistically significant. **Conclusion :** From our study, we found that Hot water increases hand grip strength as compared to cold temperature in normal individual.

Key word : Thermometer, Jammer dynamometer, Temperature, Hand Grip.

Introduction : Heating or cooling of muscle tissue has been used for decades to obtain specific therapeutic objectives.^[1,2] These objectives have included the alteration of hemodynamics,^[3] metabolism,^[4] nerve conduction,^[5] connective tissue extensibility and pain perception. Alteration of a muscle's temperature has also been shown to influence its contractile ability.

Hand grip strength can be quantified by measuring the amount of static force that the hand can squeeze

around a dynamometer.

The local application of cold is known to decrease temperatures to the applied area,^[6,7] cause a vasoconstriction of blood vessels as the body attempts to conserve and prevent heat loss, and cause a decrease in muscular temperature.^[6] The application of cold has also been shown to produce a slowing of motor nerve conduction velocity^[8] that results in an inefficiency of the musculo-tendinous unit. Elevation of intramuscular temperature by a few degrees centigrade has been shown to reduce handgrip endurance^[9], forearm flexion isometric endurance^[10] and knee extension isometric endurance significantly. While reducing intramuscular temperature tends to increase holding time duration.^[10]

It is not uncommon in physical therapy practice to prescribe various forms of exercise after the application of heat or cold treatments. One example is "cryokinetics" which specifically involves the combination of cold application and exercise.^[11] The purpose of this study, was to determine the immediate effect of heat and cold application upon hand grip strength measured with dynamometer.

Material & Method : This study was conducted at College of Physiotherapy, healthy participants were included in the study. Written informed consent was obtained from all the participants. Subjects were screened for any neuromuscular disease or injury that might influence hand grip strength. In addition, subjects were screened for any contraindications to heating or cooling of their extremities. Skin sensation was checked to avoid any complications of heat. Pre-intervention grip strength was assessed using hand held dynamometer.

Grip strength was measured using a Jammer Analogue Hand Dynamometer(Figure -1) with participants seated, their elbow by their side and flexed to right angles, and a neutral wrist position, the dynamometer handle position II and provision of support underneath the dynamometer. This position, followed by calculation of the mean of three trials of grip strength for each hand, has been documented.^[12] Subjects were randomly divided into two groups. i.e. Group A Cold water immersion (n = 10) and Group B. Hot water immersion.(n = 10) Then subjects in group A were asked to dip hand in cold water (15°C) for 30sec then immediately after grip strength was assessed. Subjects in Group B were asked to dip hand in hot

water (40°C -42°C) for 30sec then immediately after grip strength was assessed.

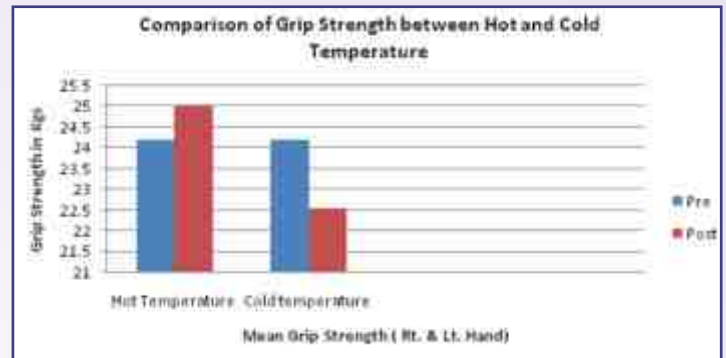


Figure 1: Measurement of Grip Strength using Jammer Dynamometer

Result : Paired t test was used to find out difference in pre and post measurements within the group and unpaired t test was used to compare between the groups.

Vriables	P	T	Significance
Pre n Post Hot (Right)	0.3366	0.9872	Not statistically significant
Pre and post Hot (Left)	0.2346	1.2298	Not statistically significant
Pre & post Cold (Right)	0.0071	3.0180	Statistically significant
Pre & post Cold (Left)	0.0324	2.3176	Statistically significant
Post Hot & Cold (Right)	0.3343	0.9783	Not statistically significant
Post Hot & Cold (Left)	0.3969	0.8570	Not statistically significant

Graph 1: Comparison of Grip Strength between Hot and Cold Temperature



On comparing normal grip strength with warm water there is slight increase in grip strength which is statistically not significant.

On comparing normal grip strength with cold water there is slight decrease in grip strength that is statistically significant.

DISCUSSION : The result of the present study demonstrated that comparing normal grip strength with warm water there is slight increase in grip strength & comparing normal grip strength with cold water there is slight decrease in grip strength.(Graph -1) Chia - Fen Chia et al concluded that there is increase in grip strength after warm immersion and decrease in grip strength after cold immersion which support the study.^[13]

The findings of our investigation are in contrast to those of Haymes and Rider ^[14] in that a decrease in grip strength was observed after the application of cold. Any one of several factors may have accounted for these differences. The method of cold application in our investigation included total submersion of the forearm and hand, whereas Haymes and Rider applied cold by ice bag to a smaller percentage of the muscle group involved. As such, the amount of cooling may have been greater in our study. Our results are in line with the results found by Carl G. Mattacola^[15] where they found that cold submersion of 15°C for 20 minutes, concentric peak torque, average power, and total work of the plantar flexors is significantly reduced.

Previous study indicated that decreased muscle temperature reduced the oxygen supply to the muscles and muscle oxygen saturation which could lead to a

deteriorated muscle performance. However, the result yielded inconclusive in response to warm water stimulus for half of the participants, the muscle strength had decreased, whereas for the other half, the muscle strength had increased.

The important clinical implication of our finding is that the application of cold to forearm or hand before treatment may have a deleterious effect on both injury prevention and performance. Future research should be undertaken to determine how long hand grip strength is adversely affected after the application of cold, and increased after application of hot fomentation.

CONCLUSION : We conclude that with the application of the cold temperature, there was a significant decrease in the hand grip strength but with the application of hot temperature, there was an increase in the hand grip strength, which was statistically not significant.

FUNDING : None

CONFLICT OF INTREST : The authors declare that there is no conflict of interests regarding the publication of this paper.

PRESENTATIONS : This Project was presented at State Level Avishkar – 2013 organized by MUHS, Nashik.

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