

# Pre-Exercise Soaking in Warm Water: Effects on Performance and Physiology

Grace Weisbecker, ATS<sup>1</sup>; Karen Westervelt MS, PT, ATC, FAAOMPT, OCS<sup>1</sup>

<sup>1</sup>University of Vermont Department of Rehabilitation and Movement Science, College of Nursing and Health Science, Burlington, Vermont



## Introduction

Geothermal springs are located throughout the world and have many known therapeutic effects for improving conditions such as osteoarthritis and psoriasis. However, little is known about geothermal spring's effects on exercise. Therefore the objective of this study was to determine what happens physiologically during a soak in warm water and how soaking affects subsequent exercise performance.

## Methods

This was a randomized, crossover study with 9 subjects who completed all tests.

	6 Minute Walk Test	15 Minute Soak	15 Minute Soak followed by 6 Minute Walk Test
Group 1	Day 1	Day 2	Day 3
Group 2	Day 2	Day 3	Day 1
Group 3	Day 3	Day 1	Day 2

Each subject was randomly assigned to a group. Each group did one test per day and each group did the tests in a different order.

Subjects completed three tests on three separate days. Heart rate, blood pressure, and respiration rate were recorded during each test. Additionally, during the 6 minute walk test, perceived rate of exertion (PRE) was measured each minute. The distance walked in each 6 minute walk test was also measured. Differences between walk tests and differences between vitals during the soak were compared using paired t-tests.

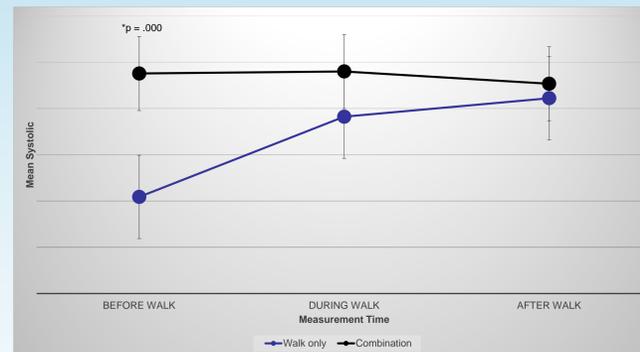
Recording times						
During Walk	0 minutes	3 minutes	6 minutes			
During Soak	0 minutes	7.5 minutes	15 minutes *exit pool	20 minutes	25 minutes	
During soak followed by walk	0 minutes	7.5 minutes	15 minutes *exit pool and change	20 minutes	23 minutes	26 minutes

Heart rate, blood pressure, and respiration rate were recorded at each interval listed above during the test.

## Results

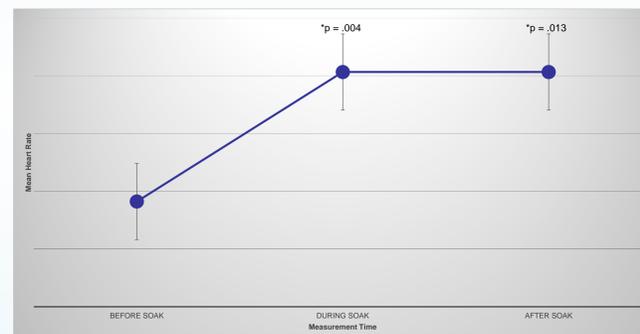
The change in distance walked was not found to be statistically significant, and the changes in PRE were not significant (all  $p > .05$ ). However, there was statistical significance when comparing systolic blood pressure prior to walking ( $p < .000$ ). The significant change in blood pressure suggested an anticipatory effect when subjects were soaking in preparation for the walk test.

## Results Continued



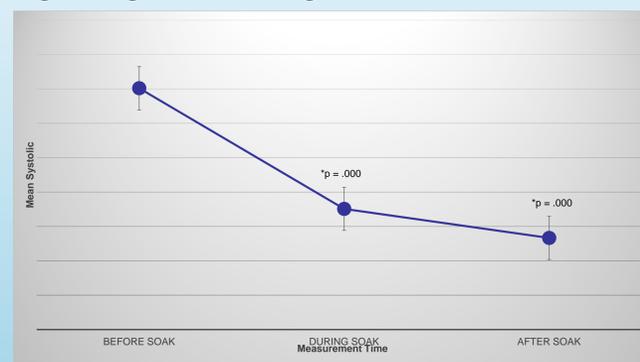
Mean systolic blood pressure compared between walk only test and walking after soaking. These elevated results are likely due to soaking in a hot tub serving as a warm up. Error bars 1 standard error.

Statistical significance was demonstrated when comparing heart rates during the soak to heart rate before the soak.



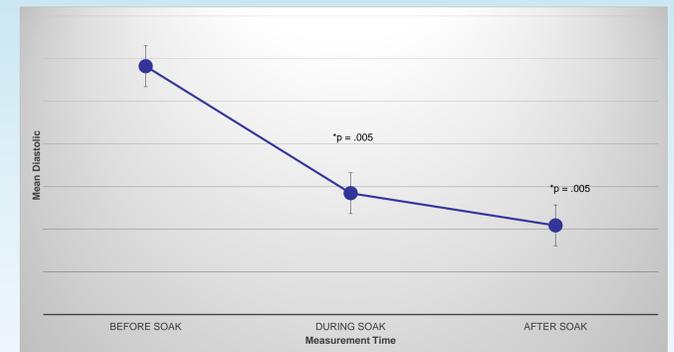
Mean heart rate changes during soaking. The change in heart rate from the start of the soak to both the middle of the soak and the end of the soak was statistically significant. This response is likely due to soaking acting as a warm up in increasing vital signs. Error bars 1 standard error.

Statistical significance was demonstrated when comparing systolic and diastolic blood pressure during the soak to systolic and diastolic blood pressure before the soak ( $p < .05$ ), suggesting changes in vital signs similar to that of a warm up.



Mean systolic blood pressure changes during soaking. The change in systolic blood pressure from the start of the soak to both the middle of the soak and the end of the soak was statistically significant. Error bars 1 standard error.

## Results Continued



Mean diastolic blood pressure changes during soaking. The change in diastolic blood pressure from the start of the soak to both the middle of the soak and the end of the soak was statistically significant. Error bars 1 standard error.

## Implications

Soaking in warm water has similar changes in blood pressure and heart rate to an active warm up prior to exercise. Soaking could be used as a warm up in cases that a full warm up is not possible, such as in cases of chronic conditions like arthritis. Soaking prior to exercise, would allow patients with these conditions to gain the therapeutic benefits of soaking in warm water, such as decreased pain and increased joint mobility, in addition to benefiting from longer aerobic exercise at a training heart rate.

Soaking in warm water can be used to continue the effects of a dynamic warm up in between warming up and competition. In sports such as swimming, there is often a long period of time prior to competition, in which athletes cool down and will not perform at their highest level. If athletes soak in warm water between their warm up and their competition, they may experience improved performance.

Future research is recommended to address how different types of exercise are affected by soaking prior to exercising and should also address how different populations are affected in their exercise performance when soaking prior to exercise.

## Acknowledgements

The authors would like to thank to the NFLI Clinic in Hveragerdi, Iceland for allowing us to conduct research in their facility. Thank you to Marcia Bosek, without whom this project would have not been possible.