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Research Review: In the spa - Is the meat cooked yet?

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Research Review

In the spa: is the meat cooked yet?

Title: Different Immersion Temperatures' Impact Upon Blood Pressure of Individuals With Varied Sex and Age

Author: Dr Hildenbrand and colleagues (Washington State University, Pullman, USA)

Source: *International Journal of Aquatic Research and Education*, 6: 303-314. 2012.

Introduction: Prior to assuming my current position at Bond University's Faculty of Health Science & Medicine, I was director of a large community chronic disease rehabilitation program. In addition to three floors of exercise facility nirvana, it also included a spa. Although I can't remember the exact temperature of the spa, regulations in the US recommend a maximum temperature of 40°C. Now common sense dictates that if you use the spa it should be either for a short period of time or intermittently, again with only short exposure times. Why? Because submersion, or conduction as we physiologists like to say, has a dramatic effect upon physiology. In brief, it has been shown that 15 minutes submersion at 30°C results in significantly increased heart rate (more work on the heart) and significantly decreased vascular resistance (i.e. systolic and diastolic blood pressures decreased due to the vasodilatation). Hmm... I'm not a brain surgeon, but I'll go out on a limb and say that some mature age individuals might get a bit dizzy from a prolonged 'simmer'. But what about other people – is it safe to use the spa or sauna?

Methodology: Dr Hildenbrand and her colleagues at Washington State University have completed a simple, but brilliant and applicable, study into the effects of various spa temperatures upon basic physiology (blood pressures and heart rate). A total of 58 individuals, younger (male/female, aged 18 to <30 years) and older (male/female, >30 to 65 years) volunteered to participate in the study which consisted of three different water temperatures compared to baseline:

Conditions	Water Temp
Baseline	room temp
Cool immersion:	31°C
Thermo-neutral immersion:	36°C
Hot immersion:	39°C

Subjects were immersed up to their sternal notch (clavicular level) for 24 minutes in each of the three temperatures, baseline ambient room temperature was also assessed. Following the hot water immersion, subjects then assumed a seated position in a neutral environment (not immersed in water).

Results: Not surprisingly, older males and females had the highest baseline values, and also demonstrated the largest decreases in systolic blood pressure in the thermo-neutral immersion. Older females actually demonstrated the greatest drop in systolic blood pressure in the hot immersion. Young females had the lowest resting systolic blood pressures and also demonstrated a large drop during the thermo-neutral



immersion. It is important to note that following hot immersion, none of the groups' systolic blood pressures returned to normal baseline values within the 12-minute recovery period.

Older males also had the highest resting (baseline) diastolic blood pressures, with all groups having the largest drop during the hot water immersion. The diastolic blood pressures of every group appeared to return to baseline values following the 12-minute recovery period.

With regard to heart rate, older adults demonstrated higher resting heart rates as compared to the younger groups. Heart rates in all groups decreased in the cool environment, and significantly increased in the hot environment.

Overall, the authors report significant differences between (age: young versus older) and within (gender: male versus female) effects from immersion in systolic blood pressure, diastolic blood pressure and heart rate.

Pros: Good study, reminds fitness enthusiasts of the physiological changes which occur with warm-hot water immersion. Although not investigated in this research study, is the effect of sauna use which is again whole body conduction with a significantly increased temperature (70°C to 100°C). In 2002 we conducted a study investigating the effects of sauna exposure (70°C for 20mins) on muscular performance. Amongst a number of measured parameters, we found heart rates significantly increased from 64bpm at rest (room temperature) to 122bpm following 30 minutes exposure. Therefore, caution should be exercised with the use of sauna.

Cons: Would have been beneficial if core temperature was also measured under all conditions.

If you investigate the literature, you will find a study reporting benefits of hot tub use for individuals with diabetes (*Lancet* 2010). This may be an accident waiting to happen: Dr Bernstein (MD) from the Diabetes Center in New York (USA) reminds us that diabetics often have nerve damage in their feet (peripheral neuropathy) and therefore can't feel the heat and are subsequently more likely to get burnt!

I had a diabetic patient who unfortunately suffered horrendous burns to the bottom of one of his feet after turning only the hot water on to 'warm up' the shower. After being interrupted by a phone call, he eventually stepped one foot into the shower, having forgotten that only the hot water was running. The nerve damage in his feet meant he did not respond immediately to the heat: consequently, he had around 20 seconds of exposure to the hot water which resulted in burns to the plantar (bottom) aspect of his foot, which required skin grafting. [\[1\]](#)

Dr Mike is supported in writing his Research Reviews by Human Kinetics.



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Dr Mike is the program director of Clinical Exercise Science at the Faculty of Health Sciences and Medicine at Bond University, QLD. He is recognised as one of Australia's leading accredited exercise physiologists working with patients suffering from a wide array of chronic diseases and disorders. For more information on this, or any recent Research Reviews, email michael_climstein@bond.edu.au.



Joe Walsh, MSc

Joe is a highly experienced sport and exercise scientist, currently working as a principle investigator on a series of observational studies investigating the demographics of various cohorts of master athletes. Joe's research interests include mathematical modelling, in particular use of Monte Carlo Methods and Markov Chains for modelling sports performance. He and Dr Mike have authored many scientific publications with findings presented at international conferences in Europe, Asia and North America.

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