

K. Rhee, W.W. Jeong, K.J. Chun. Effects of partial-immersion bath on the physiological parameters of elderly men. *Gerontechnology* 2008; 7(2):194. Hydrotherapeutic effects of bathing, which is achieved by heat and hydrostatic pressure, includes increasing perspiration and metabolism, alleviating muscle tension, fever and pain, and emotional suppression<sup>1</sup>. Various studies on the physiological effects of immersion bath, which include body temperature, blood pressure, intraocular pressure, regulation of autonomic nerve system and sleep, have been performed<sup>2</sup>. Approximately 10% of the cases of sudden death occurred during bathing, and about 10% were from drowning followed by cardiovascular disease in Japan<sup>3</sup>. Regulatory response of the cardiovascular and nervous system is changed by aging, and the changes of physiological parameters during immersion bath would be affected by the bath temperature and immersed body part. We would like to investigate the changes of cardiovascular parameters- blood pressure, heart rate and peripheral blood volume- during partial-immersion bath for young and elderly men. **Methods** The study subjects were 7 elderly men (mean age 75.0 years) and 9 young men (mean age 26.6 years). Immersion body level was up to knees (knee immersion) and upper thoracic ribs (3/4 immersion). The bathroom temperature was kept above 24°C. After a rest of more than 15 min, the subjects were immersed in hot water (temperature 42°C and 44°C), and rested for 15 min (young men) and 10 min (elderly men) in a seated position. Changes in blood pressure and heart rate were monitored with an automatic digital sphygmomanometer (Model T4, OMRON Co, Japan). Peripheral blood volume was measured at the figure tip by the photoplethysmography system developed in our laboratory. **Results and discussion** Blood pressure (BP) was decreased during 3/4 immersion (temperature 42°C) and increased to the baseline (prior to immersion) after about 10 min after completion of immersion. BP changes were more significant in the young men group compared to the elderly men group. During knee immersion, BP changes were similar for the young men group, but negligible BP changes were observed in the elderly men group. When the water temperature was increased to 44°C, BP changes were more significant in the elderly men group. Heart rate (HR) was increased during 3/4-immersion bath and decreased to the baseline at 42°C. The changes were more significant in the young men group. HR changes were not significant in the old men group, but HR changes were increased as the temperature increased to 44°C. Peripheral blood volume (BV) was also increased during immersion bath, and the changes were more significant in young men group. BP, HR and BV changes were more significant in the young men group. Recovery of BP, HR and BV back to the baseline values after immersion was also fast in the young men group. The present study implied that it is difficult for the elderly to maintain homeostasis during hot immersion bath, which would be caused by decreased response of autonomic nervous system to the heat stress.

## References

1. Moor FB. Idaho: Pacific Press; 1964
2. Michalsen A, Ludtke R, Buhning M, Spahn G, Langhorst J, Dobos GJ. *American Heart Journal* 2003;146:1-6
3. Tokutome S, Matsuo Y, Hamamatsu A, Takamatsu J, Kojimihara M, Aoki K. *Therapeutic Research* 1996;17:4248-4254

**Keywords:** bath, hydrotherapy, elderly, physiological change  
**Address:** Myongji University, Korea; E: khanrhee@mju.ac.kr

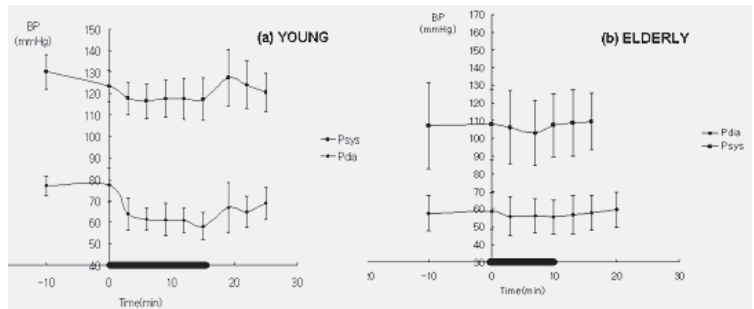


Figure 1 Changes of BP during 3/4 immersion bath (42 °C)