

Letter to the Editor

The effects of aqua PT 3-in-1 at 90°F on lumbar flexion heart rate and blood pressure

To the Editor:

We enjoyed the article by O'Neil RM et al. (1998; 10(1): 23–29.) The authors did an excellent job describing the ROM measurement technique and their results concerning lumbar flexion in the experiment. The explanation of the effects of heat and massage in the introduction was that both would result in vasodilation of the periphery. They state that “decreased preload will lead to decreased stroke volume and will then lead to increased temperature of the external environment” [1]. This explanation seems seriously deficient. The intrinsic regulation of stroke volume by the mechanism defined in the Frank-Starling Law of the Heart supports the idea that decreased preload leads to decreased stroke volume. This mechanism acts on a beat-by-beat basis. The extrinsic regulation of stroke volume is called contractility, which increases as a result of sympathetic stimulation (which also increases heart rate). Blood pressure, heart rate, stroke volume, and total peripheral resistance are related in the equation $MAP = (TPR)(HR)(SV)$ [2]. The researchers did not report the individual blood pressure changes or heart rates of the two groups, so it is difficult for other investigators to examine their results in terms of this formula. A closer examination of the results may help explain why the expected increase in heart rate did not occur, but rather a slight increase. Systolic pressures also exhibited a slight decrease, while diastolic pressures increased slightly. In future experiments with the Aqua PT, a statistically significant change between treatment and control groups in pre and post measurements may be approached if pressures are recorded for both arms of the subjects, average the pressures between the two arms, then average the systolic and diastolic measurements for each subject (MAP) and use the equation listed above.

We would also like to point out that the researchers made excellent use of their understanding of Huxley's Sliding Filament Theory to show that increased muscle length extensibility (increasing the width of the I-

bands, creating less myofibril overlap) is indicative of muscle relaxation. The authors made it clear that they were not assuming that increased range of motion is a benefit that speaks for itself as an outcome variable, but rather, increased ROM results from increased muscle length extensibility, which results from relaxation.

We are happy to support the findings that the Aqua PT 3-in-1 caused an increase in muscle length extensibility and ROM and look forward to reading the researchers' experiments with the machine at higher temperatures, higher forces, and higher cycles per second.

Travis Elliott, Linda Schmidt, Mi-Kyong Cho
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References

- [1] O'Neil RM, MacDonald BJ and Cocanour B, The effects of the Aqua PT 3-in-1 at 90°F on lumbar flexion, heart rate and blood pressure, *Journal of Back and Musculoskeletal Rehabilitation* 10(1) (1998), 23–29.
- [2] Rhoades R and Pflanzer R, *Human Physiology*, Orlando: Saunders College Publishing, 1992, pp. 641–679.

Reply:

The authors refer you to references 1 through 3 for the explanation of preload/stroke volume relationships. In this study, we were interested in the effects of the Aqua PT (a new modality) on blood pressure as would be recorded clinically. No significant changes were found for the 33 subjects used in the study. Future studies involving higher temperatures and pressure are underway and will continue to monitor blood pressure and heart rate.

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