Acute Metabolic, Cardiovascular, and Thermal Responses to a Single Session of Bikram Yoga

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INTRODUCTION

- Bikram yoga is a popular, standardized, 90 min sequence of hatha yoga postures performed in a heated (40.6 deg C) and humidified (40%RH) studio.
- There are 13 standing postures (50 min) followed by 13 floor postures (40 min).
- Each class is instructed similarly according to standard instructions. Although anecdotally this yoga is physiologically demanding due to the difficult postures and heat stress, the acute physiological responses have never been quantified.
- ***The purpose of this study was to characterize the metabolic (VO2), heart rate (HR), and core temperature (TEMP) changes during a standard session of Bikram yoga.***

METHODS

Subjects

19 experienced Bikram yoga practitioners (30±7yrs,19-40 yrs)

- Practice ≥ 2x per week
- At least 1 yr of experience (5.5±5 yrs)

Assessments

Subjects performed a session of Bikram yoga to recorded audio instructions in an environmental chamber

- Metabolic: VO_2 was measured using portable indirect calorimetry (Oxycon) with a face mask to collect expired gases




- Cardiovascular: Heart rate (HR) was measured with a chest strap ECG monitor (Polar)



- Thermal: Internal Temperature (TEMP) was measured with ingestible thermometer capsules (CorTemp)



RESULTS

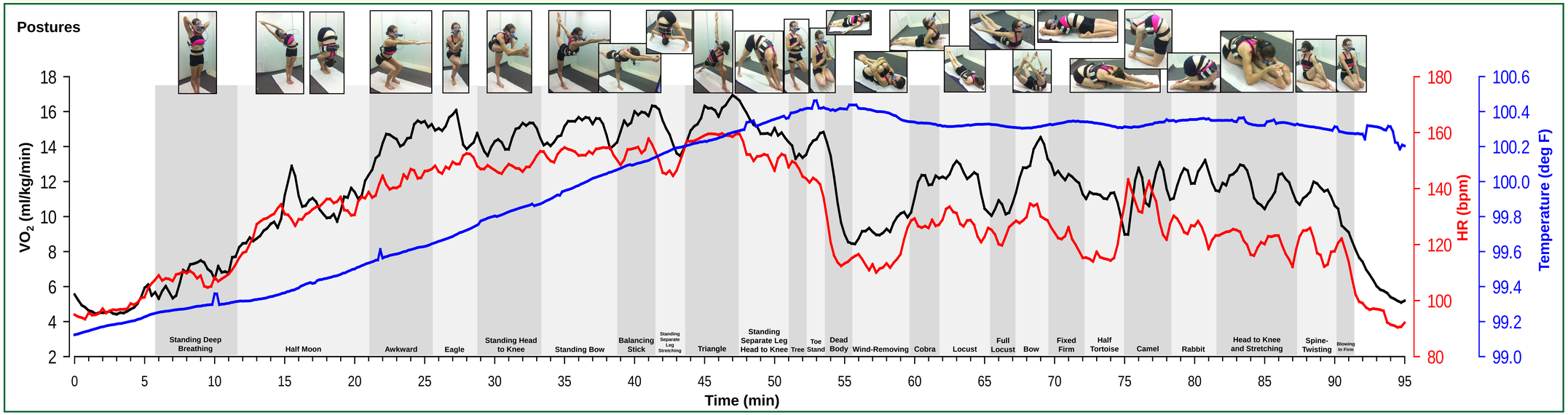
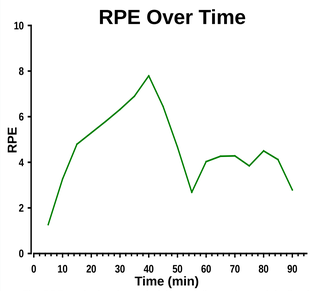
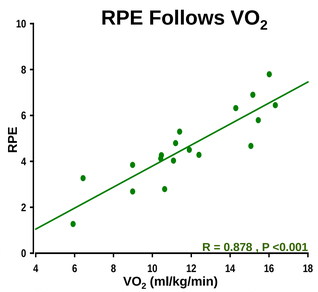


Table 1

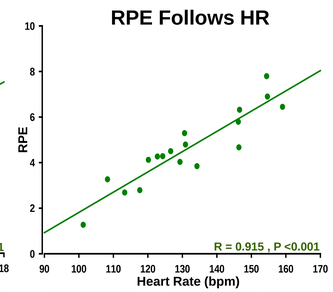
Category	Data Range	Min	Max	Average	St Dev
Avg. VO_2 (ml/kg/min)	Standing	6.7	19.7	14.2	2.7
	Floor	5.7	16.0	11.6	2.5
	Total	6.2	17.9	13.0	2.6
Avg. HR (bpm)	Standing	120.7	165.9	144.5	12.7
	Floor	104.8	149.7	123.4	13.4
	Total	115.3	157.8	133.7	12.2
Core Temperature (deg F)	Standing	98.0	101.5	99.8	0.6
	Floor	99.4	101.6	100.3	0.5
	Total Change	0.565	2.7	1.7	0.7
Avg. RPE	Standing	3.2	8.0	5.3	1.4
	Floor	3.7	2.1	6.9	1.3
	Total	3.1	7.3	4.5	1.2



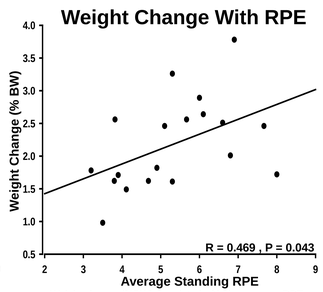
The RPE peaked at the end of the standing series and declined to a plateau during the floor series.



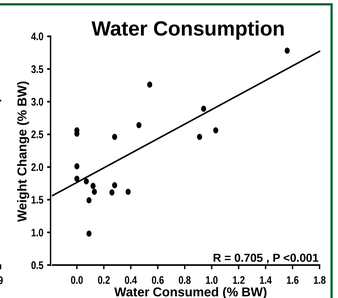
RPE responses fluctuated with oxygen consumption. Symbols represent RPE vs. VO_2 every five minutes for all subjects.



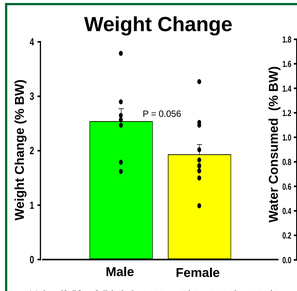
RPE responses fluctuated with heart rate. Symbols represent RPE vs. HR every five minutes for all subjects.



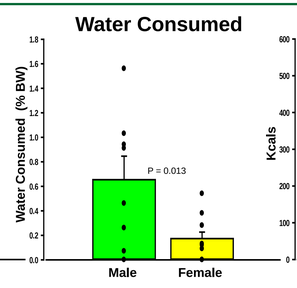
Weight change (%BW) correlated with the average RPE reported during standing postures.



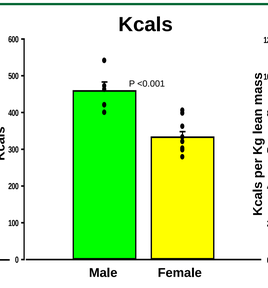
Subjects who consumed larger amounts of water (liters) demonstrated higher changes in weight.



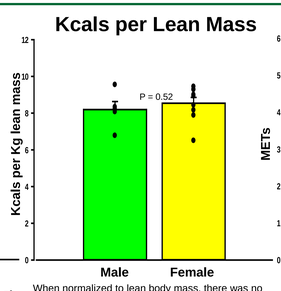
Males (2.53 ± 0.7 kg) demonstrated greater changes in weight (% BW) compared with females (1.93 ± 0.6 kg).



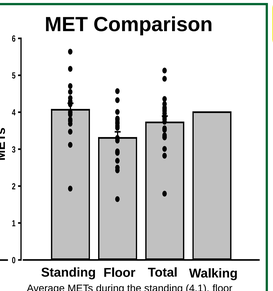
Males (0.65 ± 0.5 L) consumed more water (%BW) compared with females (0.17 ± 0.2 L).



Males (459 ± 55 kcals) utilized more kilocalories of energy (kcals) compared with females (333 ± 46 kcals).



When normalized to lean body mass, there was no difference in kcal expenditure between men (8.19 ± 0.98 kcals/kg) and women (8.54 ± 0.94 kcals/kg).



Average METs during the standing (4.1), floor (3.3), and total Bikram series (3.7), are similar to walking at 3.5 mph on a firm level surface or 2 mph on a 5% graded surface.

CONCLUSIONS

- For young, healthy, experienced Bikram practitioners, a single session of Bikram yoga produced moderate metabolic responses and substantial heart rate responses.
- Core temperature was elevated within a safe range.

ACKNOWLEDGEMENTS

The study was funded by Bikram's Yoga College of India and Pure Action, Inc.