

# Effect of Lower Body Negative Pressure on Physiological, Perceptual and Affective Responses during Self-Regulated Exercise

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## Abstract

**Purpose:** Lower body negative pressure (LBNP) treadmill exercise was developed for health maintenance during periods of microgravity. It involves exercising on a treadmill within a waist-high pressure chamber connected to a pump. LBNP treadmill exercise generates a pressure differential between the upper and lower body increasing ground reaction forces (GRFs). This study compared the physiological, perceptual and affective responses in women during 30 min of self-regulated treadmill walking with and without LBNP.

**Methods:** Fifteen healthy women (mean  $\pm$  SD; age  $24.2 \pm 5.1$  yr,  $VO_{2max}$   $48.6 \pm 6.9$  ml.kg<sup>-1</sup>.min<sup>-1</sup>, BMI  $22.6 \pm 2.0$  kg.m<sup>-2</sup>) made 7 visits to the laboratory. The first visit assessed  $VO_{2max}$ . During the next 6 visits, participants exercised for 30 min at a self-regulated velocity on a standard treadmill (TM) or a LBNP treadmill at normal body weight (BW), +10%BW, +20%BW, +30%BW and +40%BW. Participants could alter the velocity during the initial 3 min of exercise and during the first 30 sec of every 6th min. Respiratory and metabolic variables were measured using open circuit spirometry. HR was recorded using telemetry. Blood samples were drawn and RPE-O (Borg 15 category scale) and affective responses (Feeling scale) were recorded during the final 15 sec of each 5 min interval.

**Results:** There was no significant difference in any of the measured parameters between the experimental conditions.

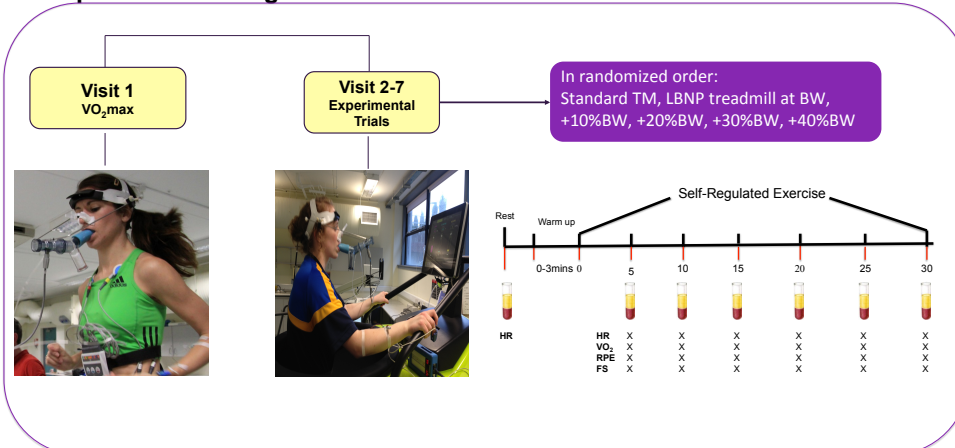
**Conclusion:** There was no significant difference in the physiological, perceptual or affective responses in healthy women during self-regulated walking with or without LBNP. This may be due to lower GRF's produced during walking compared to running.

## Introduction

Lower body negative pressure (LBNP) treadmill exercise was developed for health maintenance during periods of microgravity<sup>1</sup>. It involves exercising on a standard treadmill within a waist-high pressure chamber connected to a pump. LBNP, generated by a pressure differential between external ambient pressure and the pressure within the chamber, increases ground reaction force (GRF). Upright LBNP running has been found to significantly increase heart rate (HR) at 1.1 and 1.2 body weight (BW) and increase  $VO_2$  at 1.2 BW in recreational and competitive athletes<sup>2</sup>. The purpose of this study is to compare the physiological, perceptual, affective and metabolic responses in women during 30 min of self-regulated treadmill walking with and without LBNP.



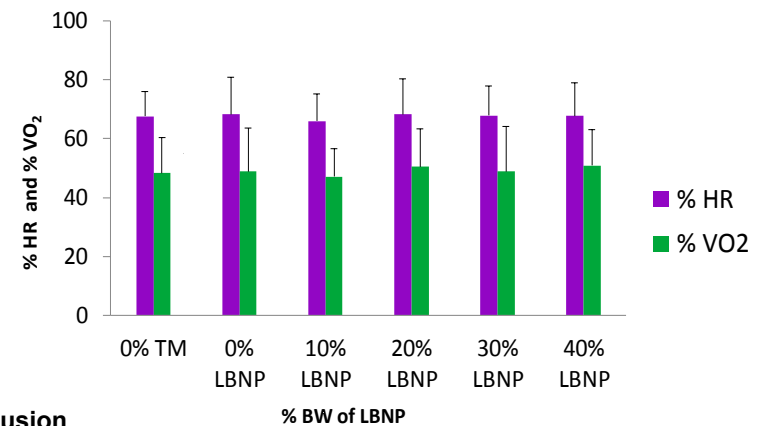
## Experimental Design



## Results

**Table.** Physiological, Perceptual and Affective Responses

	Standard TM	LBNP Treadmill				
	0%	0%BW	+10%BW	+20%BW	+30%BW	+40%BW
Velocity (km.h <sup>-1</sup> )	6.7 $\pm$ 0.4	7.1 $\pm$ 0.7	6.9 $\pm$ 0.6	7.0 $\pm$ 0.8	6.9 $\pm$ 0.7	6.8 $\pm$ 1.0
RPE-O	9.9 $\pm$ 1.4	9.9 $\pm$ 2.6	9.2 $\pm$ 2.3	9.4 $\pm$ 3.0	10.1 $\pm$ 2.5	10.3 $\pm$ 2.4
Feeling Scale	2.6 $\pm$ 1.7	3.0 $\pm$ 1.5	3.0 $\pm$ 1.5	2.9 $\pm$ 1.4	2.9 $\pm$ 1.5	2.3 $\pm$ 1.9
Kcal.min <sup>-1</sup>	7.3 $\pm$ 1.5	7.3 $\pm$ 1.5	7.1 $\pm$ 1.2	7.6 $\pm$ 1.5	7.5 $\pm$ 2.1	7.6 $\pm$ 1.4
Cumulative EE	205.4 $\pm$ 46.3	204.8 $\pm$ 50.1	200.9 $\pm$ 36.3	215.6 $\pm$ 38.5	213.6 $\pm$ 60.8	212.5 $\pm$ 42.9
Lactate (mmol.L <sup>-1</sup> )	1.0 $\pm$ 0.4	1.1 $\pm$ 0.9	0.8 $\pm$ 0.3	1.0 $\pm$ 0.7	1.0 $\pm$ 0.5	0.9 $\pm$ 0.8



## Conclusion

There was no significant difference in the physiological, perceptual or affective responses in healthy women during self-regulated walking with or without LBNP. This may be due to the lower GRF's produced during walking compared to running.

## Bibliography

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