



COMPARISON OF CARDIOVASCULAR AND LACTATE RESPONSE IN INDIVIDUALS AT DIFFERENT LEVELS OF SPINAL CORD INJURY AND ITS EFFECT ON SELF REPORTED EXERCISE HABITS

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INTRODUCTION:

The autonomic nervous system contributes to the regulation of cardiovascular, pulmonary function and metabolic processes.

During a progressive maximal exercise test, peripheral catecholamines increase exponentially with increase workload.

Spinal cord injury (SCI) above T7 leads to an impairment of the sympathetic nervous system (SNS) function due to the loss of transmission of efferent signals from supraspinal centers to the periphery and of afferent signals back to the central nervous system.

T6 is considered a critical point for autonomic innervations, and its severity depends on the level and completeness of injury.

Although there is evidence that individuals with paraplegia above T6 have an impaired catecholamine and lactate response to exercise, the degree of such impairment is still controversial and some researchers reporting normal values.

Scientific guidelines provide prescription of exercise intensity limited to moderate to vigorous depending on percentage of maximum oxygen uptake and heart rate. An alternative approach to define three domains (moderate, heavy and severe) is lactate threshold widely used in monitoring training.



CARDIOVASCULAR RESPONSE AT DIFFERENT LEVELS OF SCI			
SCI	C5-T1	T2-T6	T7-L1
HR rest	74,75±16,95	67,67±6,80	71,33±9,45
HR submax.	103,75±23,68	120,67±45,32	117,33±27,42
HR max.	115,75±34,65	147,33±33,08	146,33±18,77
SBP rest	90±18,25	103,33±5,77	101,67±7,63
SBP submax.	95±34,15	130±10	116,67±20,81
SBP max.	95,5±39,47	143,33±5,77	143,33±20,81
DBP rest	55±5,77	60±10	63,33±5,77
DBP submax.	57,50±17,07	63,33±15,27	70±10
DBP max.	57,50±20,61	70±10	75±13,22

METHODS:

We evaluated 30 persons (p); 20 males and 10 females; mean age 33,09 ± 7,3 years old, with complete long-term SCI.

Subjects were divided in three groups according to the level of the lesion (nonsignificant differences with respect to age, sex, BMI): Tetra above T1 n=10; high and midlevel paraplegics between T1-T6 n=10; low level paraplegics T7-L1 n=10. Each group had 5 p with limited physical activity (LPA) and 5 p sport players (SP).

All of them performed an incremental and continuous exercise in arm crank ergometer (Technogym) seated in their personal daily living chairs. Subjects cranked at 60 rpm with workload increases 10 w every 3 minutes until volition exhaustion. Mixed-capillary blood was taken at the earlobe to determine lactate concentrations at the end of each stage, measured by an enzymatic analyzer (Lactate plus).

We measured as cardiovascular variables: heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) at rest, submaximal (submax.) and maximal (max.) workload; double product (DP submax. and max.). Peak oxygen consumption (VO₂p) was established by ACSM formula. Lactate threshold (lactate 1mM above baseline) and VO₂ at LT were measured as a way to reflect physical performance.

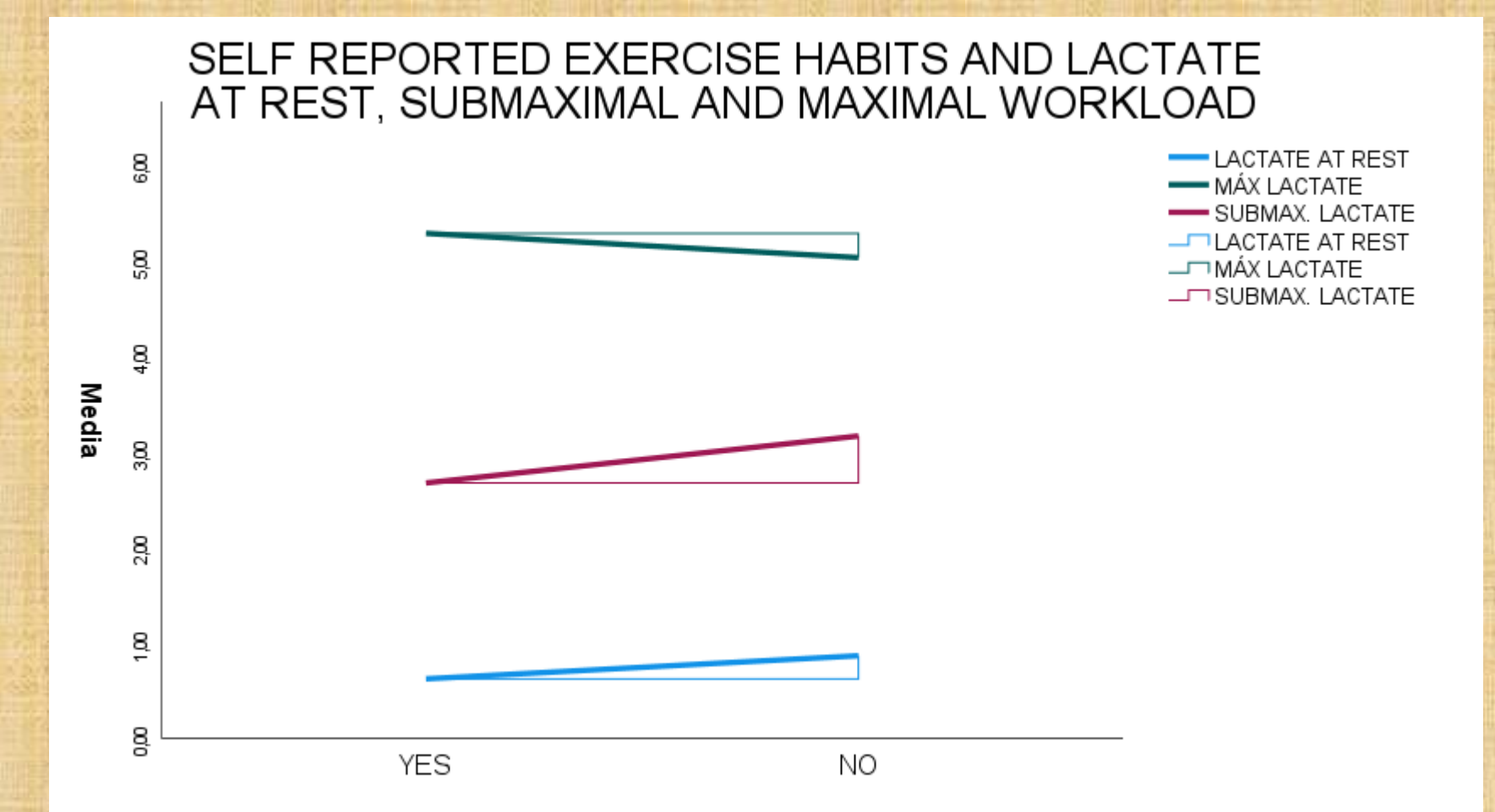
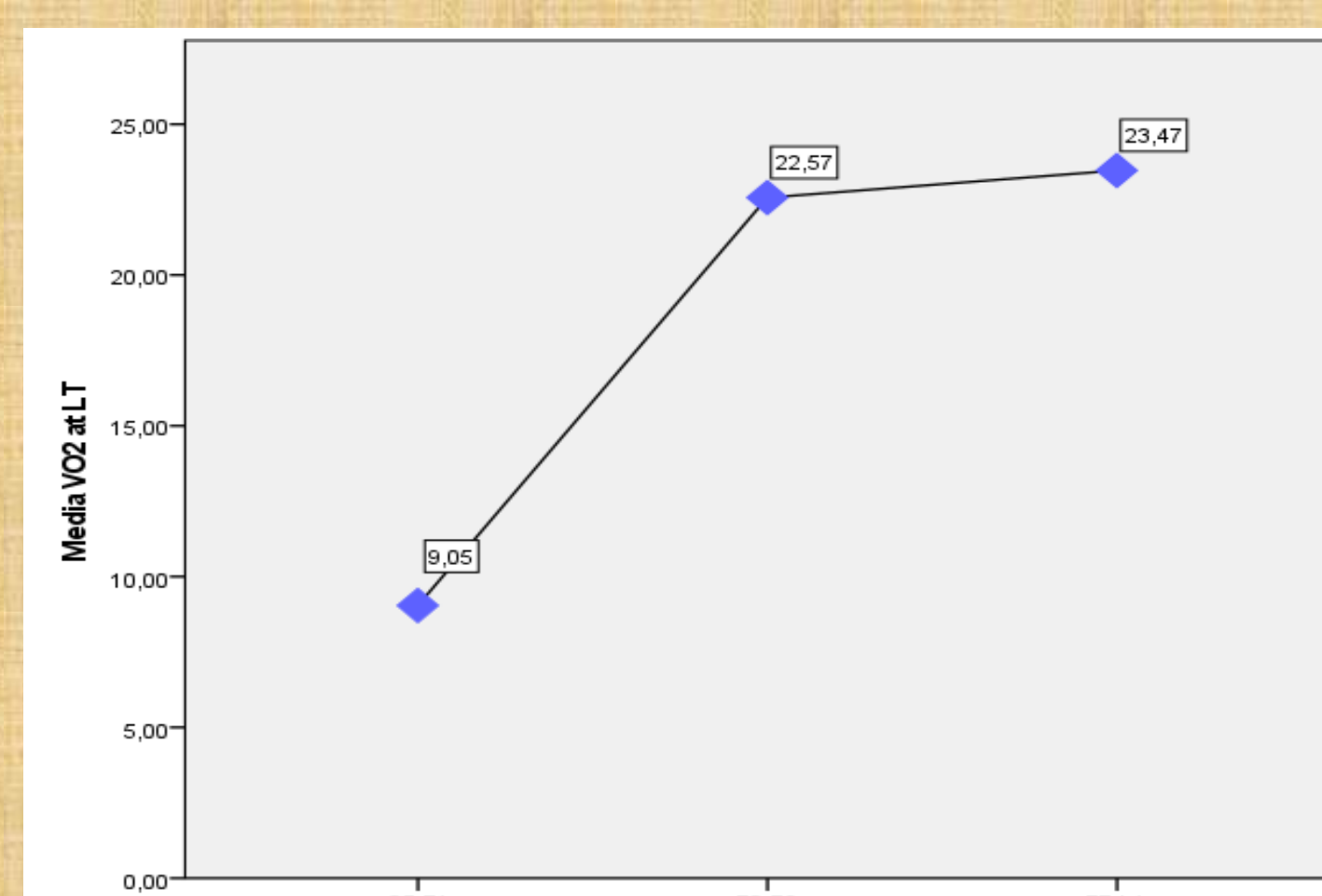
All data were presented as the mean and standard deviation (SD). Laboratory test responses were compared using one-way ANOVA followed by post hoc test to analyze the differences among the groups. The results were considered to be significant at the 0.05 level of confidence. All statistical analyses were computed using SPSS Version 24.

OBJECTIVES:

The purpose of this study was to investigate cardiorespiratory and metabolic response at different levels of SCI in persons with Tetraplegia (Tetra) and Paraplegia (Para) in wheelchair users. The impact of self reported exercise habits and potential methods of aerobic training

RESULTS:

Tetra persons showed lower LT, VO₂LT and VO₂p compared with Para subjects at different levels; C5-T1(LT 2,35±0,31; VO₂LT 9,04±4,23; VO₂peak 16,39±0,21); T2-T6(LT 4,05±1,06; VO₂LT 22,57±16,47; VO₂p 28,22±10,18); T7-L1(LT 2,47±1,05; VO₂LT 23,47±10,53; VO₂p 28,87±9,87) with statistical significant differences for VO₂LT and VO₂p $p \leq 0.05$ in Para vs Tetra. High-midlevel paraplegics had a cardiovascular response slightly higher than low level paraplegics with the exercise. Tetra persons evidenced lower HR-SBP-DBP and DP. SP improved cardiovascular and particularly metabolic response without significant differences in relation to LPA group.



CONCLUSIONS:

These data suggest that even with a small sample size, we found a normal cardiovascular response above T6 in paraplegics and could be useful LT for exercise intensity prescription as well as monitoring training.