https://doi.org/10.6063/motricidade.31876

Abstract

Is Muscle Oxygen Saturation related to Perceived Exertion?

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Conflict of interest: nothing to declare. **Funding:** This work is supported by the Project I&D&I HEALTH-UNORTE, n. º NORTE-01-0145-FEDER-000039, co-funded by the Regional Development European Fund (FEDER) through NORTE 2020 (North Region Operational Program 2014/2020).

Muscle Oxygen Saturation (SmO_2) is a physiological indicator of the amount of oxygen inside the muscle. We can observe almost immediately the decrease in SmO_2 when a muscle contracts, and when the contraction stops, its recovery is also observable. Some adaptations to exercise include having lower baseline values of SmO_2, as the muscle does not require as much oxygen consumption, an ability to consume less oxygen during exercise, and/or the ability to maintain performance with lower levels of SmO_2 during exercise. A faster muscle reoxygenation is also observed in subjects with higher training levels. All considered, this study aimed to correlate the cardio and muscle perceived exertion (RPEc and RPEm, respectively) registered immediately after exercise with

SmO_2 levels and Heart Rate (HR). Seventeen healthy adults participated in this study (age=25.6±2.8yrs; body mass=74.9±9.0kg; height=175±7cm; BMI=24.7±4.9kg/m^2; VL skinfold=13.2±4.8mm). A familiarisation session for each exercise (squat and lunge) was conducted, followed by two sessions, on separate days, where the six variations were held in random order for 90 seconds and 5 minutes rest (cadence 40-60bpm). Exercise variations were chosen so there were isometric, unstable, reactive, single-leg, and different range of motion (RoM).

During sessions, SmO_2 was continuously measured using Near Infrared Spectroscopy (Moxy Fortiori Design, Hutchinson, USA) in each *vastus lateralis* and a Garmin heart rate monitor (HRM3-SS, USA) was used to measure HR. The muscular (RPEm) and cardio (RPEc) rates of perceived exertion were registered immediately after each exercise variation (Borg scale, 6-20).

The Correlation Matrix between SmO2 vs RPEm and HR vs RPEc is presented in Table 1.

Table 1. Correlation between physiological variables and perceived exertion (Pearson R)

	Squat						Lunge					
	Isometric	**Reactive**	**RoM**	**RoM**	**Unstable**	**Single Leg**	**Isometric**	**Reactive**	**RoM**	**RoM**	**Unstable**	**Single Leg**
SmO_2 *vs* RPEm	-0.209	0.221	-0.217	0.158	-0.076	0.112	-0.464	0.005	0.483	0.196	0.188	0.270
HR *vs* RPEc	0.730*	0.560*	0.609*	-0.286	0.382	0.623*	0.378	-0.152	-0.163	0.004	-0.527	-0.520
RPEc *vs* RPEm	0.723*	0.401	0.807**	0.802**	0.733*	0.661*	0.798**	0.232	0.444	0.735*	0.571*	0.786*

Note: *p<.05; **p<.001

The results may indicate some relation between RPEc and RPEm, and we can only speculate why there are correlations between HR and RPEc in squats but none in lunges. What these results suggest is that SmO_2 alone is not an indicator of the level of exertion of an exercise since its values are not related to the effort perceived by participants.

Acknowledgements

Research Centre in Sports Sciences, Health Sciences and Human Development (CIDESD - UIDB/04045/2020)

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