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Fryer, Simon M ORCID: 0000-0003-0376-0104, Giles, David, Garrido, Inmaculada, Stone, Keeron J ORCID: 0000-0001-6572-7874, de la Puerta, Alex and España-Romero, Vanesa (2016) Cardiorespiratory and hemodynamic predictors of sport rock climbing performance (Abstract Only). In: British Association of Sport and Exercise Sciences, 29 - 30 November 2016, Nottingham. ISSN 0264-0414

Official URL: <https://www.nutrition society.org/events/british-association-sport-and-exercise-sciences-conference-2016>

EPrint URI: <https://eprints.glos.ac.uk/id/eprint/4245>

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Title: Cardio-respiratory and Hemodynamic Predictors of Sport Rock Climbing Performance

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Rock climbing performance has been suggested to involve a notable contribution from the aerobic metabolism. Previously forearm oxygenation kinetics has been used to distinguish between ability groups and predict the performance of sport rock climbers. Currently it is not known if forearm oxygenation kinetics, or a sport specific assessment of cardiorespiratory fitness best predicts sport rock climbing performance. Therefore the aim of this study was to determine whether forearm oxidative capacity index, maximal de-oxygenation of the flexor digitorum profundus (FDP), treadmill $\dot{V}O_{2peak}$, or running $\dot{V}O_{2peak}$ best predicts red-point climbing performance. **Methods:** Following institutional ethical approval, twenty-nine sport rock climbers (age 34.5 ± 6.6 yrs; height 1.71 ± 0.07 m; mass 64 ± 8.2 kg and body fat $17.2 \pm 7.6\%$) visited the laboratory on two separate occasions within 7 days. During visit one participants self-reported their indoor sport rock climbing ability, previously shown to be a valid measure, and completed a treadmill $\dot{V}O_{2peak}$ test during which maximal de-oxygenation of the FDP was assessed using near infrared spectroscopy (NIRS). During the second visit oxidative capacity index of the FDP was determined using NIRS, and this was followed by a running $\dot{V}O_{2peak}$ test. **Results:** Linear regression, adjusted for age, sex and body fat percentage revealed that forearm oxidative capacity index, treadmill maximal de-oxygenation and treadmill $\dot{V}O_{2peak}$ all significantly predicted self-reported red-point sport climbing ability ($R^2 = 0.766; 0.538; 0.495$ respectively), whereas running $\dot{V}O_{2max}$ did not ($R^2 = 0.215$). **Conclusions:** Sport rock climbers should consider additional sport specific aerobic training rather than traditional aerobic exercise such as running to improve climbing performance.