

- 1 **Title:** Utility of lactate testing for the prediction of 2000m rowing ergometer performance: a
2 systematic review
- 3 **Journal:** Sports Medicine – Open
- 4 **Author Names:** Timothy Kilbey†, Eugenio Vecchi†, Paulo Salbany, Prof. Ashok Handa,
5 Prof. Eleanor Stride, Mihir Sheth*
- 6 † These authors contributed equally to this work.
- 7 *Correspondence should be addressed to mihir.sheth@nds.ox.ac.uk

Affiliations

**Department of Engineering Science, Institute of Biomedical Engineering, University of
Oxford, Oxford, U.K**

Mihir Sheth, Prof. Eleanor Stride

Nuffield Department of Surgical Sciences, University of Oxford, Oxford, U.K

Prof. Ashok Handa, Paulo Salbany

St Catherine's College, University of Oxford, Oxford, U.K

Timothy Kilbey, Eugenio Vecchi

8 Online Resource 3: Systematic Review Study Protocol

Protocol: Accuracy of lactate testing for the prediction of 2km rowing ergometer performance: a systematic review.

Introduction

Athletes and their coaches need to determine the effects of their training regime. However, a full race-distance maximal effort test is a physiological challenge that will interrupt an athlete's training and thus cannot be performed too frequently. This issue is even greater for marathon runners, who will compete in as little as two to three marathons per year, as each one necessitates an extended recovery period. As such, previous studies have investigated the remarkable strength of correlation between lactate tests and marathon times(1,2,3) However, other studies have concluded that lactate testing alone should not be used to predict trail running times(4). Nevertheless, lactate testing of rowers has become increasingly common as a way to determine their endurance capacity and monitor fitness. However, a 2km rowing race lasts only 5:30-7 min and thus the performance under anaerobic conditions may play a greater role than in marathon runners. In addition, there are a range of different lactate tests that are performed. This systematic review aims to assess the accuracy of various lactate tests for predicting rowing 2Km ergometer performance, as no recent, published systematic review tackles this question. The findings of this review may help enable better monitoring of a rower's athletic progress and the effects of training adaptations. It may also have wider consequences such as improving the ability of a coach to identify rowing performance potential in untrained athletes.

Objectives

- 1) To review and assess the extent, quality and reliability of lactate testing as a tool for predicting 2Km rowing ergometer times.
- 2) To assess whether this is an appropriate test for athletes to use as a substitute for the 2Km test to gain an idea of the efficacy of their training regime

Methods

Eligibility criteria

Studies that report the following will be eligible for inclusion in the review

- Individuals of any age or sex
- Amateur or professional rowers
- The use of submaximal (2mM or 4mM lactate thresholds) or maximal blood lactate concentration or maximal plasma lactate concentration
- Studies on rowing for 2Km
- Studies in English

We shall exclude

- Studies that fail to report the accuracy or reliability of the lactate scores and its correlation to the rowing performance

- 49 - Studies that do not use a rowing ergometer
- 50 - Studies not published in English

51

52 There will be no date restrictions for studies

53 Information Sources

- 54 - MEDLINE (ovid), EMBASE, SPORTdiscus.
- 55 - Google search
- 56 - The bibliography of included studies

57

58 Search Strategy

59 Example Medline strategy

60 search terms will be:

- 61 3) (lactate or anaerobic threshold* or aerobic threshold* or aerobic-anaerobic threshold* or
- 62 anaerobic-aerobic threshold* or exercise test*)
- 63 4) (performance or time or fatigue or exhaustion or result*).mp.
- 64 5) (row* or ergo*).mp
- 65 6) (2Km or 2000m or 2,000m or two-thousand meter or two-thousand metre or two-kilomet* or
- 66 2-kilomet* or 2000-m or 2000 m or 2-Km).mp
- 67 7) 1 and 2 and 3 and 4

68

69

70 Selection Process

71 We shall screen records for eligibility based on title and abstract. The full texts of eligible studies will
72 then be screened independently by two reviewers for inclusion in the review. Excluded studies will be
73 documented, with reasons given. Any disagreements between the primary reviewers will be resolved
74 through discussion with a third reviewer, who will also check the data for consistency and clarity.

75

76 Data Items

77 Authors

78 Study Title

79 Journal Name

80 Journal Volume

81 Page Numbers

82 Year of Publication

83 Number of participants

84 % male participants

85 Mean age of participants

86	Standard Deviation of participant ages
87	Category of rower
88	Standard of Rowers
89	Results of lactate tests(s)
90	Correlation of lactate test(s) to 2km time/speed/power and the significance of this correlation
91	Method of calculating lactate threshold
92	Methods of generating other lactate variable data
93	Other measurements used to predict performance
94	Mean and standard deviation of Ergometer time over 2km
95	Range of 2km ergometer times
96	Mean and standard deviation ergometer Power over 2km
97	Range of 2km power scores
98	Mean and Standard Deviation ergometer Speed over 2km
99	Range of 2Km speeds
100	Type of correlation calculation
101	
102	Outcomes
103	The primary outcome will be the accuracy of the predicted ergometer time based on lactate testing
104	data.
105	
106	Risk of Bias in individual studies
107	The reviewers will independently assess the reporting quality and methodological quality of the
108	included studies.
109	
110	Results will be presented in a table, showing the correlation between lactate threshold and 2Km
111	ergometer time or prediction accuracy for each study.
112	
113	References
114	1. Sjödin, B., and I. Jacobs. "Onset of blood lactate accumulation and marathon running
115	performance." <i>International journal of sports medicine</i> 2.01 (1981): 23-26.
116	
117	2. Föhrenbach, R., A. Mader, and W. Hollmann. "Determination of endurance capacity and
118	prediction of exercise intensities for training and competition in marathon
119	runners." <i>International journal of sports medicine</i> 8.01 (1987): 11-18
120	

- 121 3. Roecker, K., et al.. "Predicting competition performance in long-distance running by means
122 of a treadmill test." *Medicine and science in sports and exercise* 30 (1998): 1552-1557.
123
124 4. de Waal, Simon J., et al. "Physiological indicators of trail running performance: a systematic
125 review." *International Journal of Sports Physiology and Performance* 16.3 (2021): 325-332.

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