

## SYSTEMATIC REVIEW

A SYSTEMATIC REVIEW AND META-ANALYSIS  
COMPARING CARDIOPULMONARY EXERCISE TEST  
VALUES OBTAINED FROM THE ARM CYCLE AND THE  
LEG CYCLE RESPECTIVELY IN HEALTHY ADULTSRasmus Tolstrup Larsen<sup>1,3,8</sup>Jan Christensen<sup>1,2</sup>Lars Hermann Tang<sup>1,3,4</sup>Camilla Keller<sup>2,3</sup>Patrick Doherty<sup>5</sup>Ann-Dorthe Zwisler<sup>8</sup>Rod S Taylor<sup>6,7</sup>Henning Langberg<sup>1</sup>

## ABSTRACT

**Introduction:** The cardiopulmonary exercise test (CPET) assesses maximal oxygen uptake ( $VO_{2max}$ ) and is commonly performed on a leg cycle ergometer (LC). However, some individuals would rather perform the CPET on an arm cycle ergometer (AC).

**Objective:** The objectives of this study were to undertake a systematic review and meta-analysis of the difference in  $VO_{2max}$  achieved by AC compared to LC in healthy adults and to explore factors that may be predictive of this difference.

**Methods:** MEDLINE, EMBASE, CINAHL, and PEDro were searched in April 2015. The differences in  $VO_{2max}$  ( $ACL_{diff}$ ) were pooled across studies using random effects meta-analysis and three different methods were used to estimate the ratio between the values obtained from the tests ( $ACL_{ratio}$ ).

**Results:** This paper included 41 studies with a total of 581 participants. The mean  $ACL_{diff}$  across studies was 12.5 ml/kg/min and 0.89 l/min with a mean  $ACL_{ratio}$  of 0.70. The  $ACL_{diff}$  was lower in studies with higher mean age and lower aerobic capacity.

**Conclusion:** There is linear association between the AC and LC values in healthy adults. The AC values were on average 70% of the LC values. The magnitude of this difference appeared to be reduced in studies on older and less active populations.

**Key words:** Aerobic capacity, exercise testing, oxygen uptake, leg cycle, arm cycle, ergometer, systematic review, meta-analysis.

**Level of evidence:** 3a

<sup>1</sup> CopenRehab, Section of Social Medicine, Department of Public Health, University of Copenhagen, Denmark

<sup>2</sup> Department of Occupational- and Physiotherapy Therapy, Copenhagen University Hospital, Copenhagen, Denmark

<sup>3</sup> Bachelor's Degree Programme in Physiotherapy, Dept. of Rehabilitation and Nutrition, Faculty of Health and Technology, Metropolitan University College, Copenhagen, Denmark

<sup>4</sup> Department of Cardiology, The Heart Centre, Rigshospitalet, Copenhagen University Hospital, Copenhagen, Denmark

<sup>5</sup> Department of Health Sciences, University of York, England

<sup>6</sup> Institute of Health Research, University of Exeter Medical School, Exeter, England

<sup>7</sup> National Institute of Public Health, University of Southern Denmark, Copenhagen, Denmark

<sup>8</sup> Danish Knowledge Centre for Rehabilitation and Palliative Care, University of Southern Denmark

## CORRESPONDING AUTHOR

Rasmus Tolstrup Larsen

Henrik Pontoppidans Vej 6, 1st floor.

DK-2200

Copenhagen N, Denmark

E-mail: [tolstruplarsen@gmail.com](mailto:tolstruplarsen@gmail.com)

Phone: + 4542423007