The heart rate method for estimating oxygen uptake in walking and cycle commuting
Evaluations based on reproducibility and validity studies of the heart rate method and a portable metabolic system

av

Jane Salier Eriksson

Akademisk avhandling
Avhandling för filosofie doktorsexamen vid Gymnastik- och idrottshögskolan, som enligt beslut av rektor kommer försvaras offentligt fredagen den 28 september 2018 klockan 9:00, i Aulan, vid Gymnastik- och idrottshögskolan, GIH, Stockholm.

Opponent: Professor Jostein Hallén
Norwegian School of Sport Sciences
Salier Eriksson, Jane: The heart rate method for estimating oxygen uptake in walking and cycle commuting: Evaluations based on reproducibility and validity studies of the heart rate method and a portable metabolic system.
Avhandlingsserie för Gymnastik- och idrottshögskolan Nr 13 (2018)

Abstract:

Walking and cycling to work can contribute to population health, but more objective knowledge concerning exercise intensities, oxygen uptake and the metabolic demands of this physical activity is needed for this and other evaluations. To attain this, valid and reliable instruments are a requirement. The focus of this thesis was to evaluate whether the heart rate method can be used for this purpose. It involves establishing the relation between heart rate and oxygen uptake during ergometer cycling in laboratory conditions, and thereafter checking if the same relation exists during cycle or walking commuting in a metropolitan area.

To accomplish this, a portable metabolic system was tested for validity and reliability in laboratory and field conditions and the reproducibility of the heart rate and oxygen uptake relation in the laboratory was evaluated. Furthermore, the heart rate and oxygen uptake relations during cycle and walking commuting was compared with those attained in the laboratory.

The first two studies showed that a portable metabolic system is valid during laboratory and sustained field conditions. Studies 3 and 4 showed that the heart rate method with respect to the heart rate-oxygen uptake relationship is reliable on the group level for both walking and cycling commuters during repeated measures in the laboratory. The last two studies showed that applying the heart rate method during cycle commuting leads to valid levels of oxygen uptake on the group level for both males and females. Contrary to that, the measured levels of oxygen uptake in the field during walking commuting were on average 17% higher for males, and 13% higher for females than the values obtained with the heart rate method. For both walking and cycling commuters, the individual spread around the mean values was rather high, creating somewhat wide confidence intervals for the mean values.

In summary, the heart rate method can be used for cycle commuters during their normal commuting conditions, while for pedestrians it is necessary to take into account that oxygen uptake per heart rate is higher while walking than that estimated from ergometer cycling in the laboratory.

Keywords: Heart rate, Oxygen consumption, Validity, Reproducibility, Oxycon Mobile, Douglas Bag Method, Cycle commuting, Walking commuting
ISBN: 978-91-983151-4-1
http://urn.kb.se/resolve?urn=urn:nbn:se:gih:diva-5400

Jane Salier Eriksson, Gymnastik- och idrottshögskolan, Lidingövägen 1, Box 5626, SE-114 86 Stockholm, Sweden, e-mail: janes@gih.se