Heart rate prescriptions from performance and anthropometrical characteristics

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Purpose: Heart rate (HR) is widely used to adjust exercise intensity in aerobic training. Training HR recommendations are calculated often from simple equations. Because at lactate steady state (LASS) may be an intensity of exercise eliciting similar objective measures of intensity and similar subjective measures of metabolism, it is an appropriate intensity upon which to base aerobic-training prescription. The purpose of this research was to develop regression equations using age and other easily accessible characteristics to estimate the HR associated with LASS (HR_LASS).

Methods: The data of 7397 healthy subjects (age ≥10 yr; 5044 male, 2353 female) with different training habits were analyzed. All participants were tested in an incremental exercise test on the treadmill until subjective exhaustion. The LASS was determined by the concept of blood lactate at the "lactate threshold" plus a net increase of 1.5 mmol·L⁻¹. The interdependence of further characteristics was tested by stepwise multiple regression.
**Results:** Age alone did not allow a precise prediction of $HR_{LASS}$ ($|r| = 0.645$ for all participants), regardless of adjustment by sex, training state, body mass, or performance characteristics using ANCOVA. Resting HR ($HR_{rest}$) decreased steeply within the second life decade but not with further advancing age. The best discrete lactate-independent predictor for $HR_{LASS}$ was $HR_{max}$ ($|r| = 0.798$). Inclusion of age and weight in the model resulted in only a small improvement of the prediction ($|r| = 0.826$). Other anthropometrical characteristics could not improve the model further.

**Conclusions:** The use of age alone seems too imprecise for exactly driven aerobic training prescriptions. A minor improvement can be achieved in this objective by use of $HR_{max}$ supplemented by age using a multiple regression model.

**Key Words:** AGING; EXERCISE; CARDIOVASCULAR; ADOLESCENCE; AEROBIOSIS; EXERCISE TEST; TRAINING; HEART RATE-PHYSIOLOGY