The ActIv-project: Self-rated exercise intensity of 86,514 female and male runners aged 18-64 yrs

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Introduction

Training induces adaptations and improvements of health and physical performance. It can be used to counteract negative changes caused by lifestyle and certain impairments that occur as a consequence of biological ageing (1, 2). Training parameters like volume and intensity are key indicators for the adaptive outcome.

Aim

1. Describe potential interactions of age and self-selected training intensities/ training habits and their connection to health factors in a population of regularly training individuals (runners) (3).

2. Derive suggestions for training (high intensity vs. low intensity) with regards to age and gender.

Methods

Data was collected via a nationwide online survey of participants in half- or marathon events (www.dshs-koeln.de/activ). The link to the survey is included during the online registration process to races organized by the "German-Road-Races e.V.". The present sample of male (m) and female (f) athletes was a selected subset from the entire data set of >190,000 participants.

The survey (Fig. 1) covers, among others, the following topics:
- Anthropometric information (e.g. age, sex, body weight and height)
- Medical risk factors (modified PAR-Q questionnaire)
- Training habits (e.g. training frequency (TF), training volume (TV)) of weekly training
- Self-rated exercise intensity (TI); (10-point-Likert-scale ranging from one ("almost never") to ten ("almost always"))

Sample selection criteria:
- Age: 18 to 64 years
- Regular running training: >= 2 times per week
- Training volume: >= 10 km per week
- Experience of running training (TE) >= 2 years

Statistics:
- Multiple ANOVA & Multiple Regression Analysis

Fig. 1: Online Questionnaire (Screenshots)

Results

Sample and training characteristics (mean ± SD)
- 56,247 males (42.6 ± 10.7 yrs); 30,267 females (39.8 ± 10.8 yrs)
- Training Experience (TE): 9.2 ± 8.9 yrs (m); 7.2 ± 7.0 yrs (f)
- Training Volume (TV): 34.6 ± 17.9 km * week-1 (m); 29.1 ± 15.0 km * week-1 (f)

Self-rated training intensity
- **Approximately linear decreases of TI** between age groups 18 to 64 years from 6.8 ± 12.7 to 4.9 ± 16.8 units ($F_{(46, 86,232)} = 81$; $p<0.001$; Fig. 2).
- **Minor sex-related difference in TI**: 5.75 ± 1.9 (m) vs. 5.55 ± 1.9 (f) ($F_{(1, 86,232)} = 400$; $p<0.001$; Fig. 2).
- **Statistically significant but** effectively **weak association of TI with TV** ($F_{(2, 86,232)} = 5$; $p<0.001$; Fig. 2).

Predictors of self-rated training intensity
- age: -0.206; sex: -0.082; marathon running experience: -0.080; health resp. medical risk factors: -0.023; Training Frequency: -0.022; body-mass-index: 0.024; Training Volume: 0.037; (standard coefficient beta in order of direction and strength of the effect size; $p<0.001$ each).
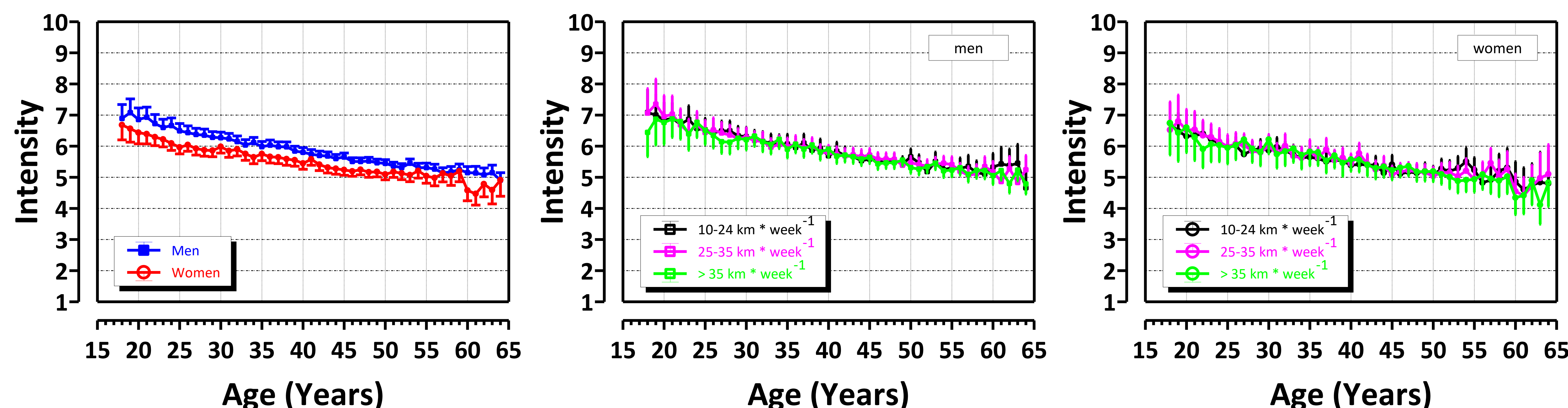

Fig. 2: Self-rated exercise intensity of men and women in relation to age (left panel: sex $p<0.001$, age $p<0.001$, sex x age $p=0.005$) and in relation to age and Training Volume (TV) in men (center panel) and women (right panel): TV $p=0.005$, age x TV $p=0.493$, (mean ± SE).

Discussion

- Interpretations of the results are subject to methodological constraints of cross-sectional studies. However:
- The clear association between self-rated exercise intensity and age suggests that the ability to realize high loads and to tolerate strain in runners consistently decrease with age and the process begins early in life.
- Age- or biology-related intrinsic factors may slowly attenuate the affinity, initial drive and motivation for high intensity activities.
- The specific application of high-intensity loads (e.g. HIIT, Cross-Fit©) is recommended to maintain willingness to achieve and to prevent premature loss of physical performance.

References

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