

'B-FIT' TRAINING GUIDE

Appendix 3



APPENDIX 3. DETERMINING THE ANAEROBIC THRESHOLD AND INDIVIDUAL EXERCISE ZONES.

Determining the anaerobic threshold.

The submaximal exercise test can be used to determine the anaerobic threshold directly (by means of respiratory gas analysis) or indirectly (by means of the RPE scale) (Section 2.7). The anaerobic threshold is the basis for determining the individual exercise zones.

Direct determination of the anaerobic threshold.

The most appropriate method for determining the anaerobic threshold (AT) is the direct method based on the plots of the respiratory gas analysis. The 'v-slope method' and the 'ventilatory equivalent method' are used to identify the AT.

- V-slope method (Fig. 1, top left): the increase in exhaled carbon dioxide (VCO_2) is greater than the increase in oxygen uptake (VO_2).
- The ventilation equivalent method (Fig. 1, bottom left): the ventilation equivalent for VO_2 increases (V_E/VO_2), while the ventilation equivalent for VCO_2 (V_E/VCO_2) remains constant.

For a more detailed description of the AT and its determination, refer to the book *Principles of exercise testing and interpretation* (Wasserman et al., 2011).

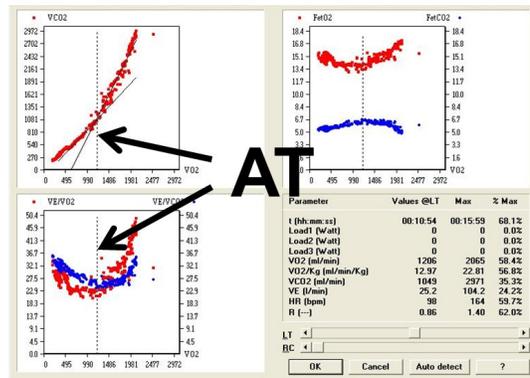


Figure 1. Plots of the respiratory gas analysis for the determination of the anaerobic threshold (AT). Top left, the 'v-slope method' and bottom left, the 'ventilation equivalent method'.

Both methods lead to the same point at which the anaerobic threshold occurs. The heart rate must then be determined at the anaerobic threshold (HR at AT). The HR at AT serves as the starting point for determining the individual exercise zones (Table 1).

Indirect determination of the anaerobic threshold.

If respiratory gas analysis equipment is not available, the AT can be determined indirectly based on the RPE scale. Determine the point during the submaximal exercise test when the score on the RPE scale was 12, and determine the heart rate at that point (HR at AT).

Sometimes 12 is not scored during the test. In that case, interpolation can be used to determine at what point 12 would have been scored, and then determine the heart rate at that point.

Determination of the individual exercise zones.

Based on the heart rate at the anaerobic threshold (HR at AT), the individual exercise zones can be determined based on the diagram below (Table 1).

Exercise zone	Percentage of HR at AT		Heart rate (beats/min)	
	Lower limit	Upper limit	Lower limit	Upper limit
Recovery	60%	80%	=0.6*HR at AT	=0.8*HR at AT
Low intensity	80%	100%	=0.8*HR at AT	= HR at AT
Moderate intensity	100%	105%	= HR at AT	= 1.05*HR at AT
High intensity	105%	115%	= 1.05*HR at AT	= 1.15*HR at AT

Table 1. The individual exercise zones based on the heart rate at the anaerobic threshold (HR at AT).

Assuming that patient A had a HR at AT of 120 beats per minute, then the lower and upper limits for the high-intensity exercise zone are:

Lower limit = 105% of HR at AT	Upper limit = 115% of HR at AT
Lower limit = 1.05 * HR at AT	Upper limit = 1.15 * HR at AT
Lower limit = 1.05 * 120	Upper limit = 1.15 * 120
Lower limit = 126	Upper limit = 138

Calculation tool for automatically determining the individual exercise zones and the exercise schedule

A calculation tool is available on the B-FIT website with which the lower and upper limits associated with the various exercise zones can be determined automatically and easily. You only have to fill in the heart rate at the anaerobic threshold (HR at AT):

1. Go to the following link: <https://www.amc.nl/trainingguide>
2. Open the file: "Calculation tool" (Fig. 2).
3. Make sure the exercise zones tab is active (bottom left).
4. Enter the HR at AT in the pink box.
 - Please note that in **block 1** the HR at AT before the start of the exercise program must be entered (upper pink box) and in **block 2** the HR at AT of the interim evaluation must be entered (lower pink box).
5. Press enter.

6. Go to the *Exercise schedule* tab. The heart rates corresponding with the various individual exercise zones are now filled in automatically.
 - Please note, this is an illustrative exercise schedule based on 16 weeks of exercise and three exercise sessions per week. As described in Section 2.8, the practitioner can make adjustments within the corresponding frameworks.

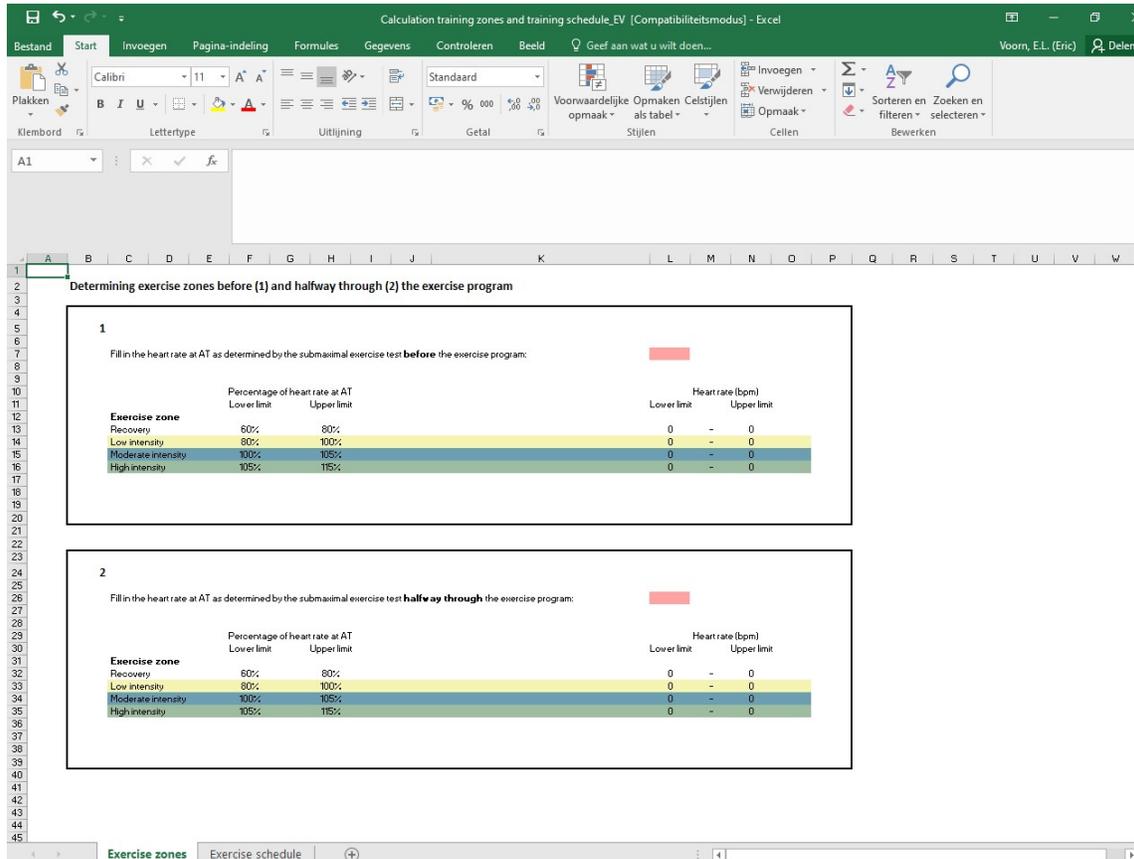


Figure 2. Calculation tool for exercise zones and exercise schedule.