'B-FIT' TRAINING GUIDE

Appendix 2

APPENDIX 2. SUBMAXIMAL EXERCISE TEST.

The submaximal exercise test as described below can be used to determine whether the type of exercise is appropriate, to design the exercise schedule based on the individually determined exercise zones, and to evaluate the effect of the exercise on physical fitness. First, the conduction of the test is discussed. The following appendices describe how the test results can be used for various purposes.

Requirements.

- Exercise test protocol.
- Exercise test score form (Appendix 5).
- Ergometer (bicycle, arm, rowing, treadmill, etc.).
- RPE scale 6–20 (Appendix 1).
- Heart rate monitor (recommended).
- Stopwatch.
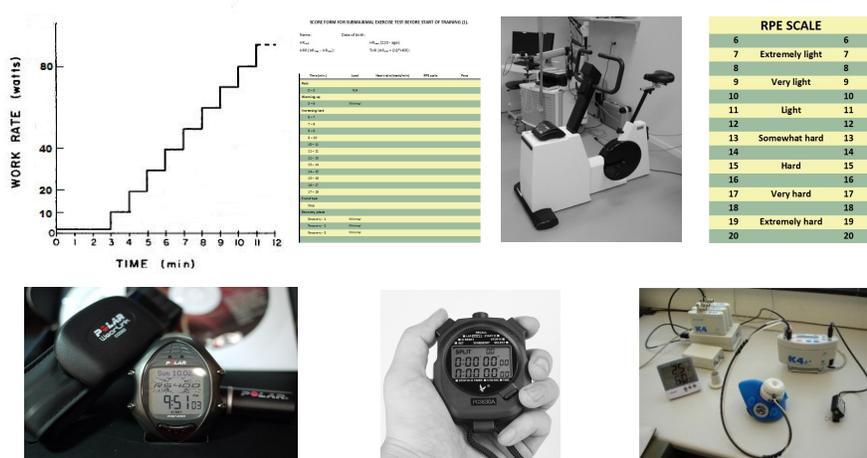- Respiratory gas analysis equipment (recommended).

Figure 1. The requirements for the submaximal exercise test.

Preparation.

Because it is a submaximal exercise test, the presence of a physician is in principle not necessary. However, it must be determined before the test whether there are any contraindications. With absolute contraindications, the test and physical exercise are excluded. In the case of relative contraindications, the test can be performed after consulting a physician and possibly under the supervision of a (sports) physician (Section 2.6).

The patient must be given the following instructions and information at least 1.5 days before the test:
- Do not engage in heavy exertion during 24 hours before the test.
- Do not eat a large meal less than 2 hours before the start of the test.
- Bring comfortable clothing or sports clothing.
- Whether there is the possibility to shower afterwards.

Before the start of the test, the practitioner must:
- Adapt the ergometer to the patient (seat height, etc.) and record the settings on the score form.
- Put the heart rate monitor on the patient.
- If respiratory gas analysis is used, calibrate the system.
- If respiratory gas analysis is used, the equipment should be fitted to the patient.
- Inform the patient about the protocol.

Performing the submaximal exercise test.

Rest measurement and warming-up.

The test starts with a rest measurement. Here, the patient sits quietly in a chair for 3 minutes (near the ergometer).
- After 2 minutes, the resting heart rate (HR_{rest}) is noted on the score form. Because the heart rate varies, it is important to avoid any outliers.
- The HR_{rest} is used to calculate the 'heart rate reserve (HRR)' on the score form: HRR = HR_{max} - HR_{rest}, where HR_{max} = 220 - age.
- The HRR is used to calculate the 'target heart rate (THR)' on the score form (see also stop criteria test): THR = HR_{rests} + 80%HRR, where 80%HRR = 0.8 * HRR.

After the rest measurement, the patient takes his or her place on the ergometer. The patient starts to exercise, preferably without resistance, and otherwise at the lowest possible resistance. The patient continues to exercise at this workload at a constant pace for 2 minutes. This can also be seen as the warming-up.
- After 1.5 minutes, the RPE is scored and recorded on the score form along with the heart rate at that time.

Incremental workload.

The resistance is then increased in steps (every minute). The increase depends on the physical capacity of the patient and the chosen modality. For bicycle and arm ergometers, for example, the resistance will be increased every minute by 5–25 Watts (W). On a treadmill the resistance can be increased in two ways: by increasing either the speed or the incline. The magnitude of the increase is determined by the practitioner based on clinical expertise. The patient continues to exercise at the most constant pace possible; the duration of the incremental part of the test should preferably be between 8 and 12 minutes.
- After 30 seconds (at each load step), the score on the RPE scale is determined and is recorded on the score form together with the heart rate.

The termination of the submaximal exercise test.

The exercise test is terminated with one of the following stop criteria:

- When the heart rate reaches the THR (HR_{rest} + 80% HRR).
- When the pace becomes too low: with arm and bicycle ergometers <50 revolutions per minute; with rowing <18 strokes per minute. On a treadmill, when the patient can no longer maintain walking speed.
- If the patient's safety is at stake (e.g. with signs of poor perfusion (cyanosis or paleness) or with certain symptoms (such as dizziness or chest pain).

- The same criteria apply to *patients with beta blockers*. However, if the score on the RPE scale is ≥ 16 before the THR is reached, the test is stopped.

As soon as one of the stop criteria is reached, the resistance is brought back to the minimum level. At the end of the test, the score on the RPE scale is determined and is recorded on the score form together with the heart rate.
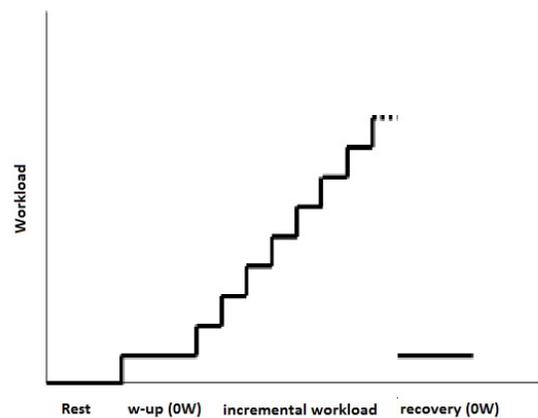

Figure 1. The protocol of the submaximal exercise test.

The recovery phase.

The patient continues to exercise for three minutes, preferably without resistance, and otherwise at the lowest possible resistance. The heart rate is recorded on the score form every minute. The recovery phase can be seen as cooling-down, and after this the submaximal exercise test is completed (Fig. 1).