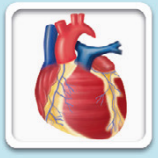
Exertion “simply changes”

If you want to manage your daily routine economically or if you intend to exercise “safely”, it is important to know how much time it takes until your organs have adjusted to an unfamiliar physical activity [adaption] and recover from it.

Adjusting to exertion (adaptation)

Let us have a look at the lungs and the transition from strolling (= 12-15 litres of air; approx. 30 watts) to slowly climb a flight of stairs (=40-45 litres of air; approx. 100 watts). Even though you might not feel it immediately, exertion increases abruptly from 30 to 100 watts when changing from walking to taking the first (couple of) steps. The cardiovascular system [cardiopulmonary system] is not able to immediately increase e.g. the work rate of the lung from 12-15 litres per minute to 40-45 litres per minute or the heart rate from 60-70 to e.g. 130-150 beats per minute. There are not enough energy sources stored in the muscle, which are ready to be used.

Partial pressures of O_2 and CO_2 and classification of gas exchange disorders	
Time to complete transition to continuous work rate	
	At least 10-30 seconds to 2 minutes
	At least 20-40 seconds to 2 minutes
	At least 1-2 minutes to several minutes

All of these processes, depending on the organ, take a certain period of time: the process of adjustment or in general the cardiovascular systems switching from rest to exertion.

In COPD: Adjustment to physical exertion takes longer

Due to the factors mentioned above, it takes longer for heart and lungs to provide the required amount of blood and oxygen on exertion. Thus, adjusting to physical exertion takes longer with COPD than with a healthy lung. Although, there are no reference values for the degree of severity yet, one can assume a period of “more than 2 minutes” in practice.
Recovery after (termination of) exertion takes longer
It also takes longer to “cool down the cardiovascular system” than usual. At the point of termination of exertion due to increasing hyperinflation many systems are maximally loaded. One has also put oneself out of action “mechanically”. Thus, the intake of a sufficient amount of air for recovery processes is deferred. In general, the respiratory muscles have to “work” extremely hard even during the recovery phase. The demand of oxygen is high, respectively. The passing time until the uptake of oxygen eventually reaches the muscles, which have just been active, plays a crucial role, as well.

Termination of exertion in practice

After terminating exertion (reducing the amount of air that needs to be breathed) it takes quite a while until one has breathed off the hyperinflation. It can slowly be observed that recovery does not proceed consistently. At the onset, everything happens rather slowly, the breathlessness is still severe. After acertain period of time, everything happens increasingly faster and “all of a sudden” one is able to take deeper and deeper breaths: the pressure has dropped so far that more and more airways are able to “open up again” and the air can escape. The tightness in the chest disappears and the rib cage moves more “easily”. It takes about 30 to 60 seconds until you “can more or less recover your breath”. For a nearly complete physical recovery after a strenuous activity (e.g. a set during strength training, an exercise interval you can assume (in total) a period of “clearly more than 2 minutes”.

It becomes a problem in everyday life that exertion (e.g. to continue walking) is resumed as soon as one “recovers one’s breath” or “breathlessness becomes endurable”. However, “only the lung is ready to be used again” while The muscles (e.g. in the legs which have just worked) are still far from recovery. COPD patients lose their ability to perceive body signals (e.g. muscular overload) because everything is “overlain” by breathlessness. Physical exercise training is an excellent opportunity to improve the body’s perception.

Your “batteries” run low often

Decreasing exercise capacity turns almost every kind of exertion into a “maximum” one and forces the muscles to almost constantly produce energy at insufficient oxygen supply in an “uneconomical” way. Immediately available energy sources are then completely used up. The time to “charge the batteries” (keyword: regeneration) becomes too short due to the demands of everyday life and insufficient breaks after terminating exertion.