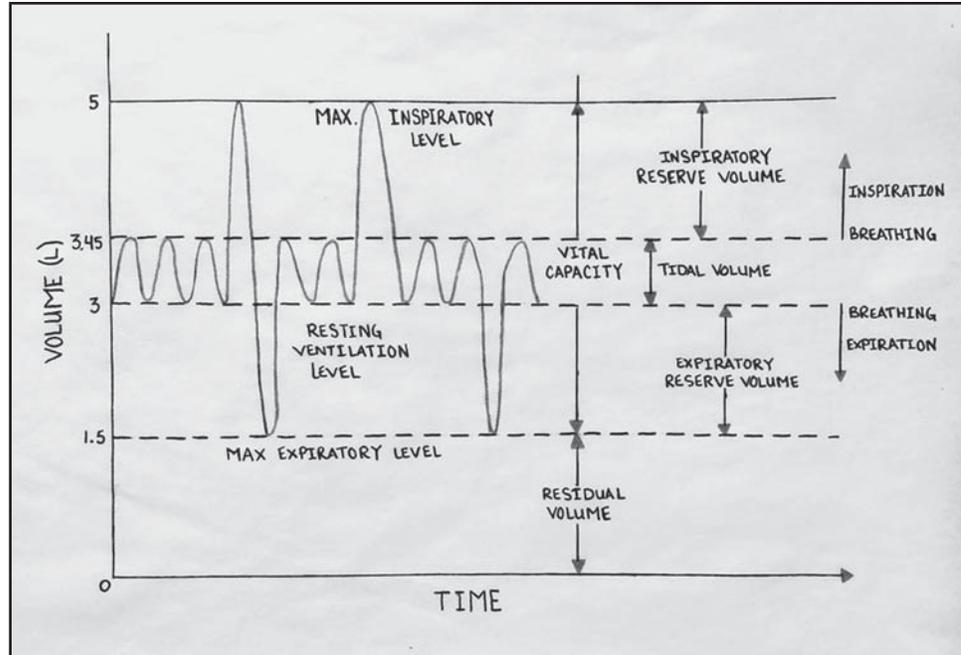


Figure 6.1-3. Smoothed respiratory volumes as depicted by spirometry. (Image drawn by Mathew DeVore)



of air can be inspired beyond the normal tidal inspiration. Similarly, if the inspired volume is found to be insufficient, the speaker may continue to power the speech mechanism with air pressure produced by contracting the thorax beyond the resting state of tidal expiration. At their extremes, reserve volumes are rather not as efficient as tidal and mid-reserve volumes in providing a consistent, even power source for speech (Binazzi et al., 2006).

Inspiratory reserve, sometimes called *complemental air*, is the volume that can be inspired beyond the tidal inspiration. It represents about 50% of total lung capacity (Blom, 2004). Inspiratory reserve volumes would usually be applied in cases where a speaker anticipates an extended speech or other voicing duration, such as singing. At the peak levels of lung capacity, the recoil pressure is relatively strong, and vocal tract muscular efforts are usually too effortful to produce efficient or normal sounding speech.

Similarly, expiratory reserve volume, the volume that can be expired beyond tidal expiration, is normally accompanied by a diminishing flow rate. Expiratory reserve capacity is about 15% to 20% of total lung capacity (Blom, 2004) and would typically be used by an untrained speaker who had more to say than breath to support the effort. As airflow rate diminishes, the aerodynamics of the vocal tract become less efficient as drivers of speech sources, requiring muscular effort to predominate. Expiratory reserve volume is sometimes called *supplemental air*.

RESPIRATORY CYCLES

The flow of air in and out of the respiratory system can be described in cyclic terms. Each cycle would, thus, consist of an *inspiratory phase* and an *expiratory phase*, and one cycle would be considered one inspiration and one expiration. In this sense, the words inspiration and expiration are synonymous with the words inhalation and exhalation. The inspiratory and expiratory phases of a respiratory cycle differ in duration according to the uses to which the flow of air is put. Thus, the inspiratory phase of a tidal respiratory cycle takes a little less than half of the entire cycle, while the inspiratory phase of a respiratory cycle for a long duration utterance takes about 20% of the entire cycle.

BREATHING FOR SPEECH

In the most general terms, the difference between speech breathing and tidal breathing lies in the timing. As described above, volumes may differ depending upon speaking requirements. Timing of speech breathing may be generally described as a quick, full inspiration and a slow expiration, with inspiration taking much less time in the speech respiratory cycle than it does in the tidal cycle, and expiration taking much more time.

However, breathing for speech purposes is very much more complex than the general description above