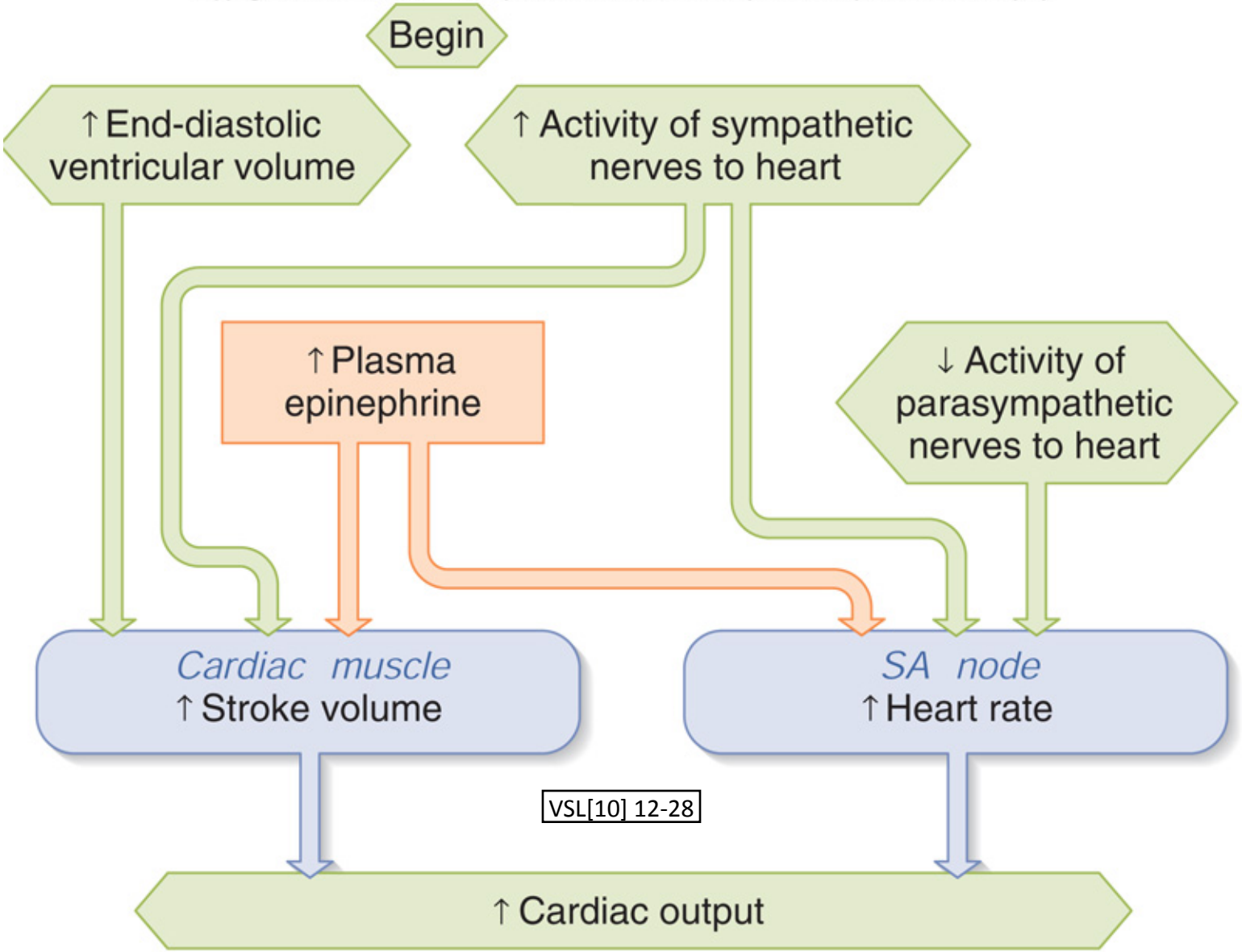
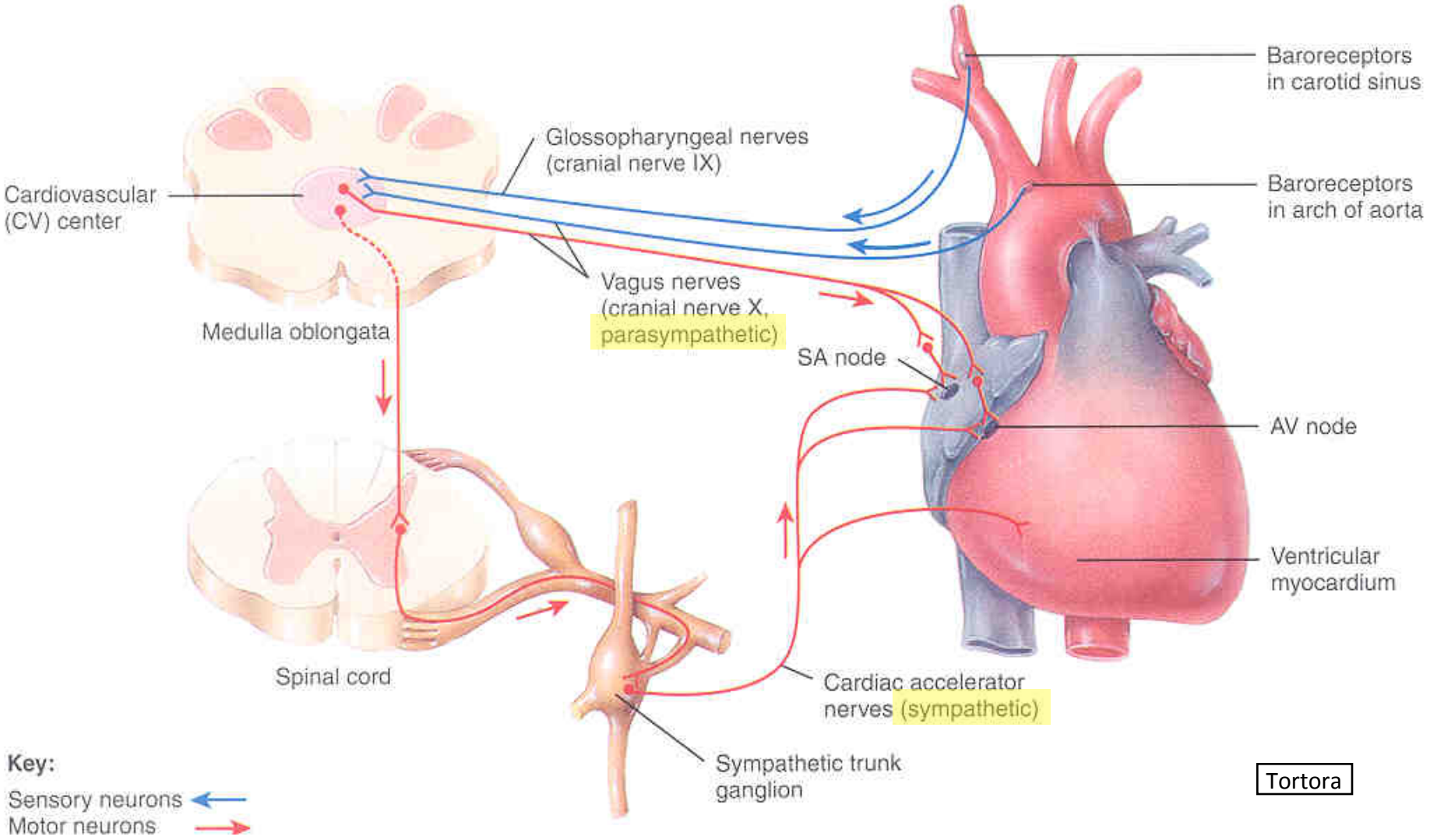


VSL[10] 12-28

Cardiac output = Stroke volume x Heart rate

Figure 15.9 Autonomic nervous system regulation of heart rate.

The cardiovascular center in the medulla oblongata controls both sympathetic and parasympathetic nerves that innervate the heart.



Tortora

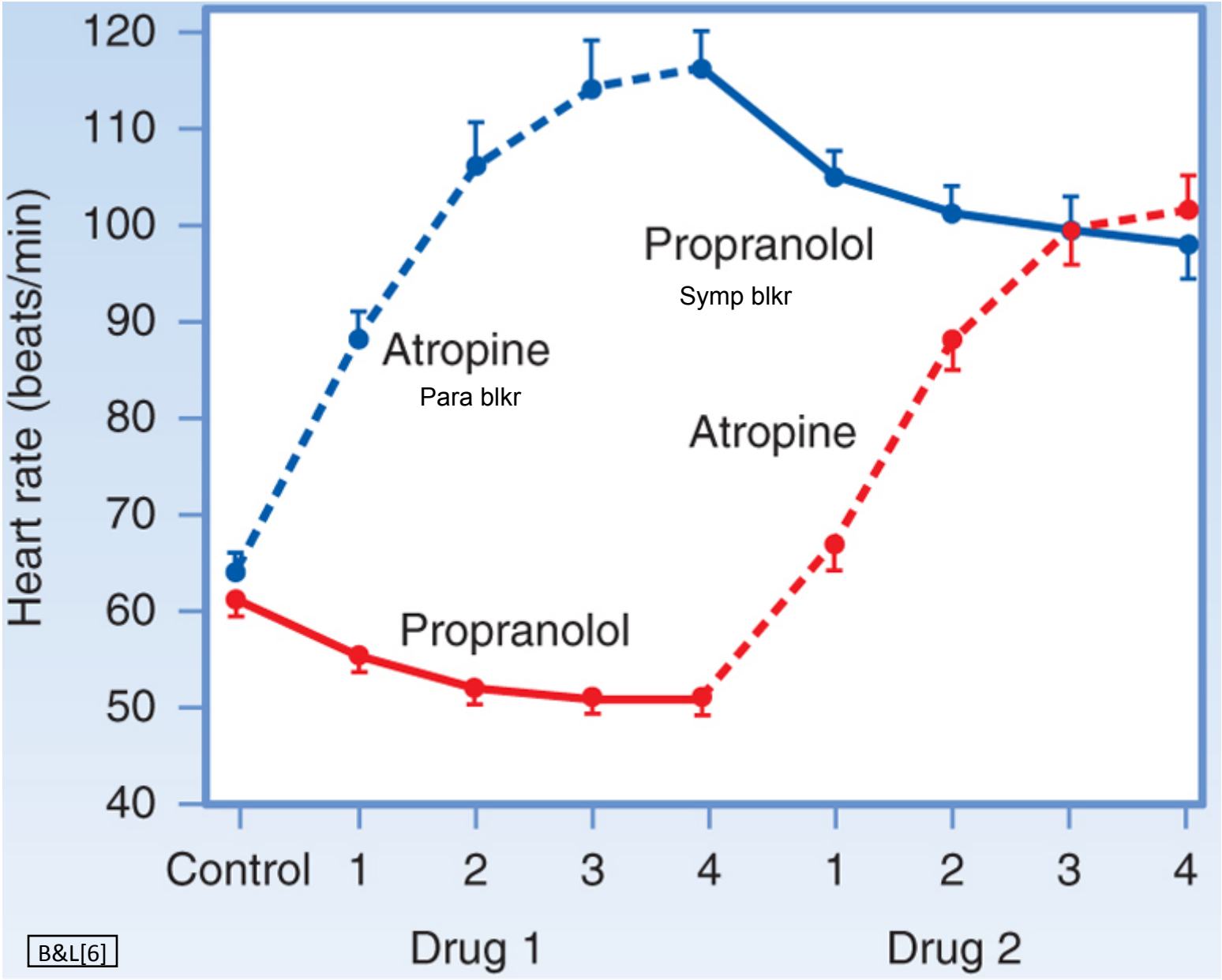


Figure 18-1 Effects of four equal doses of atropine (muscarinic receptor antagonist that blocks parasympathetic effects) and propranolol (β-adrenergic receptor antagonist that blocks sympathetic effects) on the heart rate of 10 healthy young men. In half of the trials, atropine was given first (top curve); in the other half, propranolol was given first (bottom curve). (Redrawn from Katona PG et al: J Appl Physiol 52:1652, 1982.)

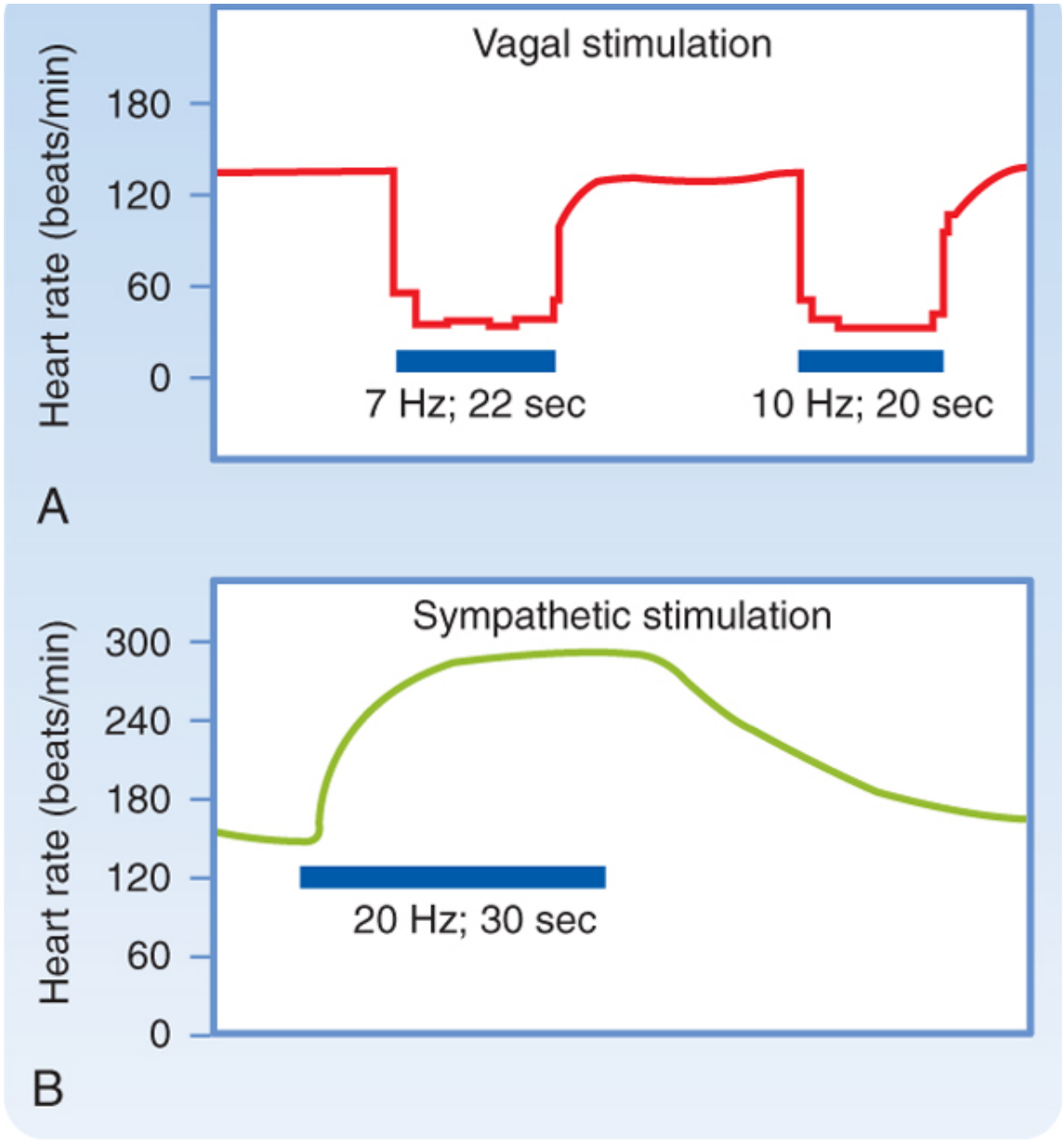


Figure 18-2 Changes in heart rate evoked by stimulation (horizontal bars) of the vagus (A) and sympathetic nerves (B). (Modified from Warner HR, Cox A: J Appl Physiol 17:349, 1962.)

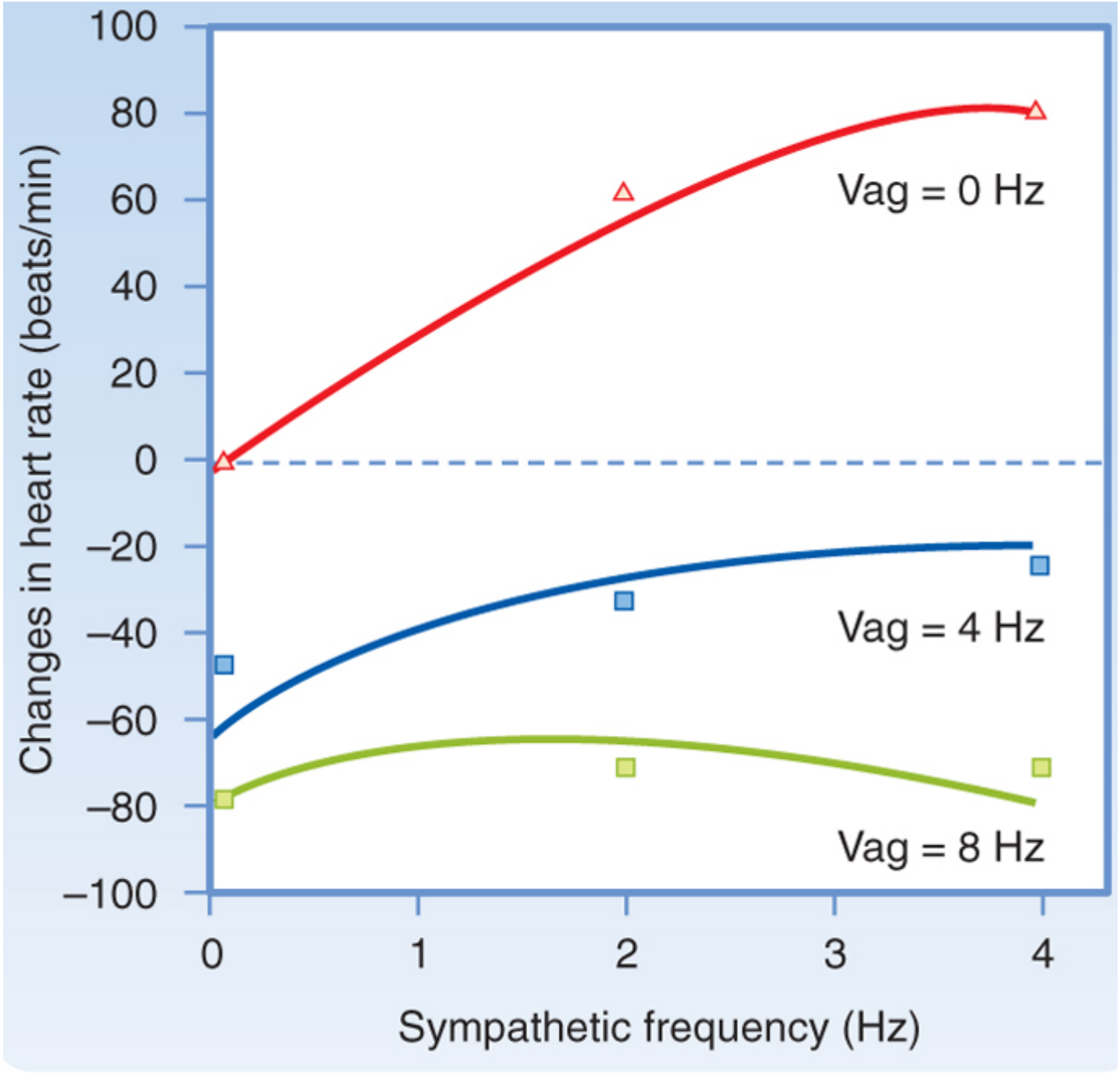


Figure 18-3 Changes in heart rate when the vagus and cardiac sympathetic nerves are stimulated simultaneously. The sympathetic nerves are stimulated at 0, 2, and 4 Hz and the vagus nerves at 0, 4, and 8 Hz. (Modified from Levy MN, Zieske H: J Appl Physiol 27:465, 1969.)

END

Video 2, Module 9