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Other Reflexes and Reflex Actions

M1 – Cardiovascular/Respiratory Sequence

Louis D'Alecy, Ph.D.

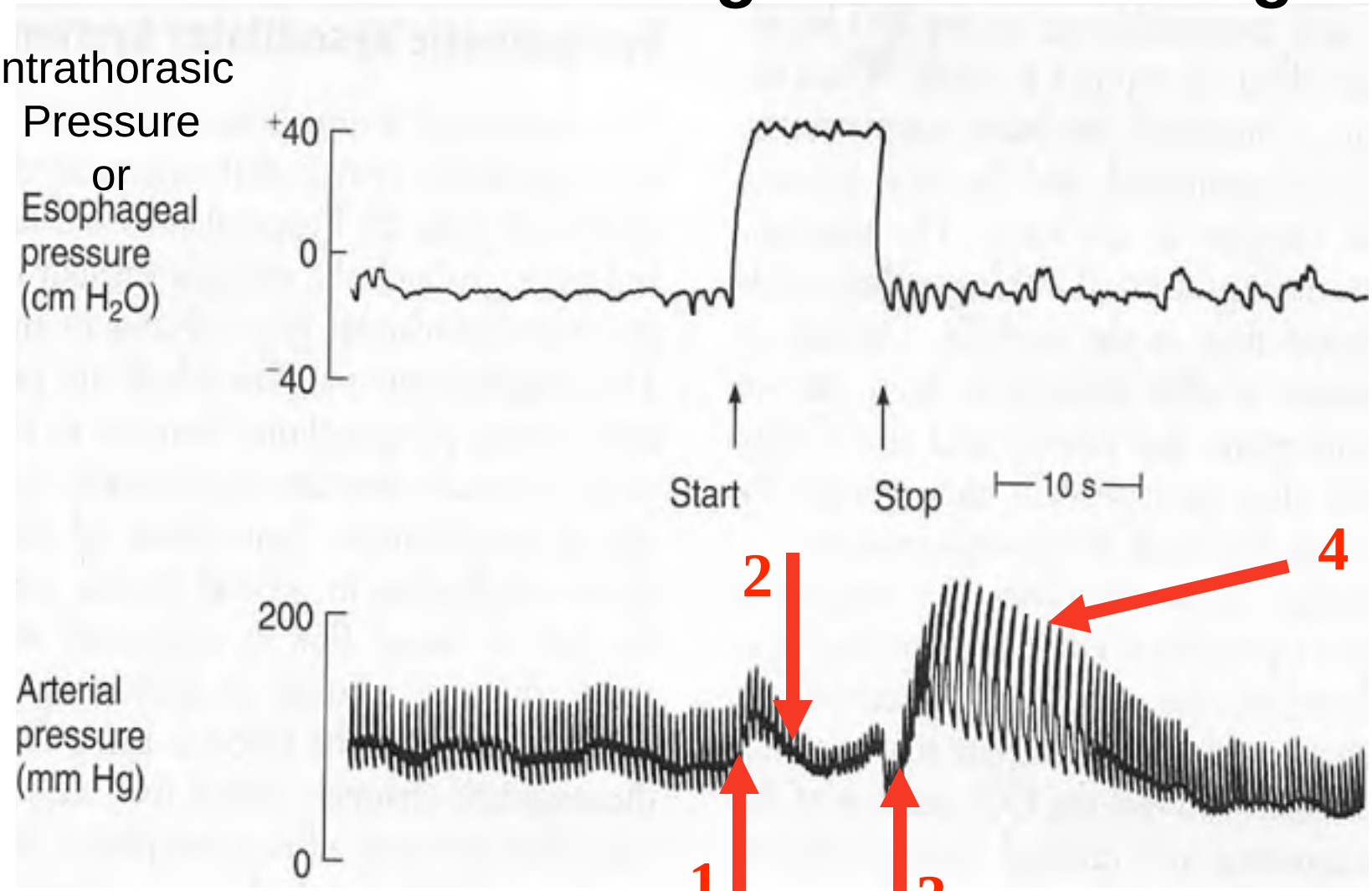
Fall 2008

Wednesday 11/05/08, 10:00
Other Reflexes & Reflex Actions

22 slides, 50 minutes

1. Valsalva maneuver
2. Idiopathic Orthostatic Hypotension
   - (autonomic nervous system defect)
3. Baroreceptor reset in hypertension
4. Gravity (standing)
5. Low pressure -volume (Bainbridge Reflex)
6. Cardioinhibitory (Bezold-Jarisch Reflex)
7. Cerebral ischemic (Cushing Reflex)

Valsalva Maneuver: forced expiration against a closed glottis



Valsalva Maneuver:

1 Increased MAP due to increased intrathorasic pressure(ITP)

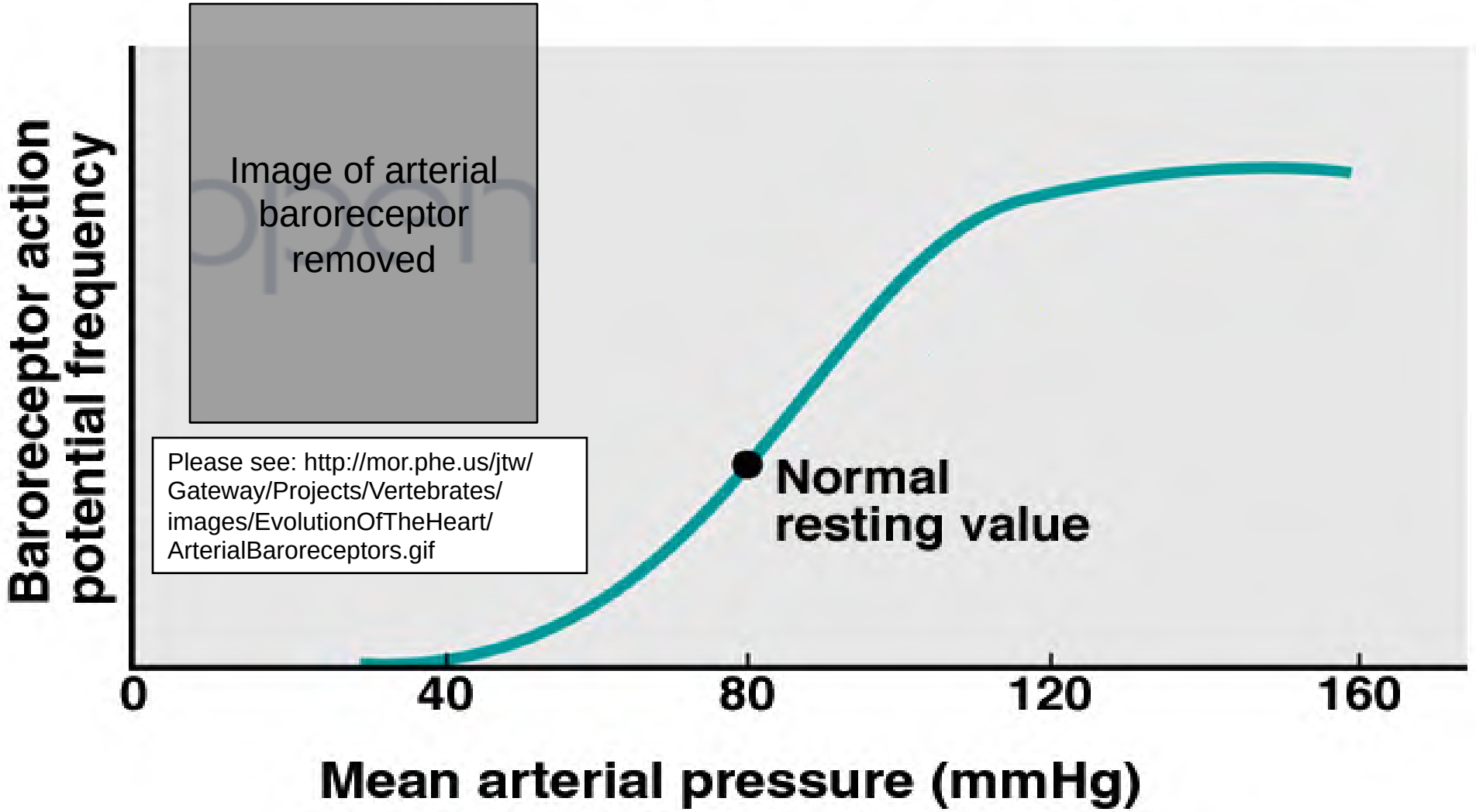
2 MAP & PP decrease due to decreased VR

3 Baro-R increase in HR & VC (little effect)

STOP FORCED EXPIRATION

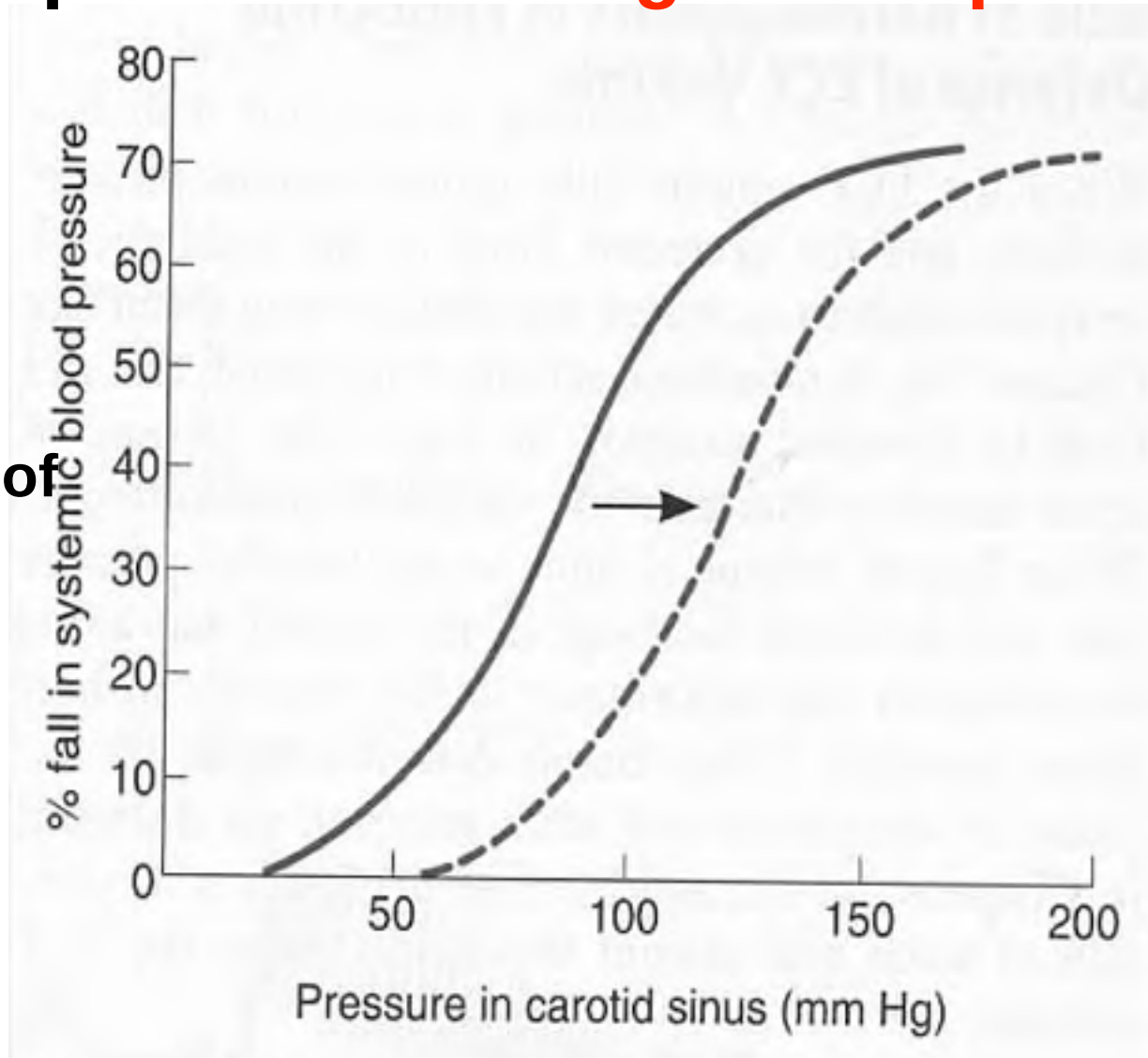
4 Decrease ITP, Increase VR &PP, Baro-R, decrease HR

Mean arterial pressure (MAP)



Hypertension resets baroreceptors to Regulate pressure at a higher set point.

Frequency of Action Potentials



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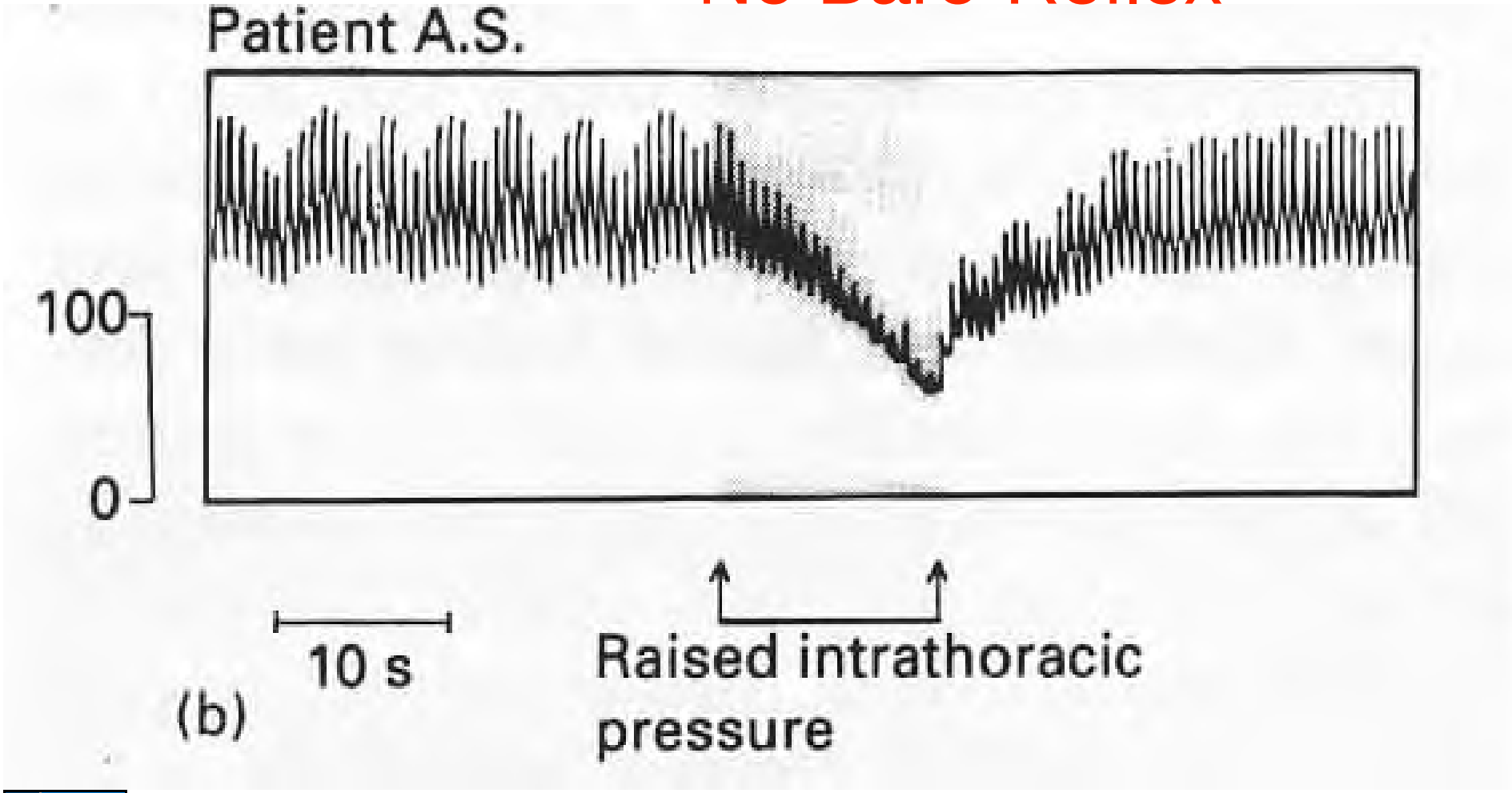
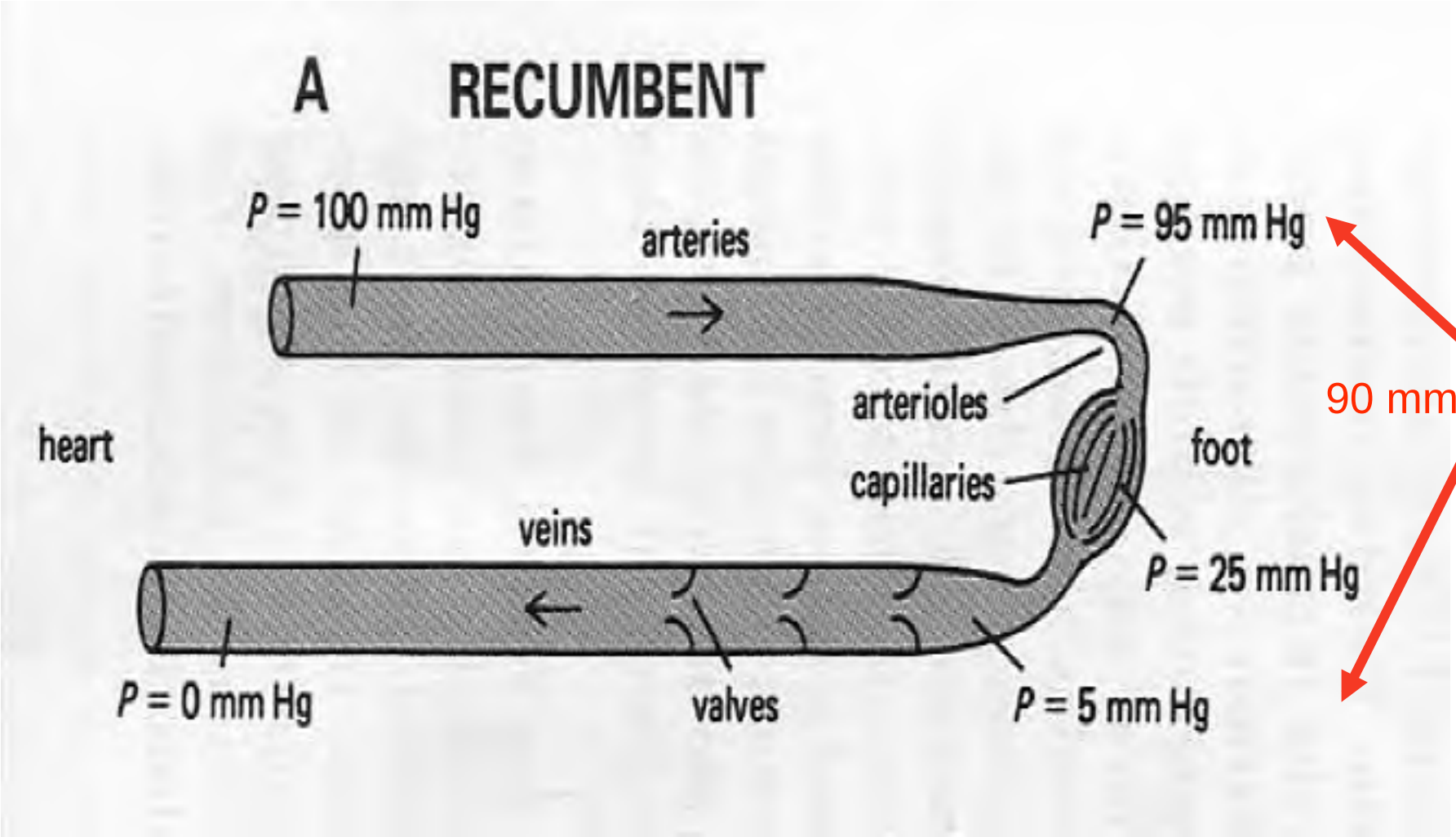
No Baro-Reflex



Idiopathic Orthostatic Hypotension (autonomic defect)
Deep anesthesia and over inflation of lungs
Restricts VR and decreases preload.

M&H Fig. 10.2
Pattern of pressures in recumbent individual



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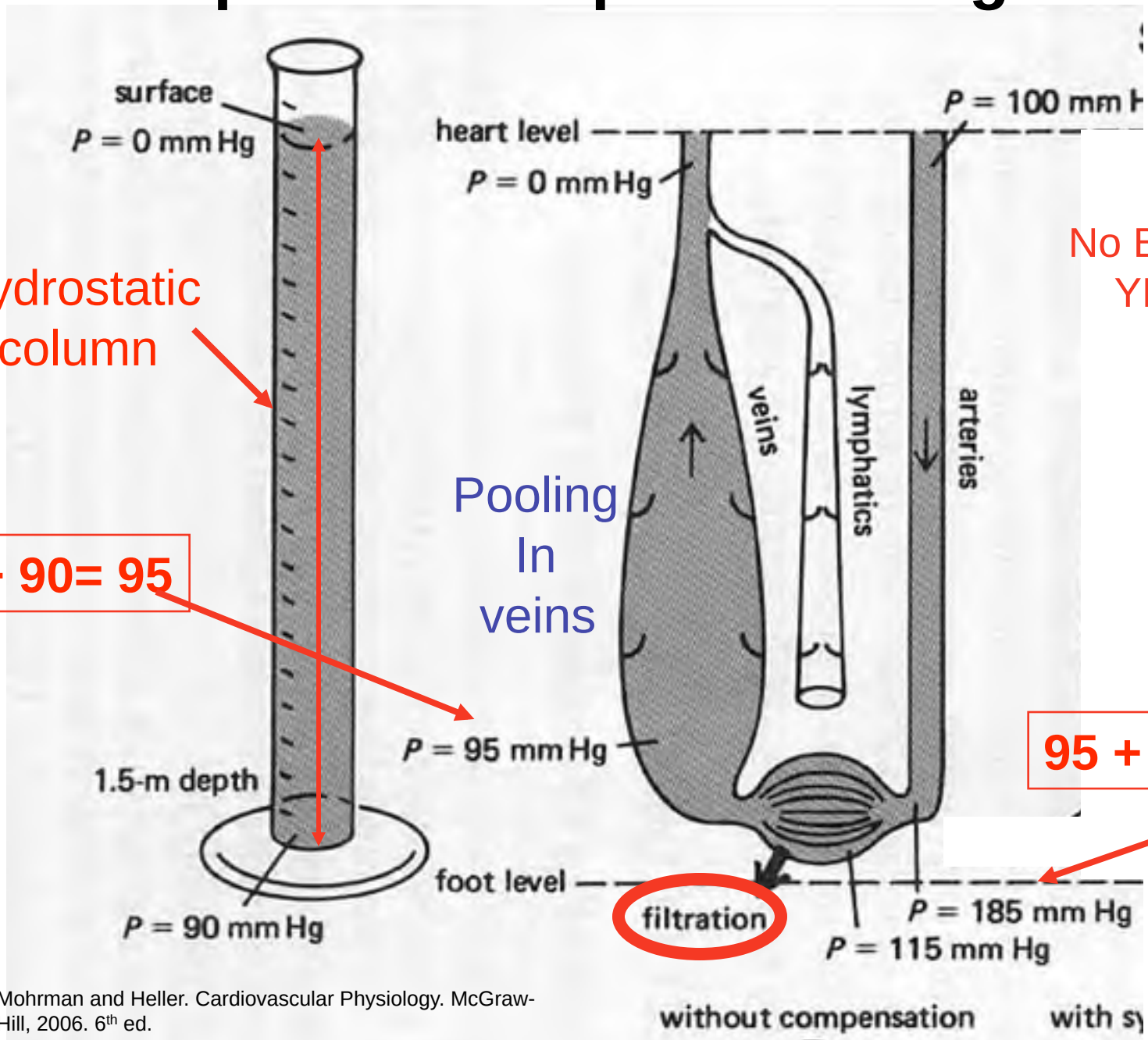
Pattern of pressures upon standing



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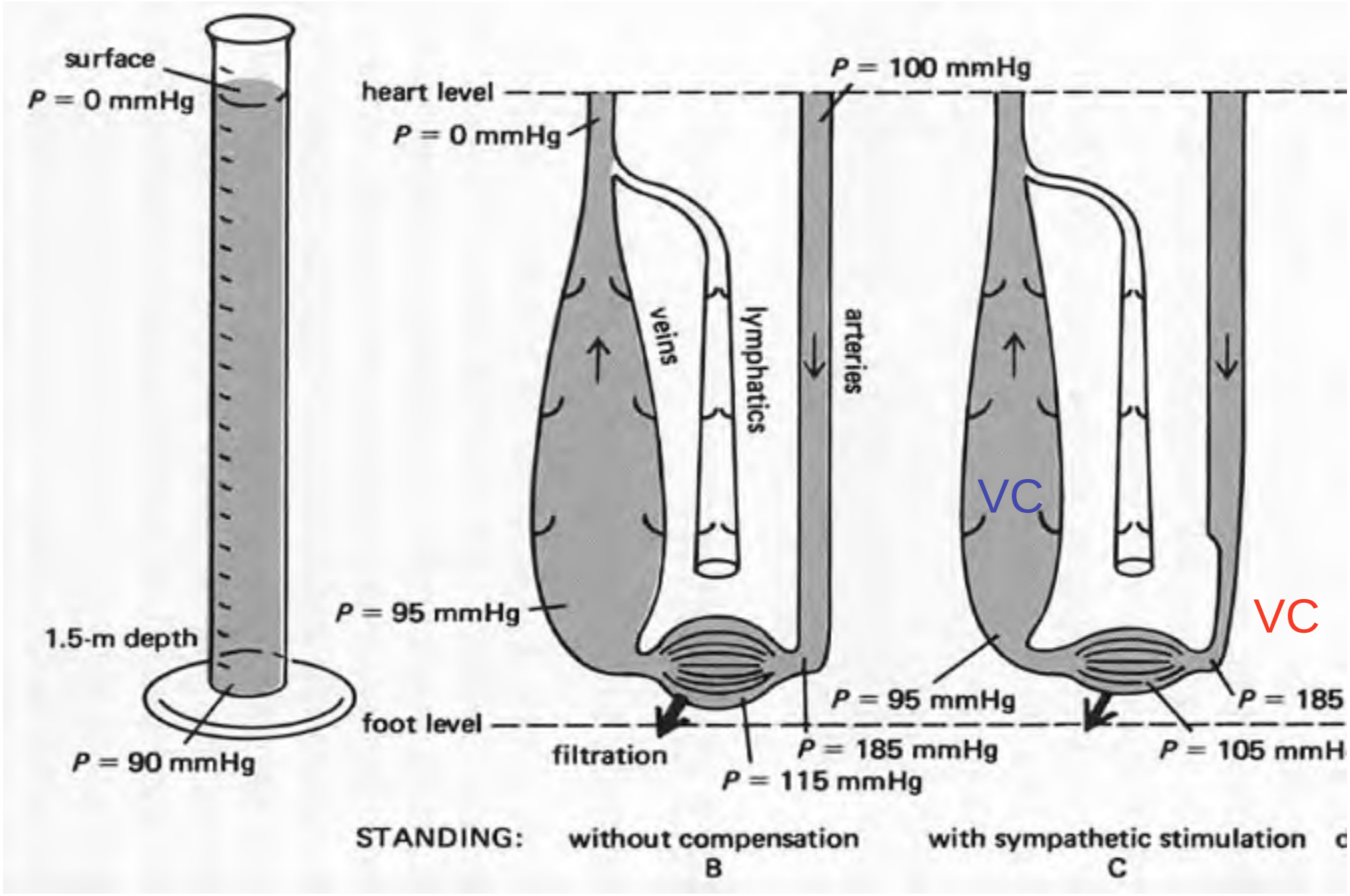

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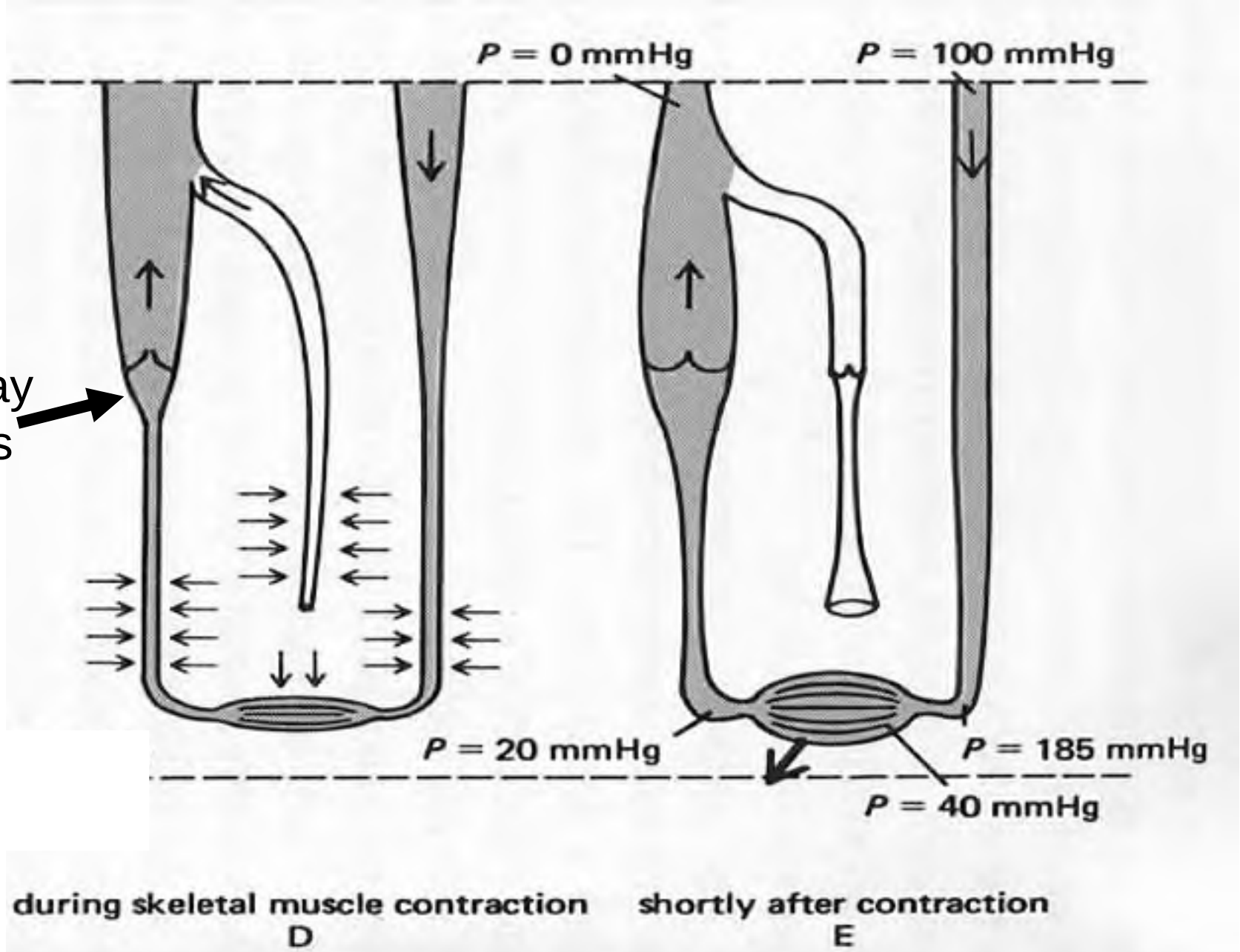
VC = vasoconstriction or
venoconstriction

One-way valves



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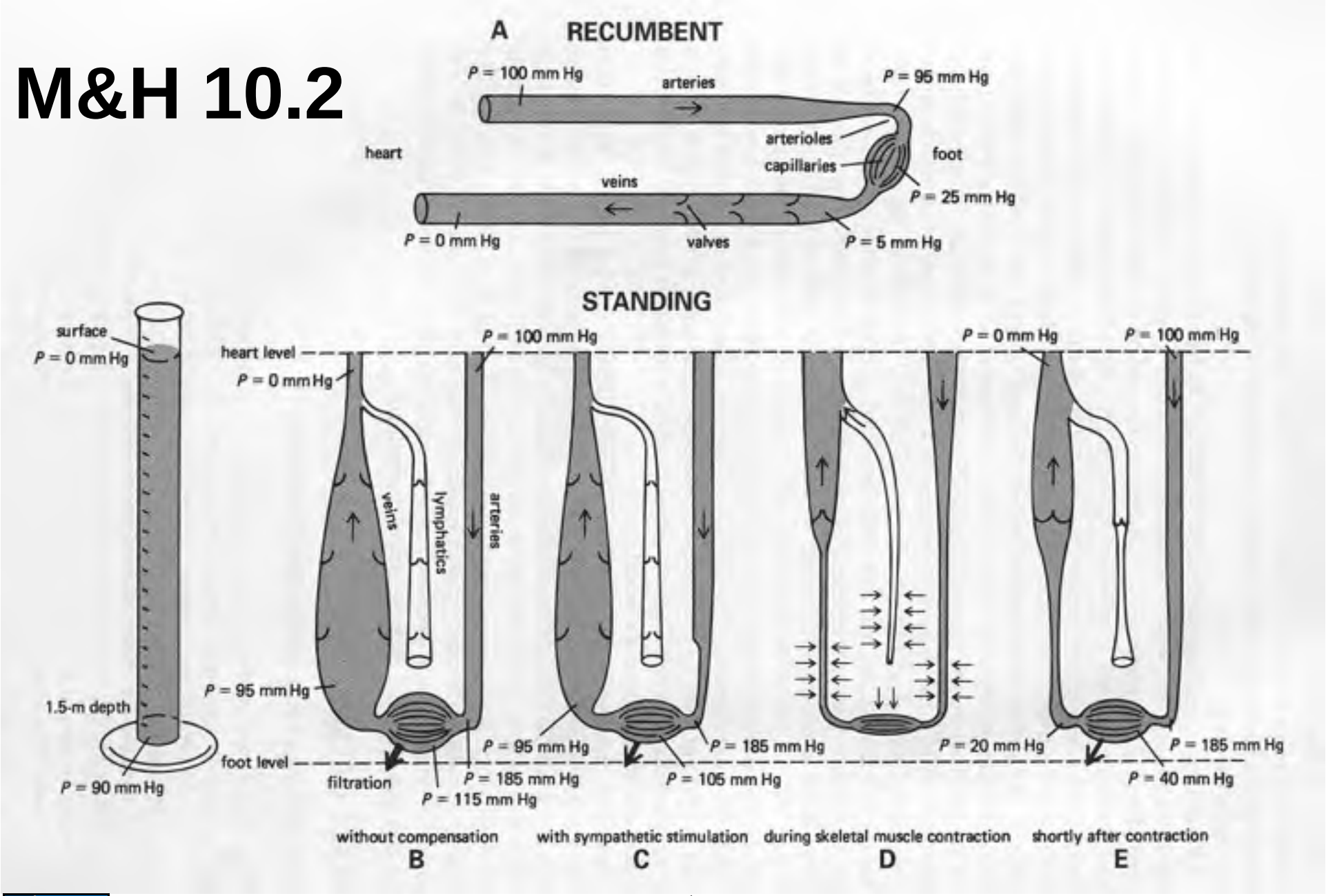
Contraction of skeletal leg muscles breaks the Hydrostatic Column

Leg muscles relaxed: Pressure due to gravity=80 mmHg

Leg muscles contracted: Pressure due to gravity=14 mmHg

M&H 10.2



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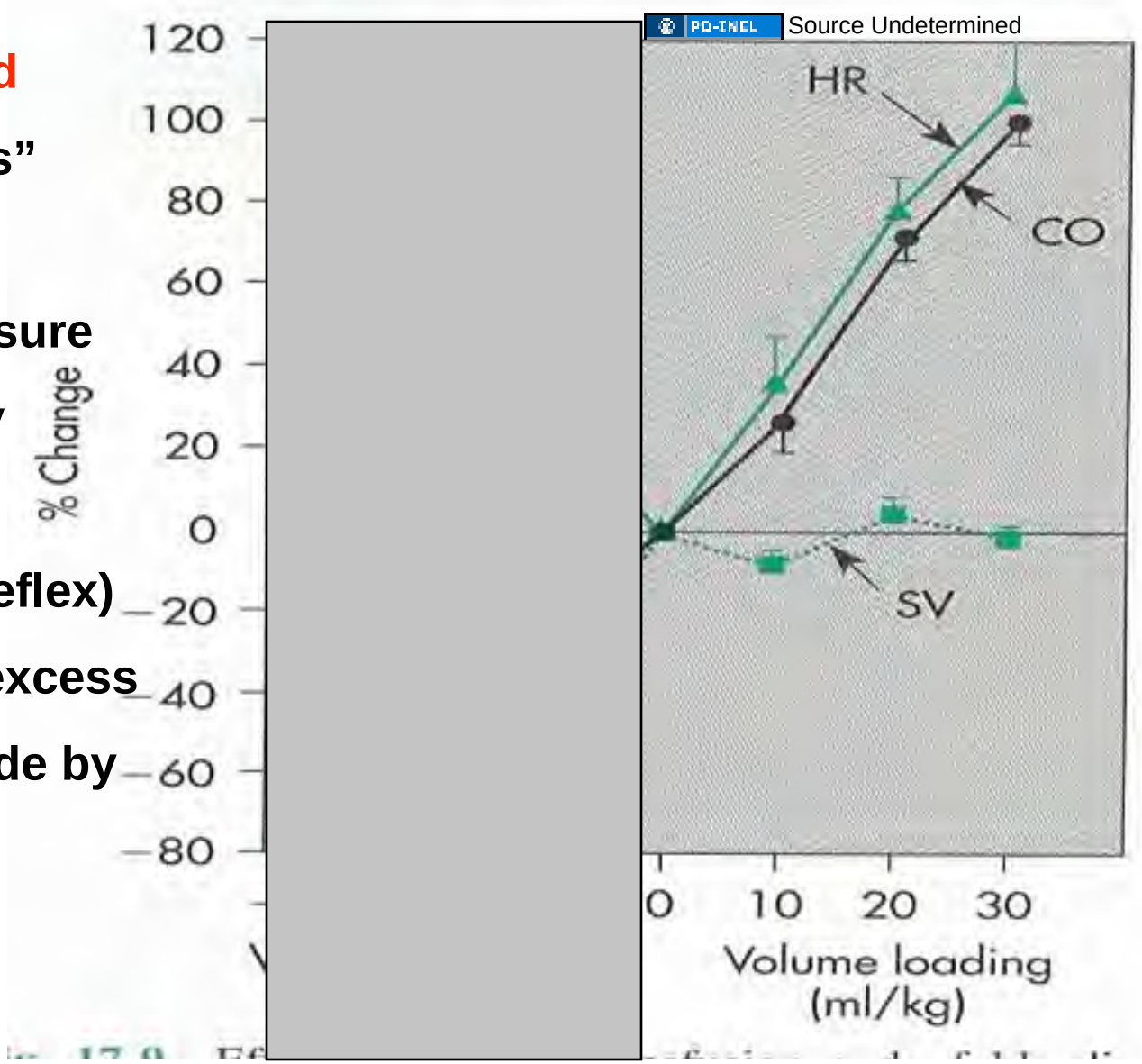
Bainbridge Reflex: Increase stretch of low pressure receptors causes a reflex increase in heart rate and cardiac output.

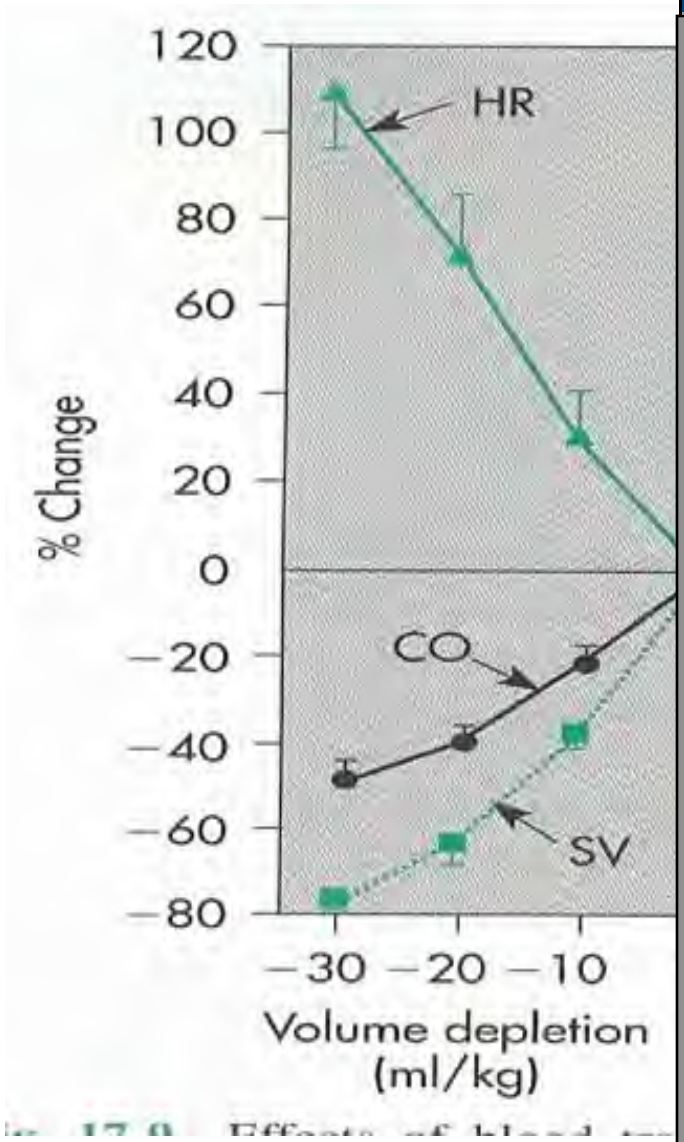
In a normally hydrated individual the "excess" volume is sensed by venous side low pressure receptors and reflexly increases HR and CO (Bainbridge reflex) favoring removal of excess fluid on the arterial side by renal mechanisms.



Arterial baroreceptor reflex: A increase stretch (pressure) causes a reflex decrease in heart rate (negative chronotropic effect) .

In a dehydrated (patient) individual the volume replacement increases CO and produces increased MAP and a reflex bradycardia.

Used as test of "How dry?"



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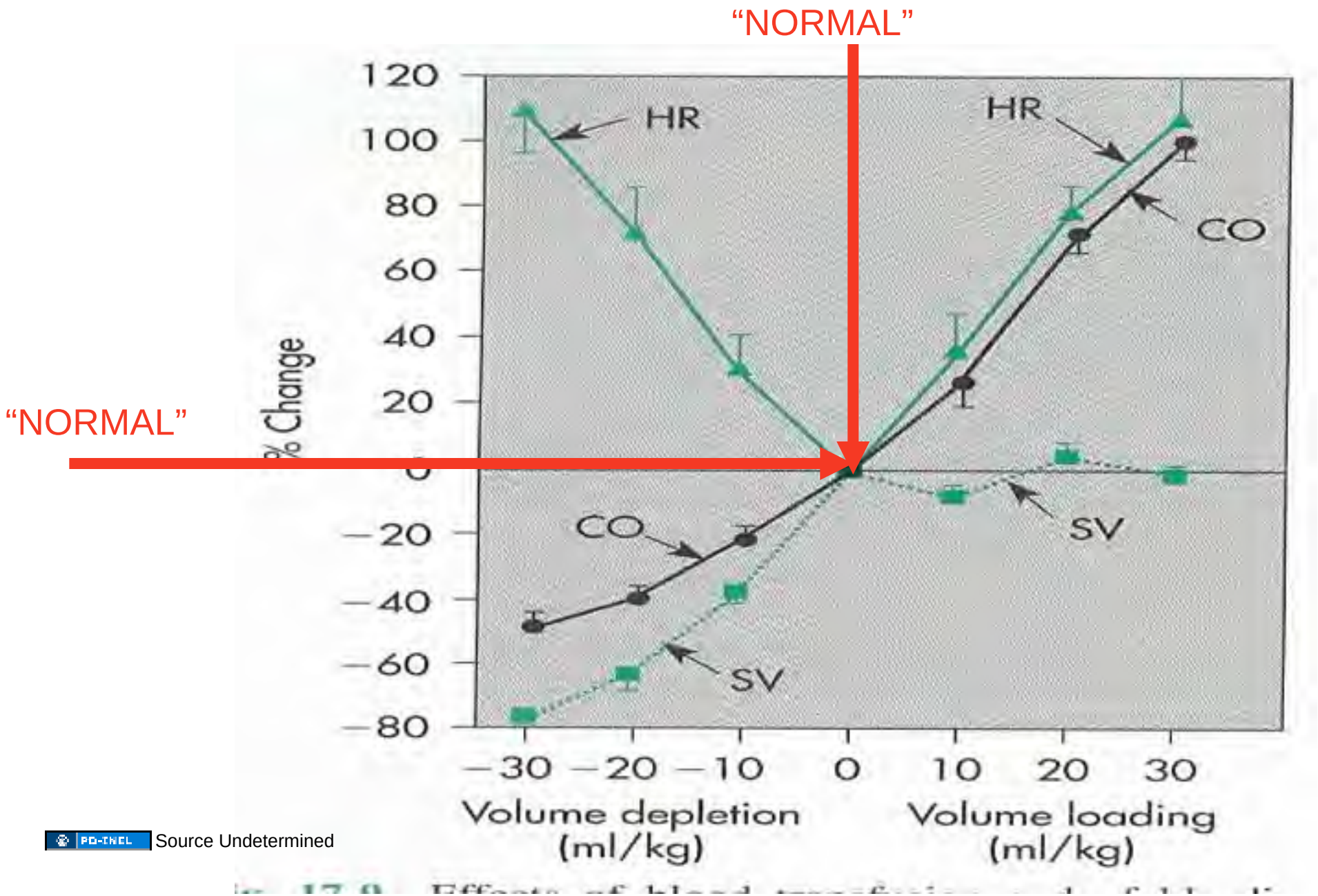
Volume status determines the heart rate response to “volume expansion”.



Other Cardiovascular Reflexes
(Resetting of Set Point ? Pathophysiology ?)

Bezold-Jarisch Reflex

-respond to chemostimulation in myocardium
by veratrum alkaloids

-may be “pharmacological curiosity”

BUT

-***bradycardia with hypotension***

-over rides arterial baroreceptor reflex !!

-vagal afferents

-atropine blockable

-may have role in posterior-inferior infarcts

Anesthesiology 2003; 98:1250-1260

Other Cardiovascular Reflexes
(Resetting of Set Point ?)

Cushing (Cerebral Ischemic Reflex)

-response to compressive ischemia in CNS

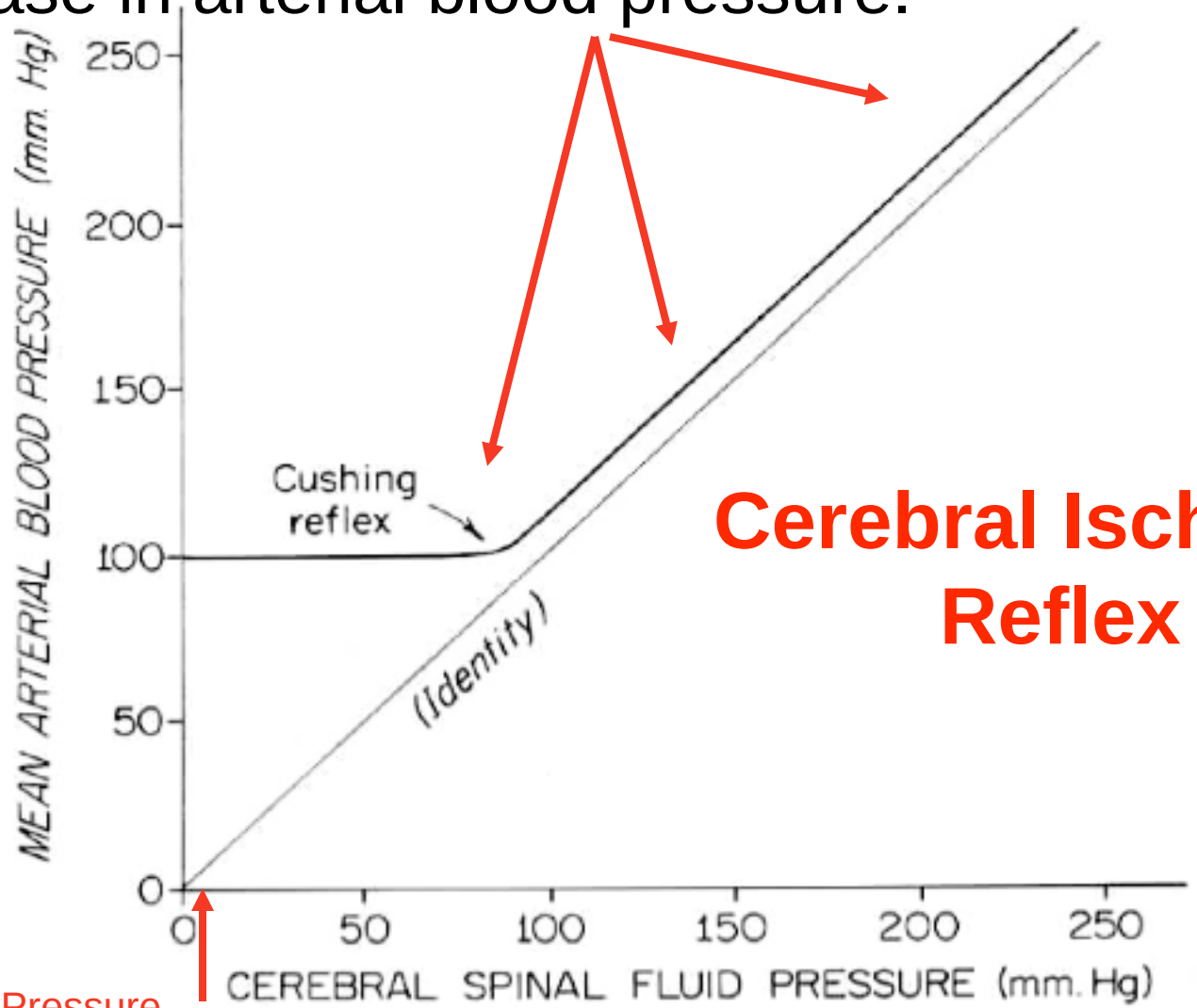
-marked increase in arterial blood pressure

-over rides arterial baroreceptor reflex !!

-may involve central chemoreceptors

-presumed to be “protective” of ischemic CNS

When intracranial pressure approaches arterial pressure the Cushing reflex produces a sustained Increase in arterial blood pressure.



Cerebral Ischemic Reflex

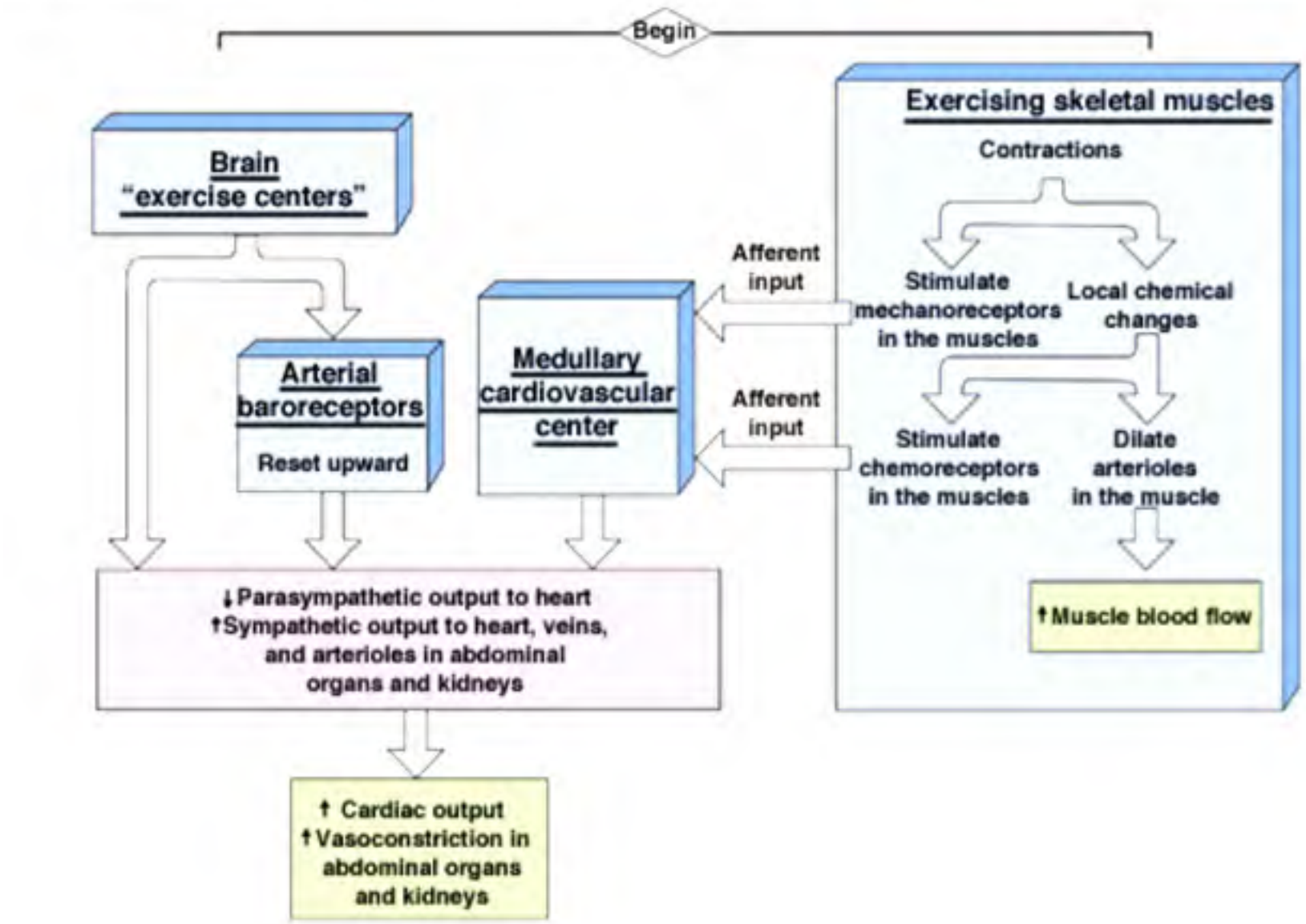
Normal CSF Pressure

If time permits

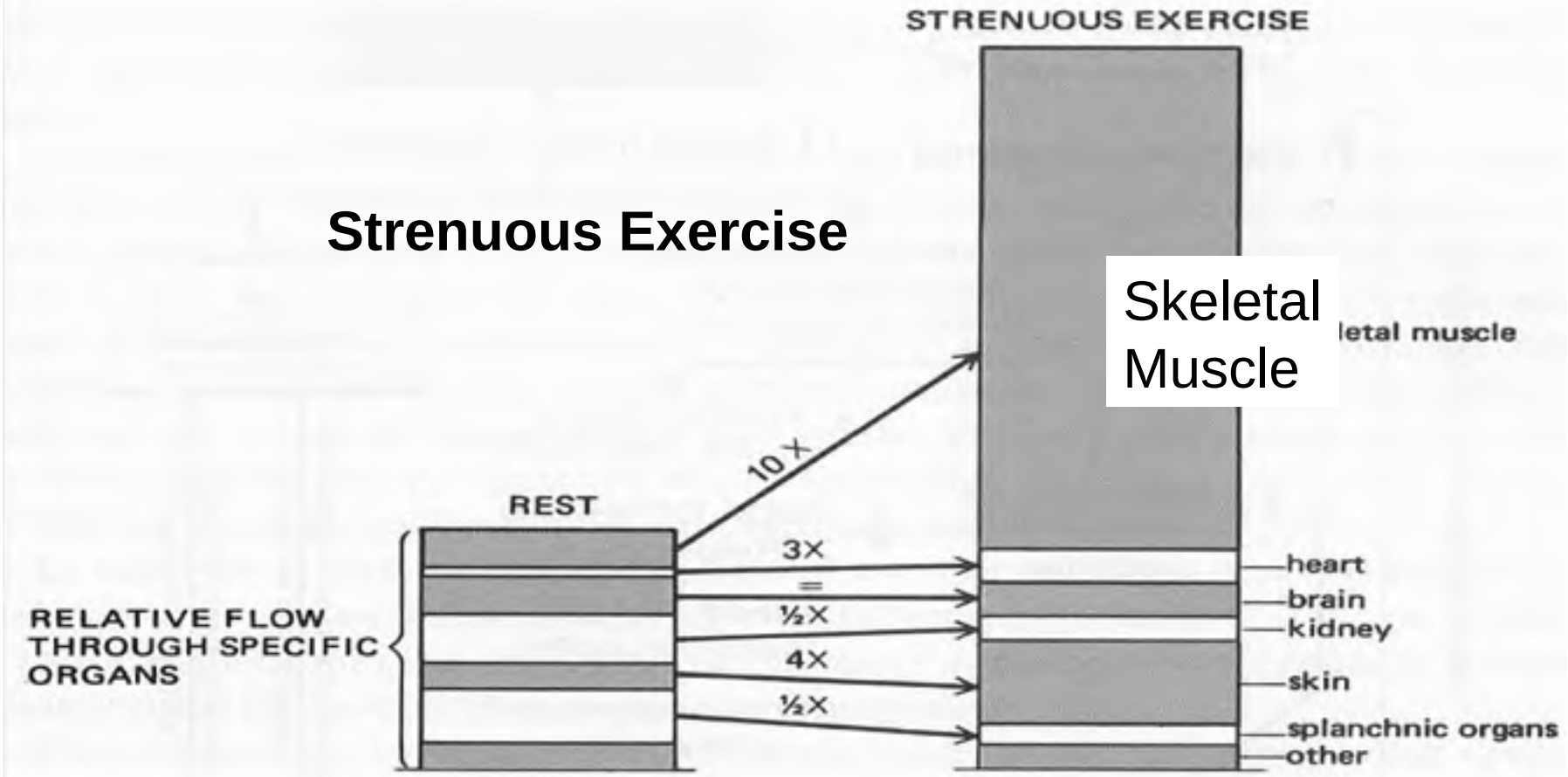
And not to be tested

Cardiovascular Response to Exercise

Control of cardiovascular system



Strenuous Exercise



cardiac output	6 liters/min	18 liters/min
heart rate	70 beats per minute	160 beats per minute
ejection fraction	60%	80%
arterial pressure	120/80 mmHg	150/80 mmHg
central venous pressure	2 mmHg	2 mmHg

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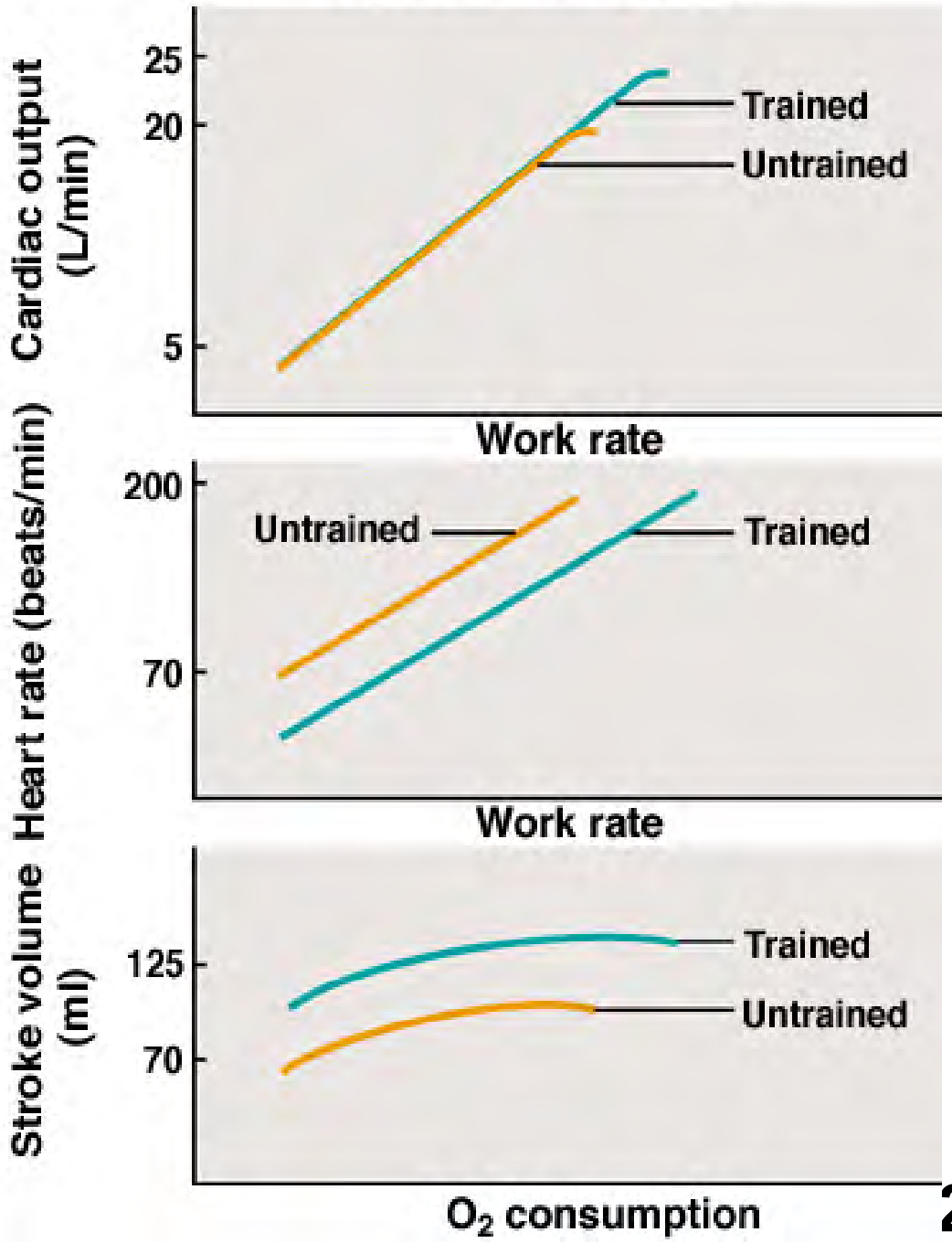
M&H 10.4

Change in cardiac output/ heart rate/ stroke volume



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