

The cardiac cycle

2nd edition



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Notes :

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First of all :

- Tetanized: if you give continues stimulate to the skeletal muscle during contraction it will be contracted.
- Heart muscle can't be Tetanized.
- Summation : giving 2 stimulation separating it's effect are added

Cardiac Cycle

Is the events that take place in one heart beat and it's divides to :

1- Electrical

2- mechanical

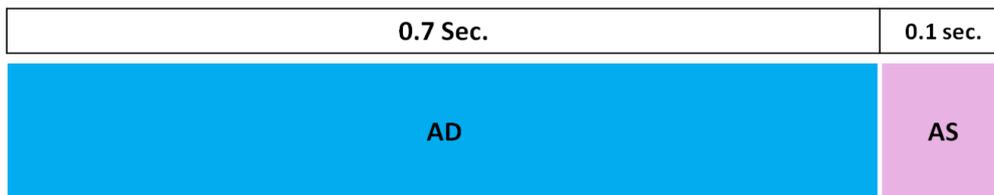
Article		ventricle	
Systolic	diastolic	Systolic	diastolic
0.1	0.7	0.3	0.5

⌚ In 60 sec (1 minute) = 75 heart beat

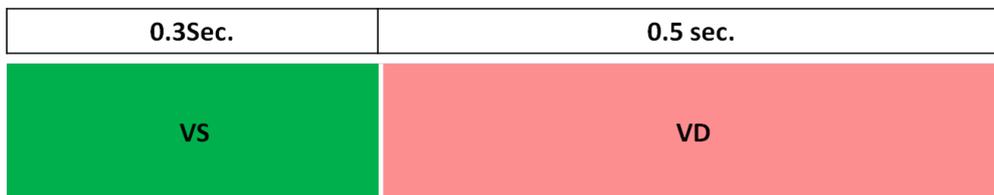
⌚ 1 heart beat takes 0.8 sec and that's the duration of the cardiac cycle.

⌚ If the cardiac cycle is short that means rate is fast

⌚ If the cardiac cycle is long that means the heart rate is slow



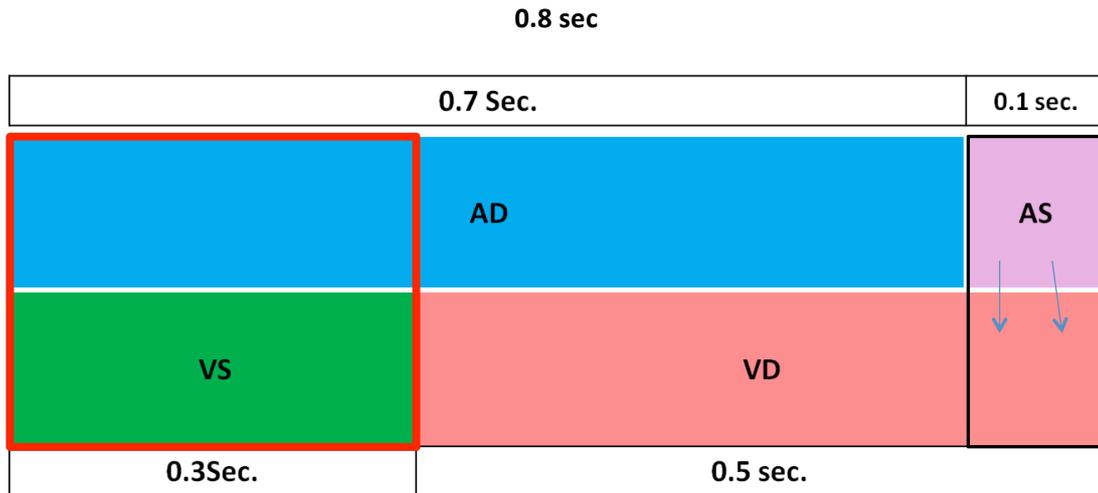
Atrial Cycle (0.8 Sec.) at rest



Ventricular Cycle (0.8 Sec.)

Remember !

Diastolic always takes more time than systolic time



First heart sound

second heart sound

First

Blood is coming to Atrium while **relaxing** ..

In the **red square** , blood doesn't flow to ventricle because it's **contracting** .

after (0.3 sec -) , the blood will flow to ventricle from atrium by Gravity (70%ventricular filling)

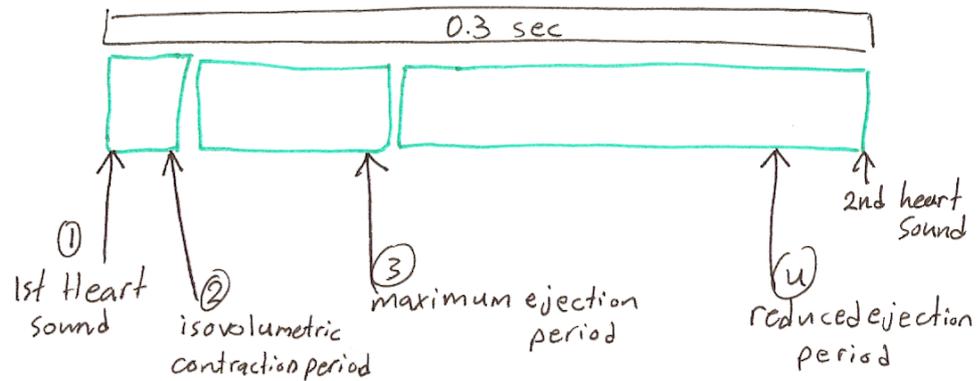
in the **black rectangle** , the blood will flow to the ventricle by the **atrial contraction** (30 % of filling)

- 1st heart sound is the beginning of ventricle systole **VS**
- 2nd heart sound is the end of ventricle systole **VS**

the heart is **contracting** from the 1st heart sound to the 2nd heart sound

the heart is **relaxing** from the 2nd heart sound to the other 1st heart sound (0.5 sec)

Ventricular Systole (events)



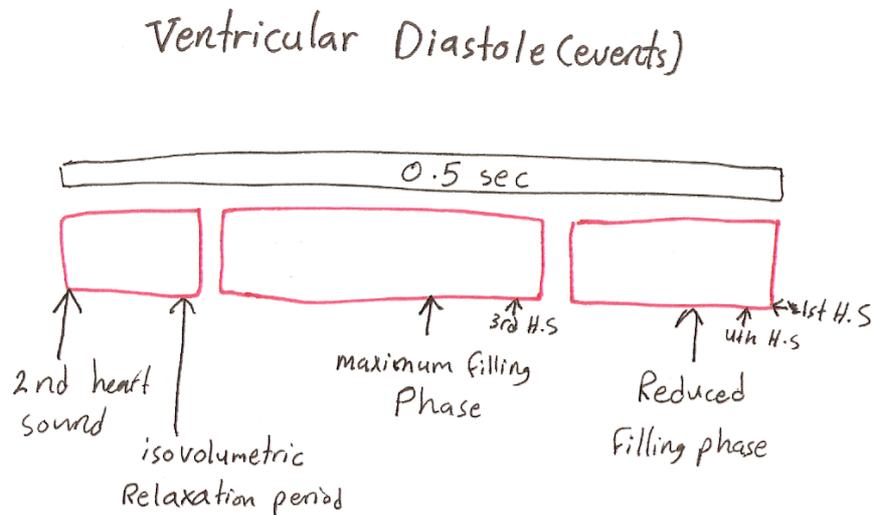
① **1st heart sound** : because the **AV** valves close

② **Isovolumetric contraction period** : heart is contracted as a closed cavity (all valves are closed)

③ **Maximum ejection period** : it will contract more (maximum) and cause more pressure. That will open the semi lunar valve then blood will flow to Aorta and pulmonary trunk. It takes less time than ④ event .

④ **Reduced ejection period** : the remaining blood flows to to Aorta and pulmonary trunk slowly .

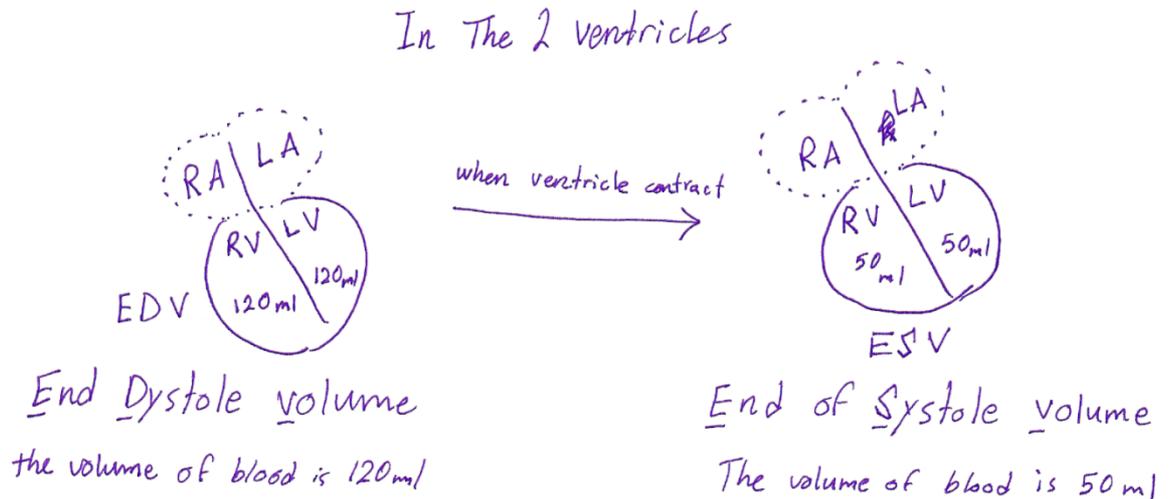
2nd heard sound means heart has started relaxing ..



- ① **2nd heart sound** : because closing of semi lunar valves
 - ② **Isovolumetric relaxation period** : all valves are close and the heart is relaxing as closed cavity with less blood .
 - ③ **Maximum filling phase** : filling of ventricle with blood. It takes also less time than reduced filling phase. This cause 3rd heart sound (because of ventricular filling)
 - ④ **Reducing filling phase** : entering of blood slowly
- 70% of blood flows from atrium to ventricles by gravity
 - 30% of blood flows from atrium to ventricle by contraction of atrial muscle :

That atrium systole causes the 4th heart sound . This known as atrial sound

Stroke volume



$$\mathbf{EDV - ESV = 70 \text{ ml}}$$

Stroke volume: amount of blood pumped out of the heart in one contraction

Notes :

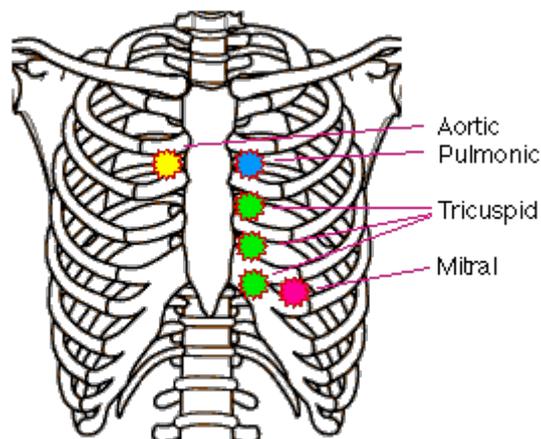
- Cardiac output : amount of blood pumped out from each ventricle preminute
- Each ventricle contain 120 ml & each give 70 ml

Remember!

Heart is never empty it's always contains blood

Heart sounds

- There are 4 heart sounds
- 1st and 2nd heart sound are easy to hear in all part of chest .
- 3rd heart sound can be heard only in young people and pregnant women. (60% of young people)
- 4th heart sound doesn't heard in normal person



1st heart sound areas :

Apex : Mitral area in the left 5th intercostals space, $\frac{1}{2}$ inch in the middle clavicular line inside the apex of the heart.

You can also hear 2nd heart sound ,but 1st is louder .

1st heart sound has 2 components that is mitral and tricuspid closure

The mitral valve close first because it has more pressure on it .

NUMB3RS :

duration : .015 sec

frequency 25- 40 hrtz cycle/ sec

character : LUB sound

it's : dull and prolong comparing to 2nd heart sound

2nd heart sound areas :

At left base (pulmonic area) : in the 2nd intercostals space near next to the sternum from the left side.

At right base (aortic area) : in the 2nd intercostals space near next to the sternum from the right side .

The aortic will close first because of high pressure, but the closure of both of them cause the 2nd heart sound .

2nd heart sound is listened better in  areas.

NUMB3RS :

Duration : 0.1 sec

Frequency: $50 \leq \text{Hts}$

Character : DUB sound

Sharp and short compared to 1st heart sound .

Tricuspid area (left lateral sternal border) :

Best area to hear tricuspid valve closing.

near in the end of sternum and left side

3rd heart sound :

It occurs at the beginning of middle third of diastole

Rush of blood from atrium to ventricle during maximum filling

Phase of cardiac cycle cause 3rd heart sound . it causes vibration in the blood

NUMB3RS:

Duration : 0.1 sec

Frequency: 20- 30 Htz

4th heart sound (atrial sound)

Occurs at last $\frac{1}{3}$ of diastole, just before 1st heart sound.

Atrial contraction cause rapid flow of blood in ventricle and cause the 4th heart sound and vibration in blood

NUMB3RS :

Frequency: >20

Phonocardiogram

heart sound are recorded

4th heart sound is recorded when the ventricle is very tough not expanding (it's abnormal when heard or recorded

Triple rhythm (gallope) like a horse riding sound:

- It's when you hear the 1st, 2nd and 3rd sound

Split & ting

.. when you hear the 2nd heart sound splitted to aortic sound and pulmonary sound (called (splitting of 2nd sound) ..

It's normal when you take a deep breath in. because the thoracic cavity expand more blood will go to the right ventricle

Splitting of tricuspid and mitral valve is called splitting of 1st heart sound.

That's all :)