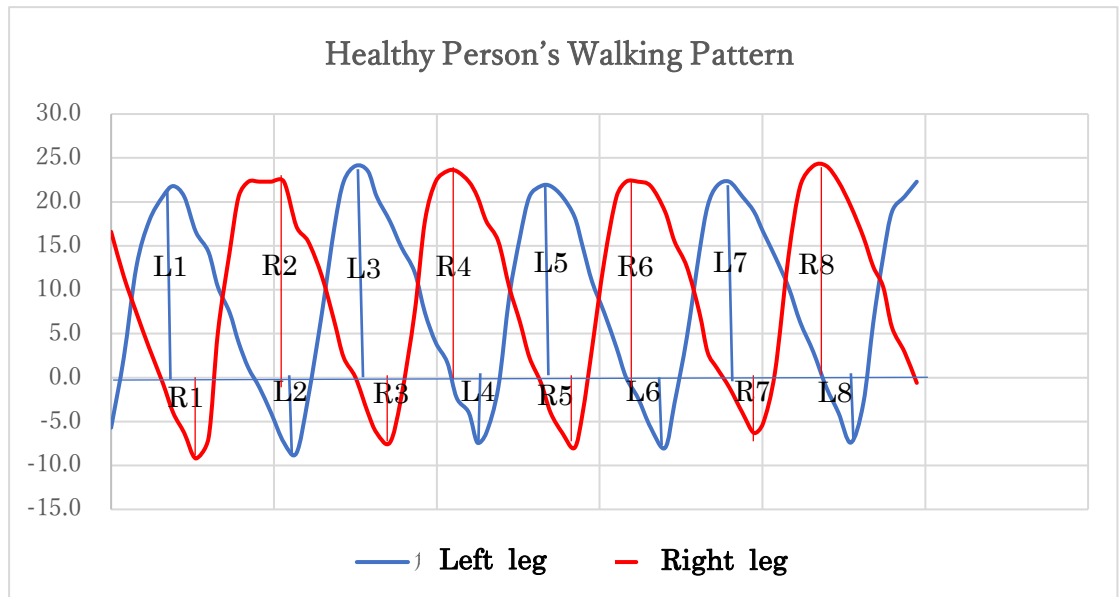
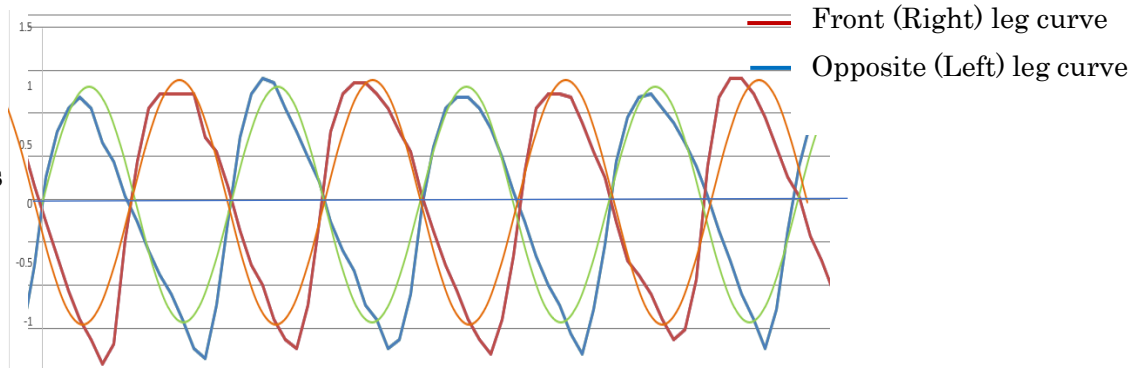


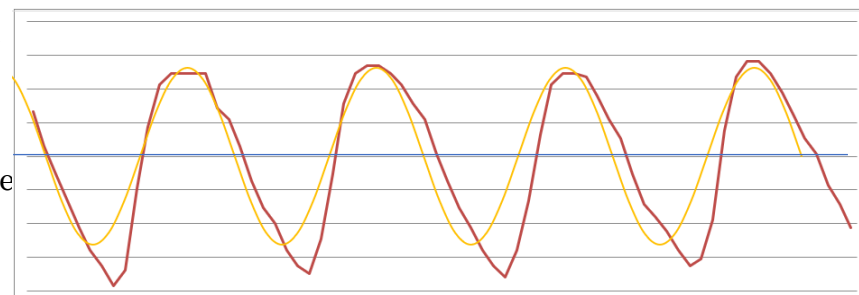
Figure 14. Gait Cycle curves and Sine Curves



(1) Both legs' gait cycles and sine curves



(2) Front leg's gait cycle and a sine curve



(3) Opposite leg's gait cycle and a sine curve

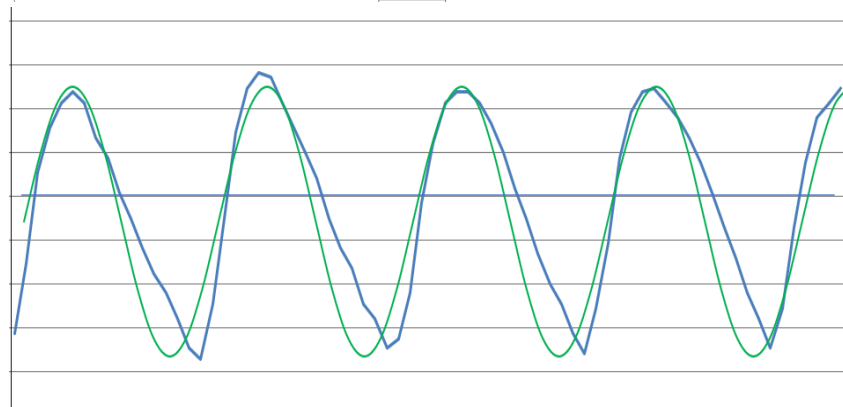
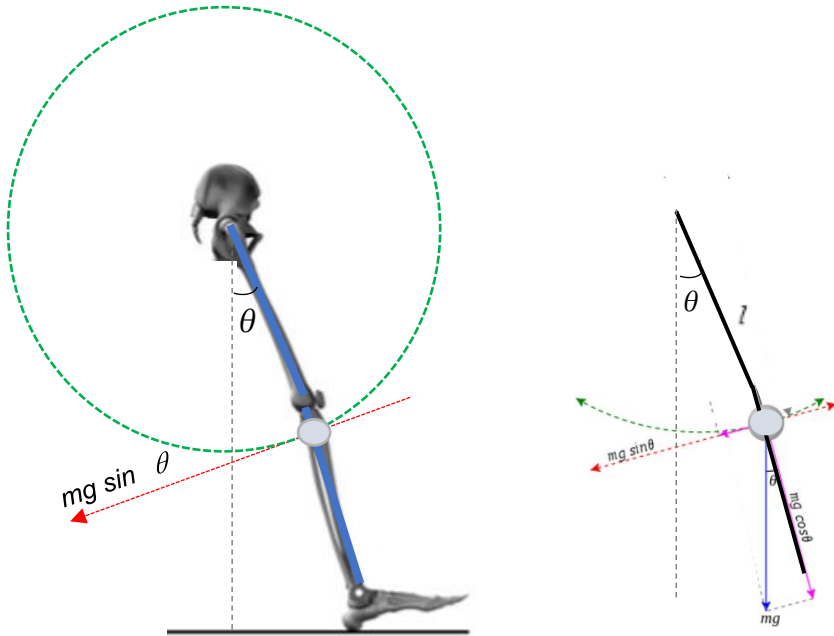


Figure 15. Legs' gait cycle - Pendulum



Legs' gait cycle - Pendulum

$F = - mg \sin \theta$

Interior angle made with Femur and Perpendicular: θ (rad)

Bottom point: 0

Deviation from point 0 on arc: x (m) right direction is positive

Gravity acceleration: g [m/s²]

m : weight of right leg or left leg

When x is positive, the power which $mg \sin \theta$ works is directed to the left hand, therefore F is designated as minus.

Right leg's pendulum $F_1 = - m_1 g \sin \theta$

Left leg's pendulum $F_2 = - m_2 g \sin \theta$

Figure 16. Kangaroo's hopping

A kangaroo hops with two legs that move simultaneously. Its hopping has two phases., i.e., the stance phase and swing phase. Both legs' moves are synchronized.

Stance Phase

1. Initial contact

Both feet touch ground.

Cyclical running (1)



2. Loading response

Forward movement of whole body, while both feet keep touching ground and both legs are at stance phase

Cyclical running (2)



Cyclical running (3)



Cyclical running (4)



3. Swing Phase

Both feet leave ground.
and both legs swing simultaneously.

Cyclical running (5)



(additional pictures)



Cyclical running (6)



(additional picture -Kangaroo's high Jump)

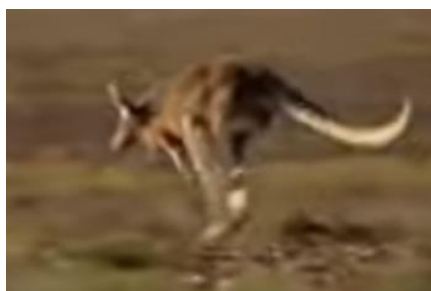


Both legs are in the air and now are returning to front.

Cyclical running (7)



(Both legs are on the verge of touching ground)



A kangaroo uses the whole lower half of its body to hop as shown below.

