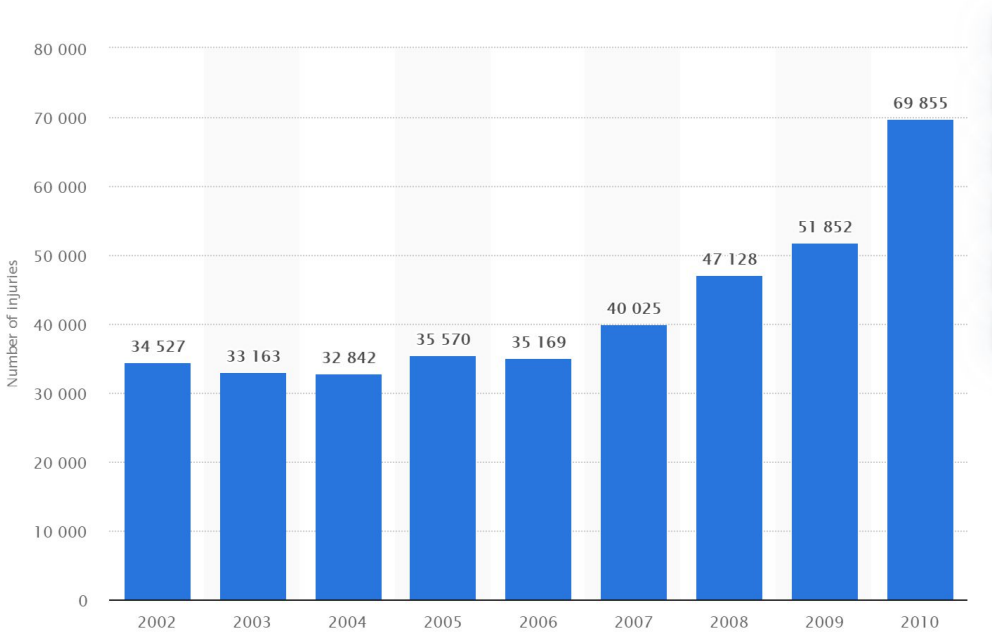
# Pillar

By Jason Yao

# Crutches

- More than 3.5 million injuries occur each year in the US through sports.
- 1/3 of all injuries incurred are sprains/strains and require crutches.
- More than 70000 people are hurt using crutches, canes and walkers every year.




Number of injuries from crutches, canes and walkers in the U.S. from 2002 to 2010

# User needs

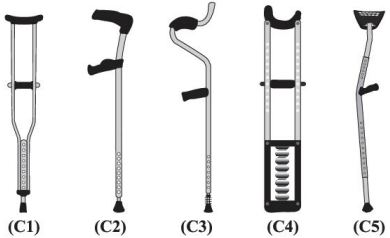
- To be able to move and commute freely
- Have a hands free experience
- Comfortability
- To be able to recover ASAP

# Issues

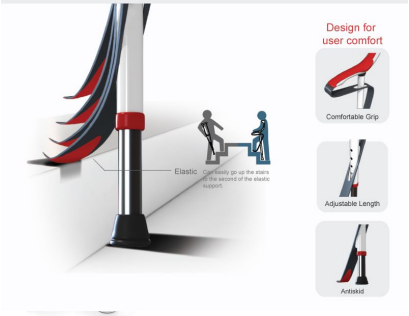
- **Crutch paralysis** - Damage to nerve endings in the armpit.
- **Skin irritation** - additional irritation and rubbing of the skin when using underarm crutches.
- **Slipping** - the smaller point tips of some crutches and the lack of non-slip grip can lead to slipping and falling.
- **Catching tip and falling** - trip hazards on walking surfaces like cords may cause a patient to catch the tip of their crutch and lose their balance leading to a fall.
- **Joint or muscle pain** - less serious joint pain (arthralgia) or muscle pain (myalgia) may occur from the use of crutches as patients engage different muscle groups and incur many more awkward body movements and positions than they otherwise might. Neck, shoulder, back, and even elbow pain may occur.
- **Occupys both hands**

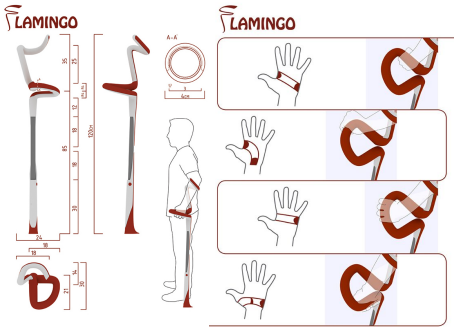
# CURRENT PRODUCTS

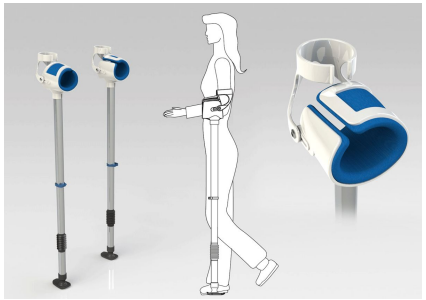
- Axillary
- Forearm
- Platform
- Strutter
- Leg support



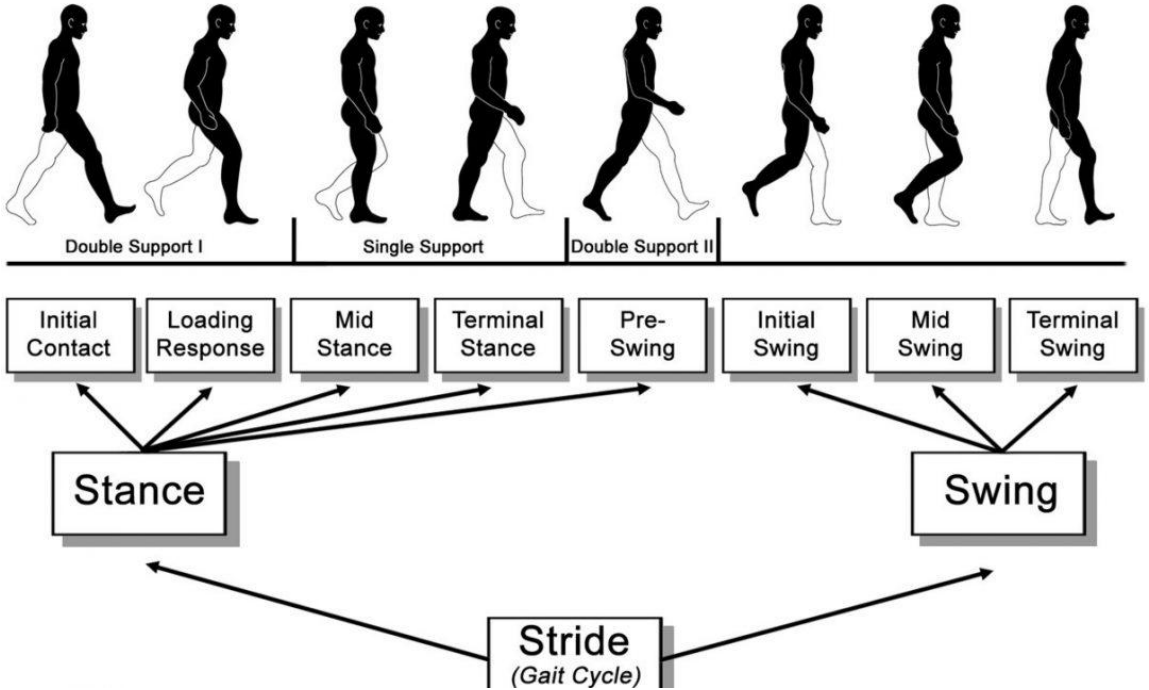
CRUTCHES FOR A YOUNGER GENERATION



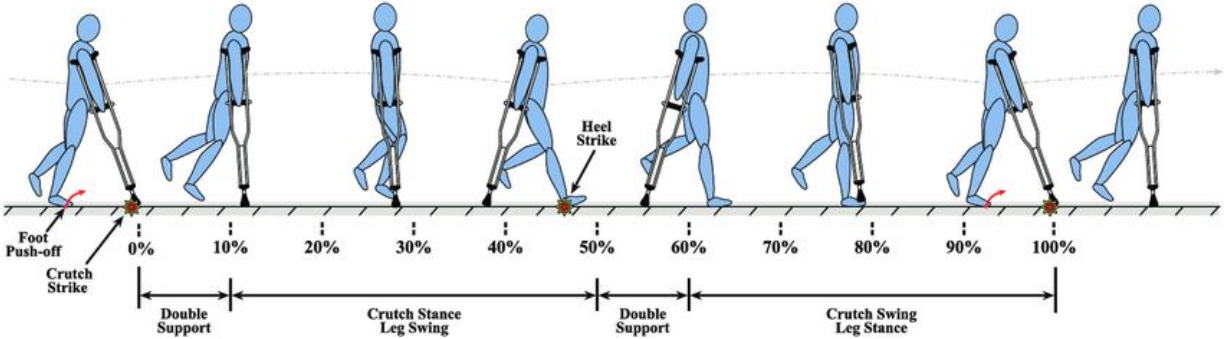



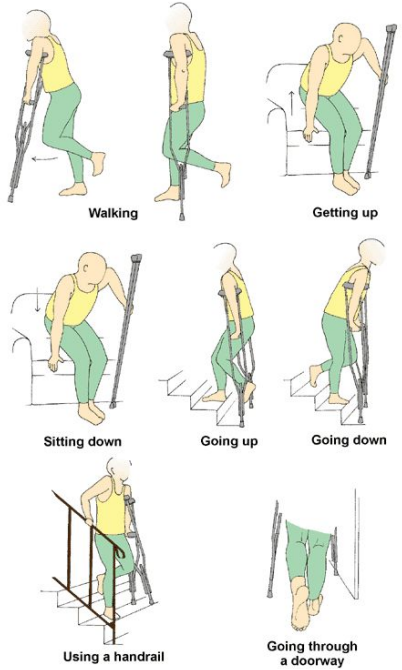



# How we walk


Double Support I
Single Support
Double Support II
Initial Contact
Loading Response
Mid Stance
Terminal Stance
Pre-Swing
Initial Swing
Mid Swing
Terminal Swing
Stance
Swing
Stride
(Gait Cycle)

# Movement study



# INSPIRATION

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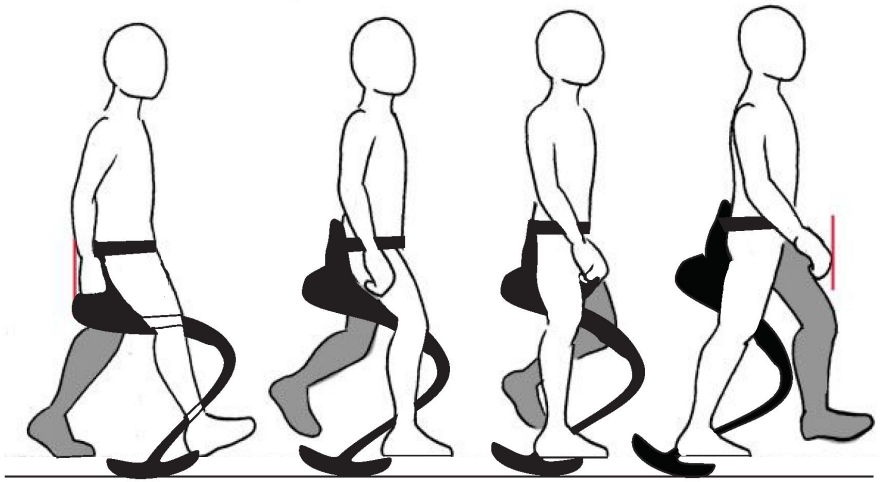
HONDA

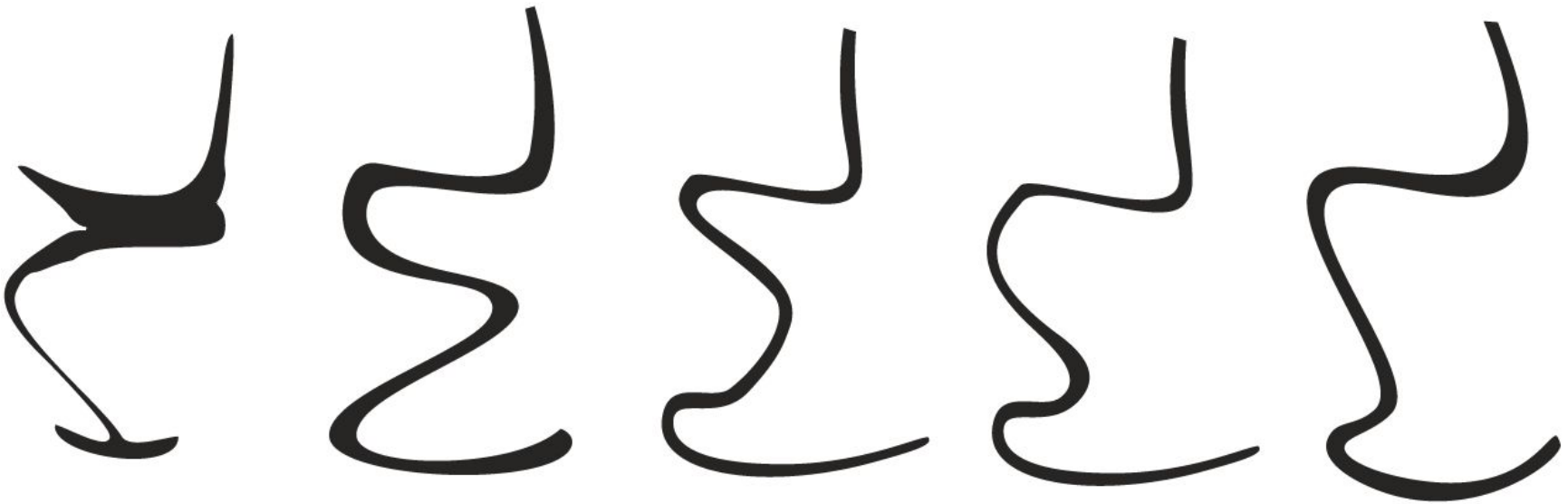
# Form study

# Motion study



# Testing

# Form update



# Material

6061T5 Aluminum

High Capacity Urethane

Memory foam+Hyper-Elastic Polymer