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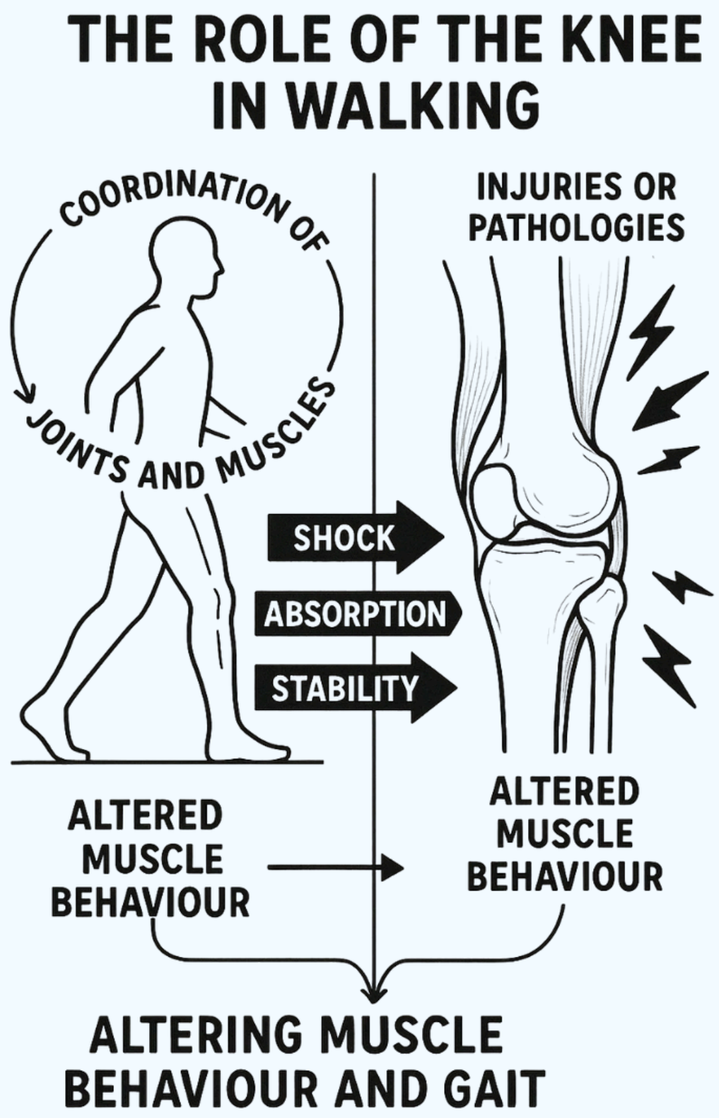
歩行中の下肢の筋肉行動に対する膝の異常の影響の研究

Study of the impact of knee anomalies on the behaviour of the muscles of the lower limb during walking

Presentation R&D, Kyushu University, Japan

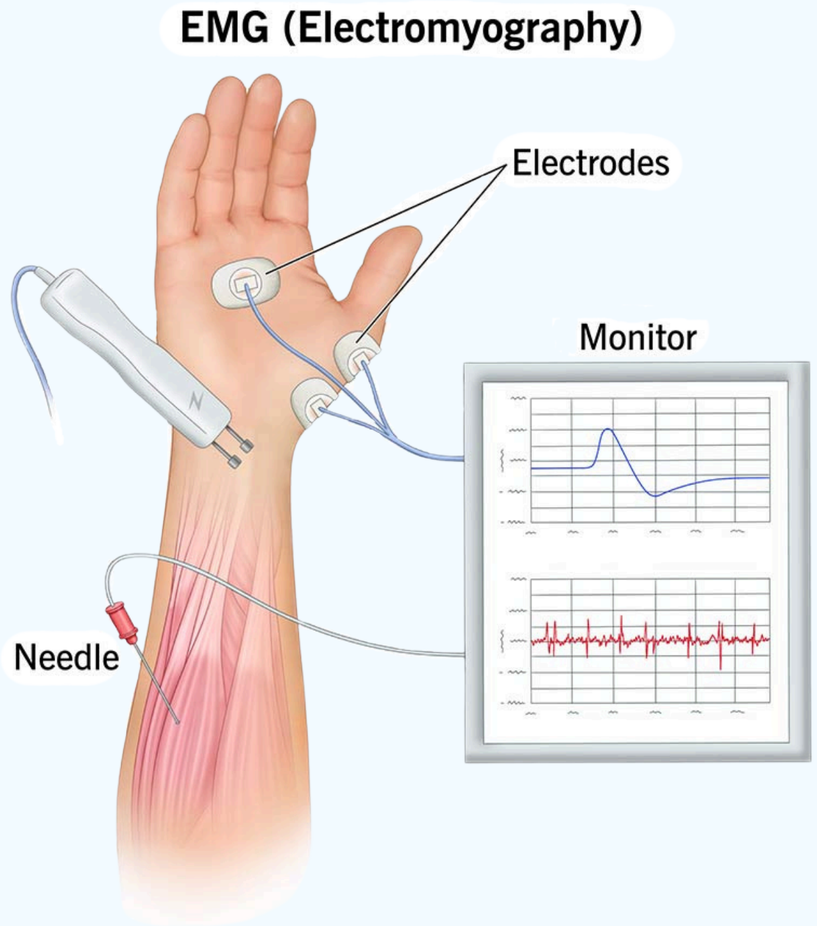
イントロダクション
INTRODUCTION

- Walking = coordination between joints & muscles
- Knee = shock absorption, stability, propulsion
- Knee pathology → muscle dysfunction, altered gait
- Goal: use EMG to analyze these changes



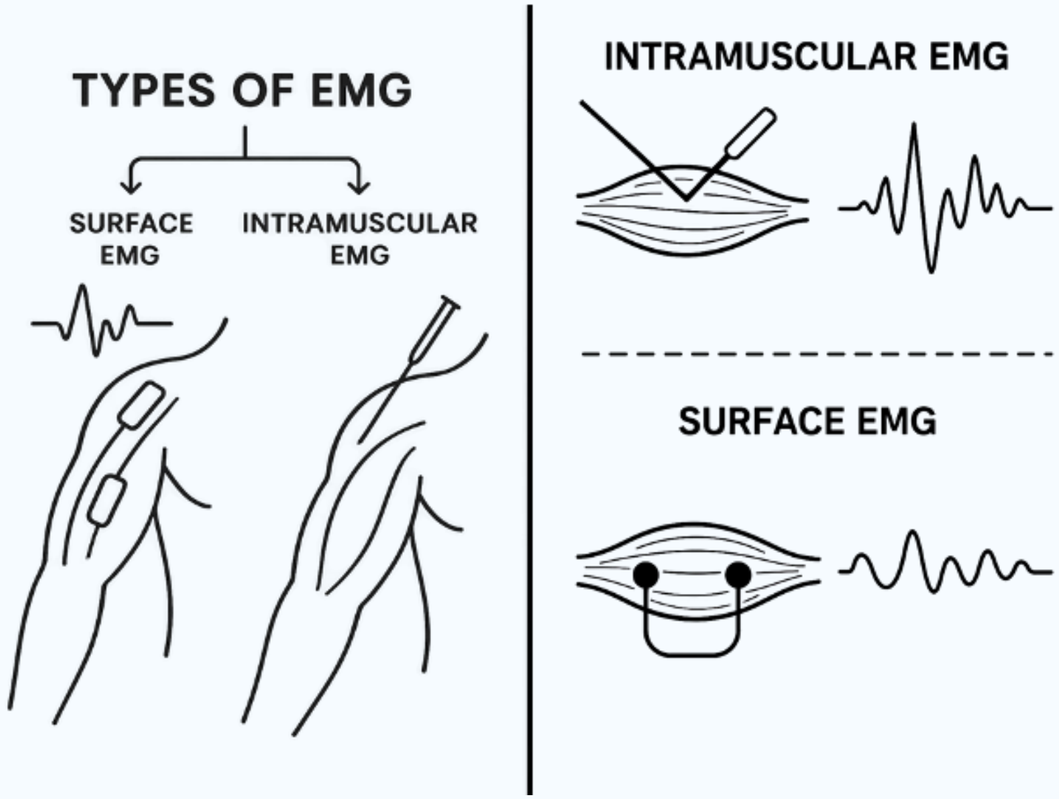
EMGとは何か　WHAT IS EMG?

- Records electrical activity of muscles
- Surface EMG: skin electrodes (non-invasive)
- Intramuscular EMG: needle electrodes (invasive)
- Measures voltage during contraction (0–10 mV)

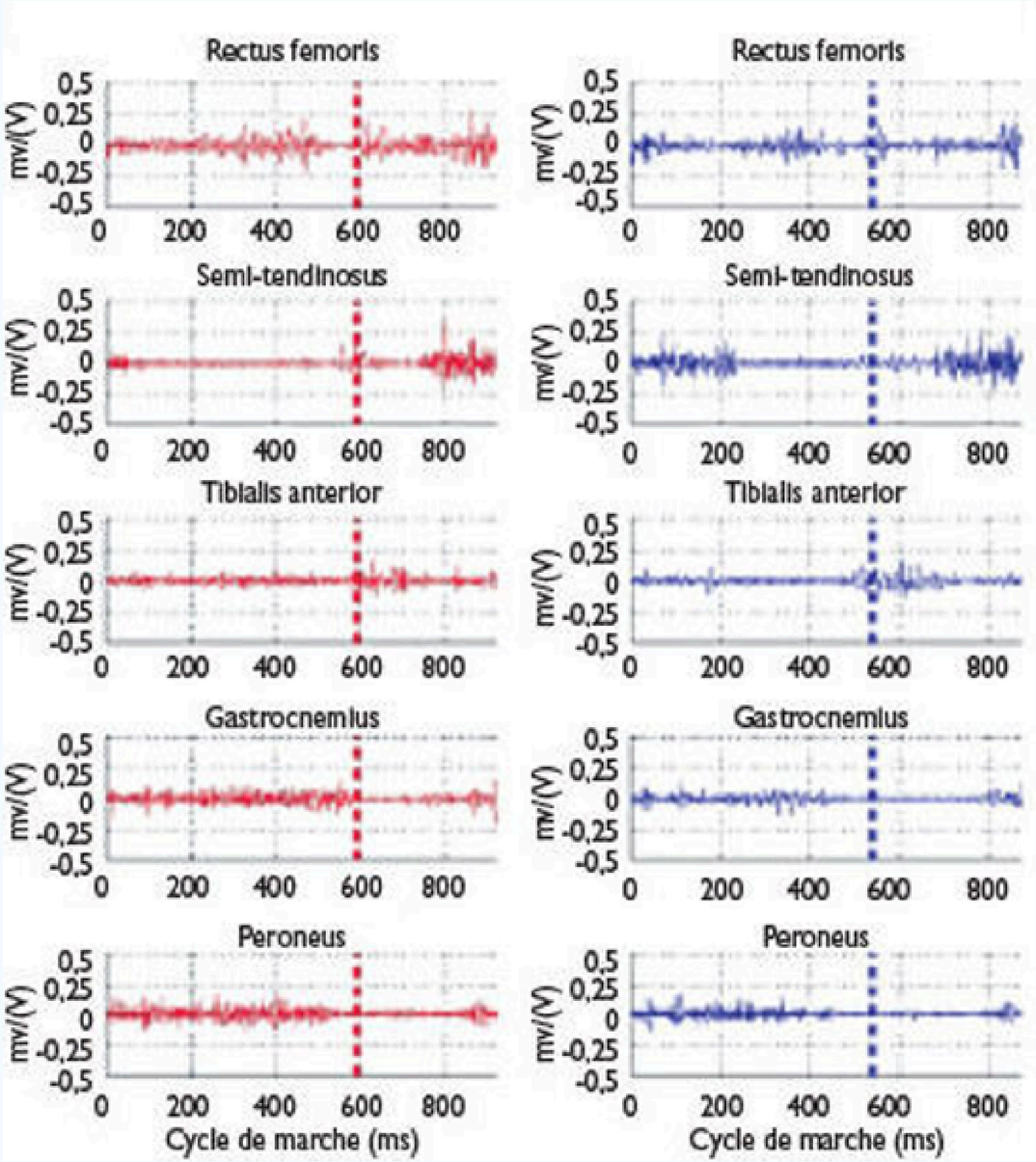


EMGの種類　　TYPES OF EMG

- **Surface EMG:** easy setup, good for motion, less accurate for deep muscles
- **Intramuscular EMG:** high precision, invasive, used in clinical settings

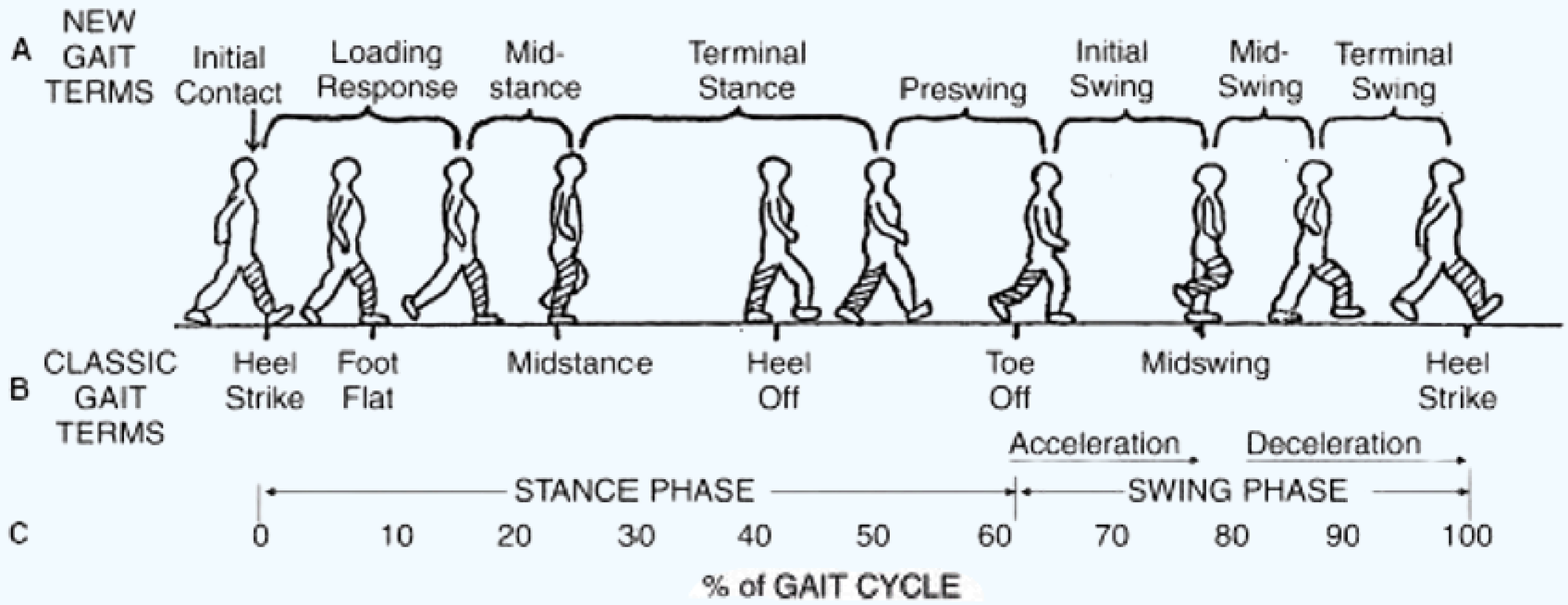


歩行中のEMG例　　EMG EXAMPLE



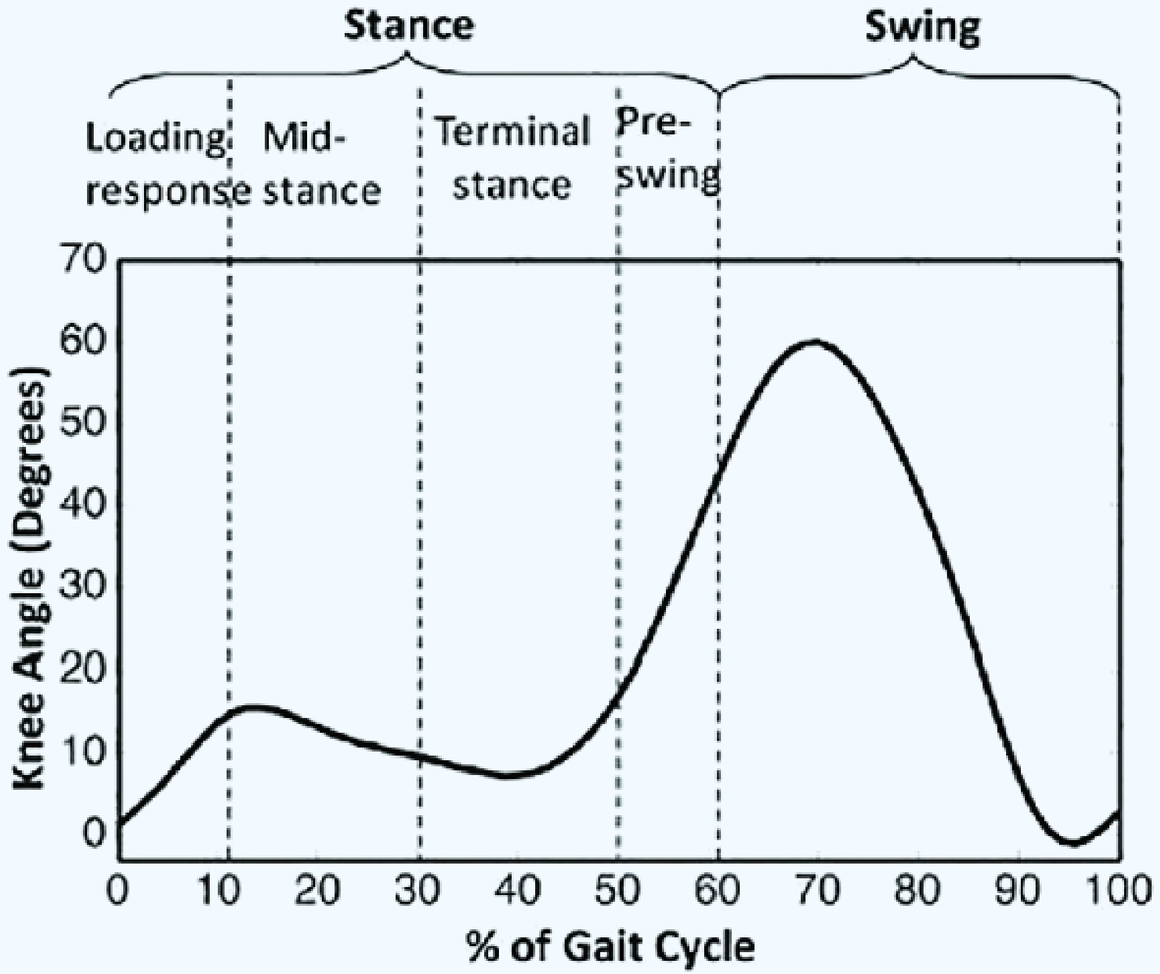
- 5 muscles monitored (left: red, right: blue)
- Graph shows activation pattern during walking

歩行サイクル　　GAIT CYCLE



- Two phases: stance (60%) + swing (40%)
- Each phase involves specific joint and muscle actions

膝の曲げ角　　KNEE FLEXION



- Graph: knee angle over time
- Helps detect gait cycles and segment EMG signals

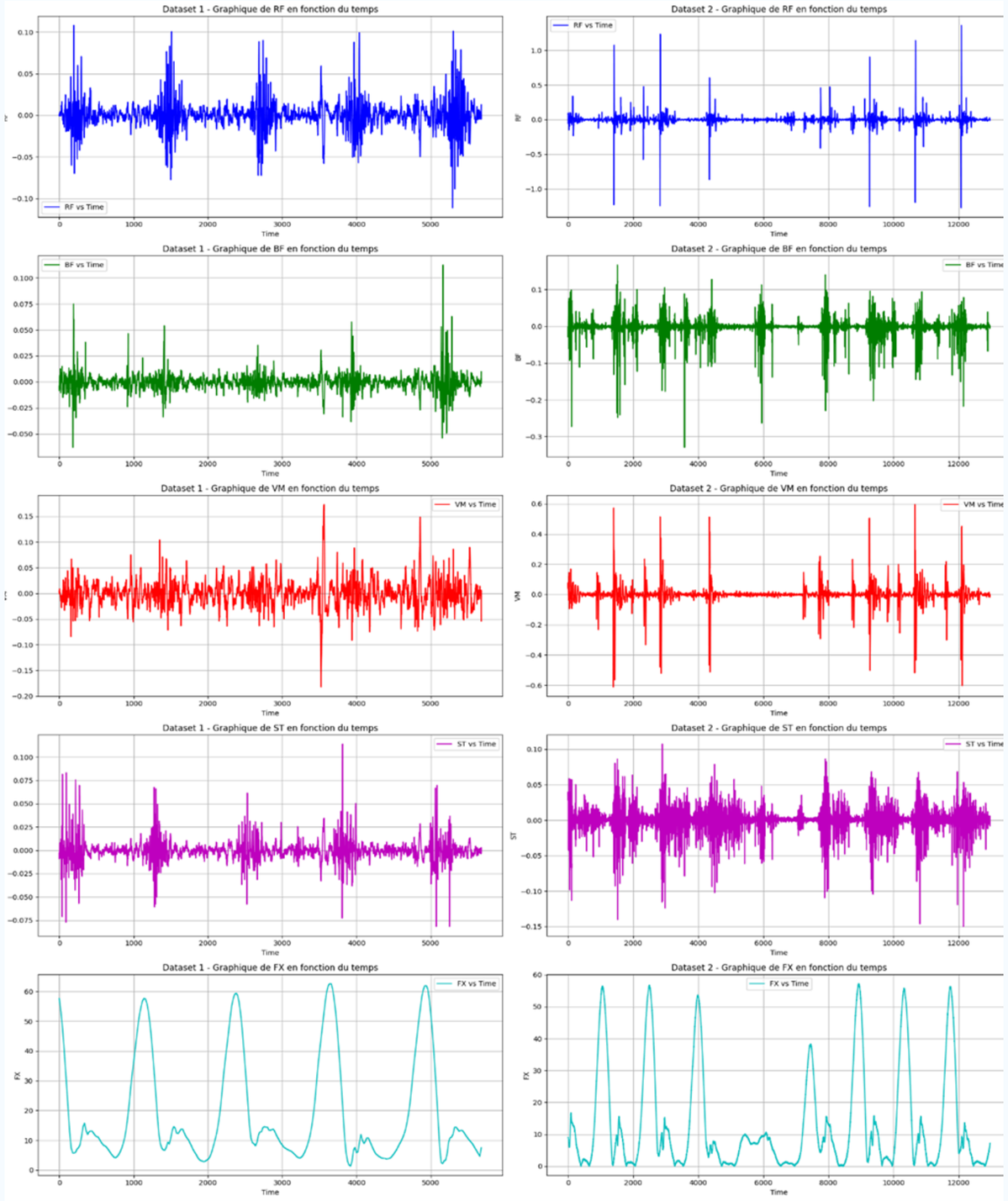
データベース
DATABASE

- 22 subjects (11 healthy, 11 pathological)
- Data sampled at 1000 Hz, stored as .txt files

Each file has 5 columns:
Col 0: Rectus Femoris (RF)
Col 1: Biceps Femoris (BF)
Col 2: Vastus Medialis (VM)
Col 3: Semitendinosus (ST)
Col 4: Knee flexion angle (FX)

Each color represents a specific muscle and the last one corresponds to the knee flexion signal

Right side: pathological subjects.
Left side: healthy subjects



今後のステップ　　NEXT STEPS

Start signal preprocessing:

- Filtering
- Rectification
- Segmentation
- Feature extraction

AI model for gait classification

Goal: assist diagnosis and rehabilitation