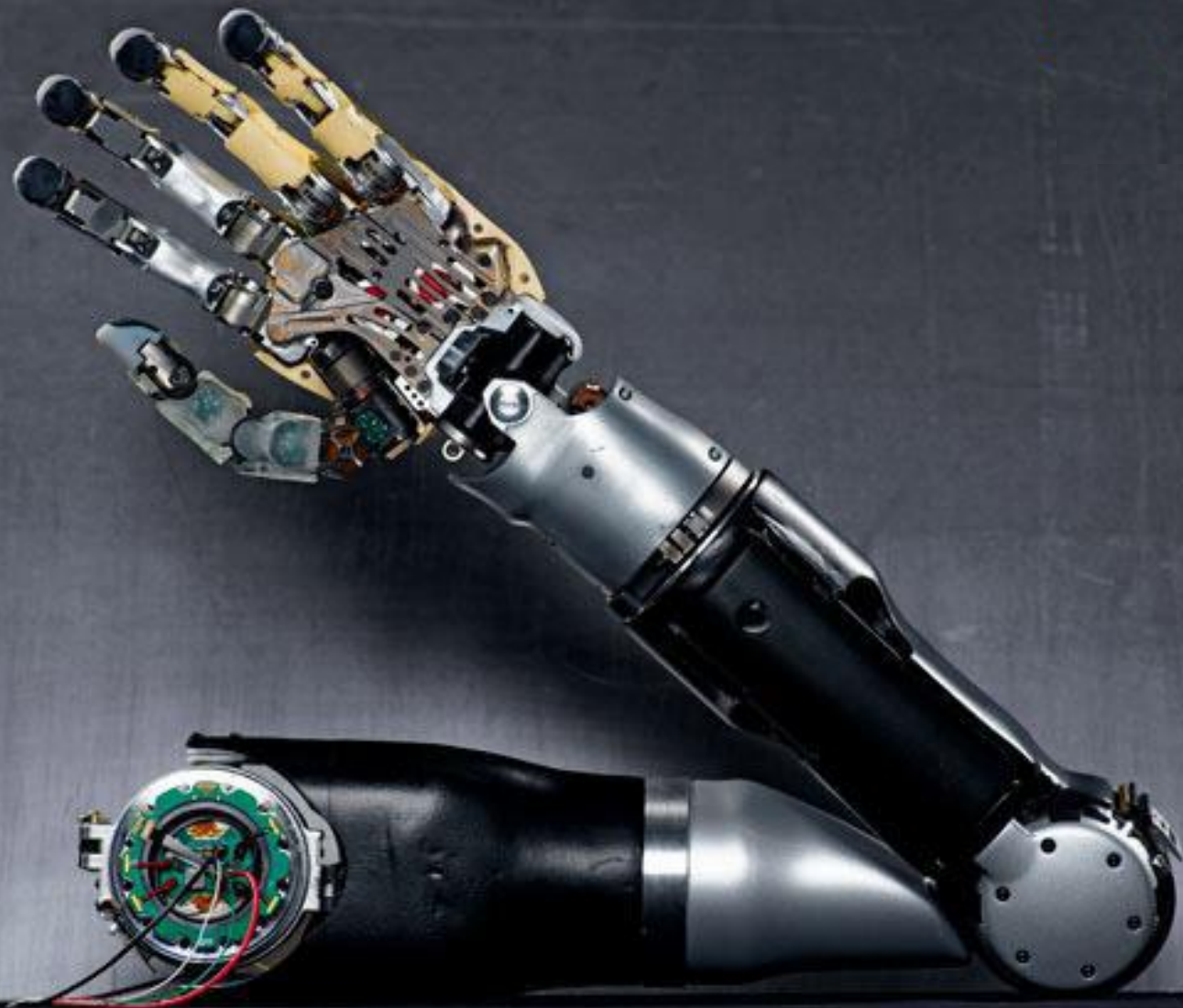


# 第九組

好人、ting、阿法



# Introduction

- o What is prosthesis?
- o 義肢－與血肉相連的工具

- o What is myo-electric prosthesis?

肌電義肢－與生物體相連的機器，可感應由生理電訊號以完成特定的工作；最新的發展則還可以回傳訊號給生物體以達成協調的作用。

- o Why do we need it?  
=, = 我們應該不需要

除非...

# Why we need it?

- 重大傷害：車禍、火災、山崩
- 重大疾病：糖尿病、血管病變

- 肢體損壞達一定程度，為避免進一步的感染破壞，醫生會為病患進行肢體切除手術（traumatic amputation）



# How does it help?

- 解決受截肢者生理 or 心理上的困擾
- 替代失去的肢體（或者更進一步強化）
- 提升生命價值!?



# Categories

- o Cosmetic Prosthesis
- o Body-powered Prosthesis
- o Myo-electric Prosthesis

# Cosmetic Prosthesis

## o Pros

Don't need training

Light, cheap

Looks better

## o Cons

Low functionality



nice looking!?

# Body-powered Prosthesis

## o Pros

More functions

## o Cons

Heavier, more expensive

Hard to control

Depends on users remaining muscle strength

Ugly

VERY UGLY..





# Myoelectric Prosthesis

## o Pros

- Much more functions
- Still advancing

## o Cons

- Very expensive and heavy
- Needs battery
- Needs testing + training
- Only beneficial for amputees

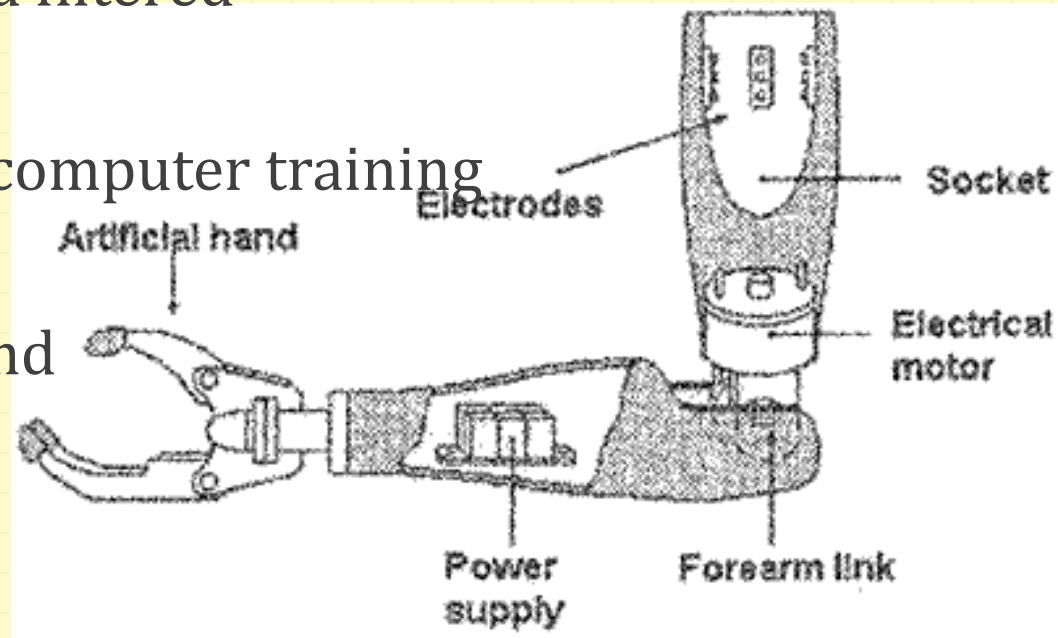


# Preparation

1. Should be an amputee
2. Use voltmeter to measure electric potential
3. Patient 'uses' his phantom hand
4. Computer processes input signals
5. Custom 'mapping' of signals to actions

# Usage

1. Muscle contraction sends electrical signals
2. Signals ( $\sim\mu V$ ) are picked up by electrodes
3. Signals are amplified and filtered
4. Comparison made with computer training
5. Motors perform command



# Limitations from and EE point of view

One degree of motion

No feedback

Speed/Accuracy tradeoff

Dangerous around water

Others:

Heavy motor, battery ( needs recharging )

Parts wear out quickly

# A little story...



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# Design?

o 電極 → filters → amplifier → A/D converter  
→ filters → artificial limb ( prosthesis )

- o Different from real arm?
  - 1.one motion at one time
  - 2.only for simple work

# A little story...



# A little story...





# Targeted Reinnervation

- Targeted : 選定的
- Reinnervation : 神經重建
  - 運動神經
  - 感覺神經

# Targeted Reinnervation

- 目前肌電義肢缺點

- 結合TR

  - 更複雜的操作

  - 有知覺回饋

- TMR-Targeted Muscle Reinnervation

- TSR-Targeted Sensory Reinnervation

# TMR

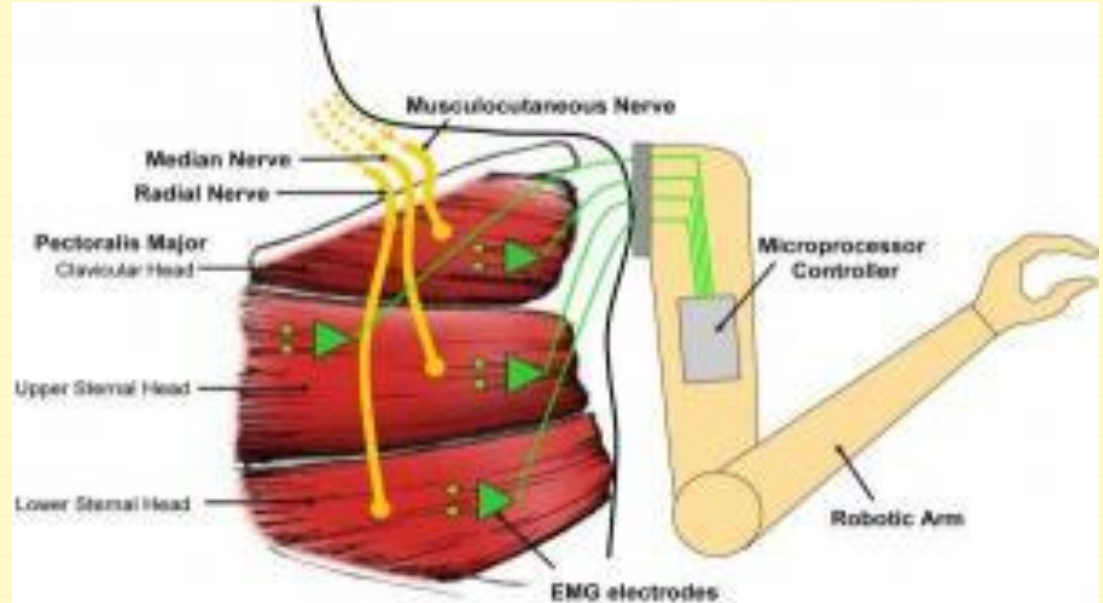
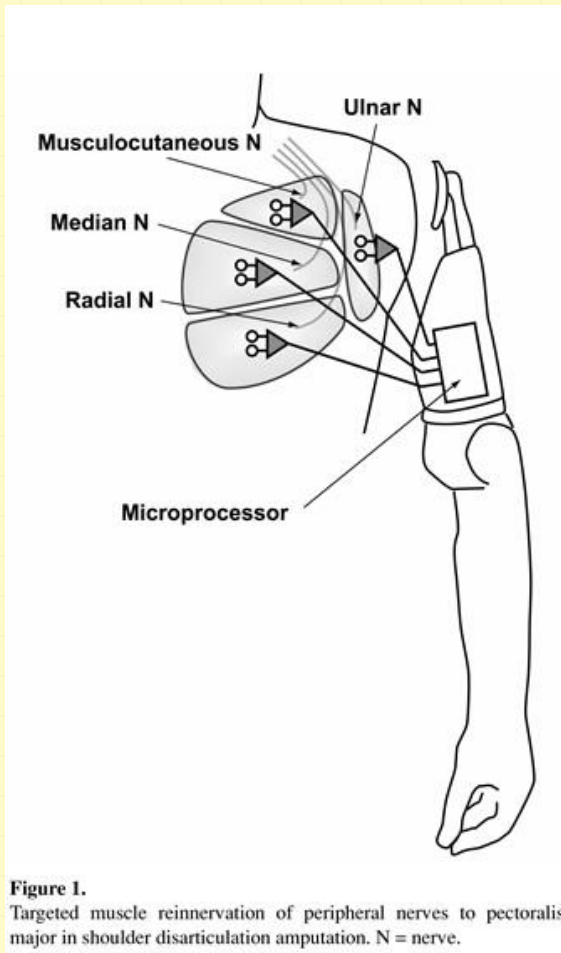
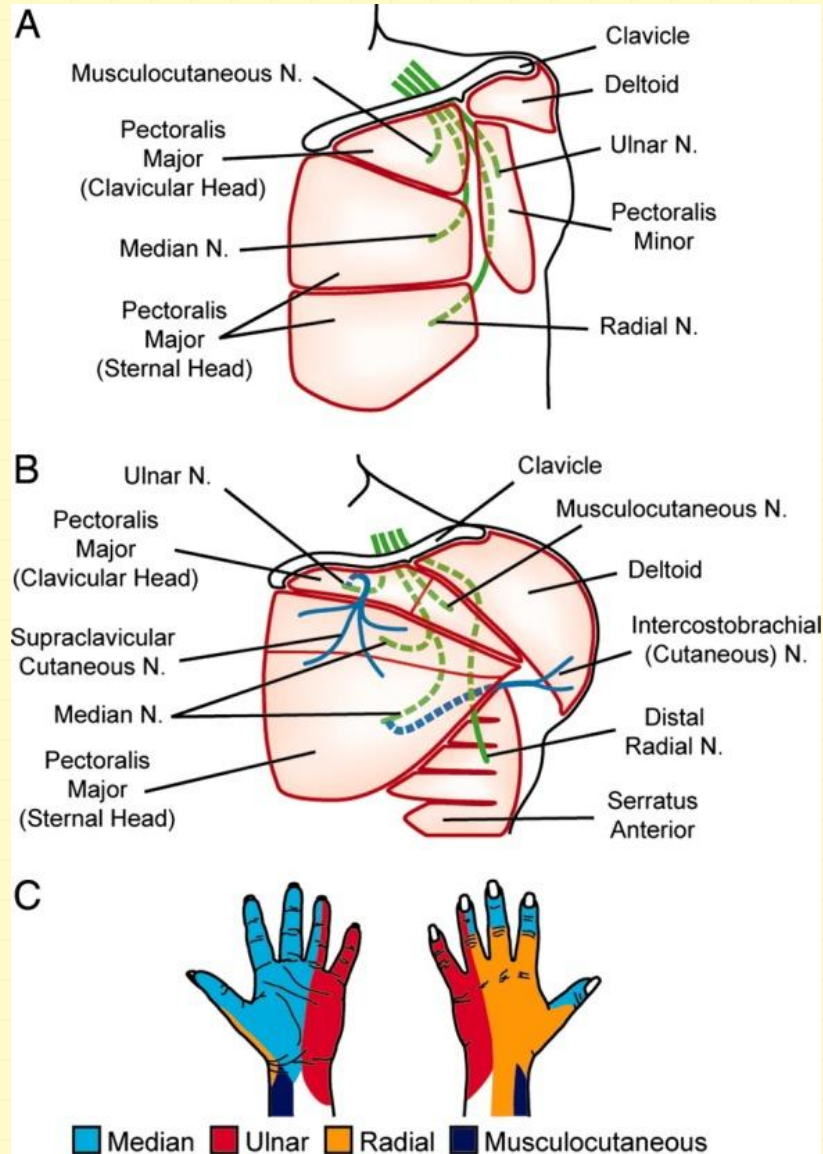


Figure 1.  
Targeted muscle reinnervation of peripheral nerves to pectoralis major in shoulder disarticulation amputation. N = nerve.

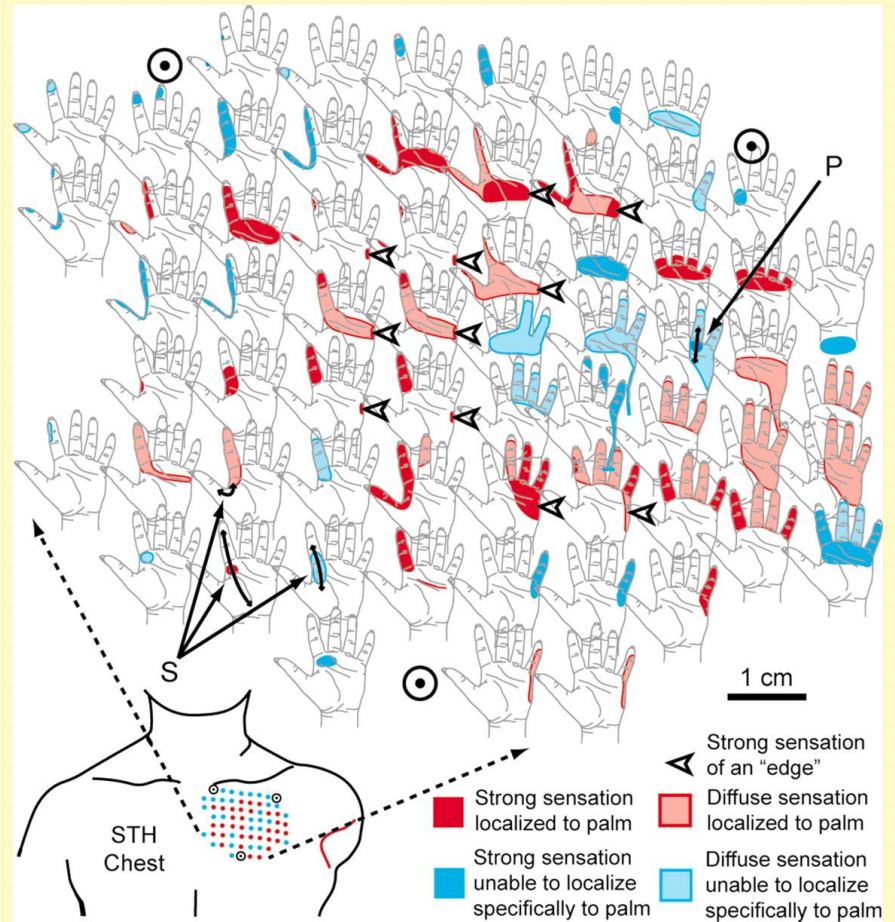
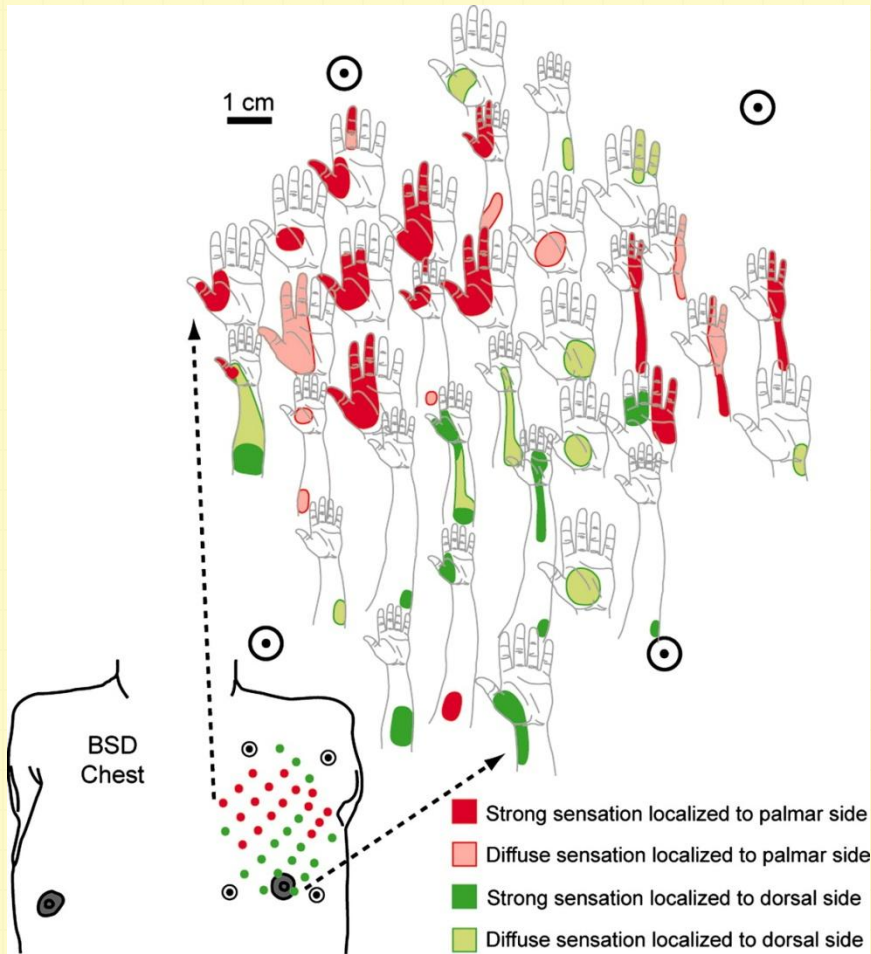
# TMR



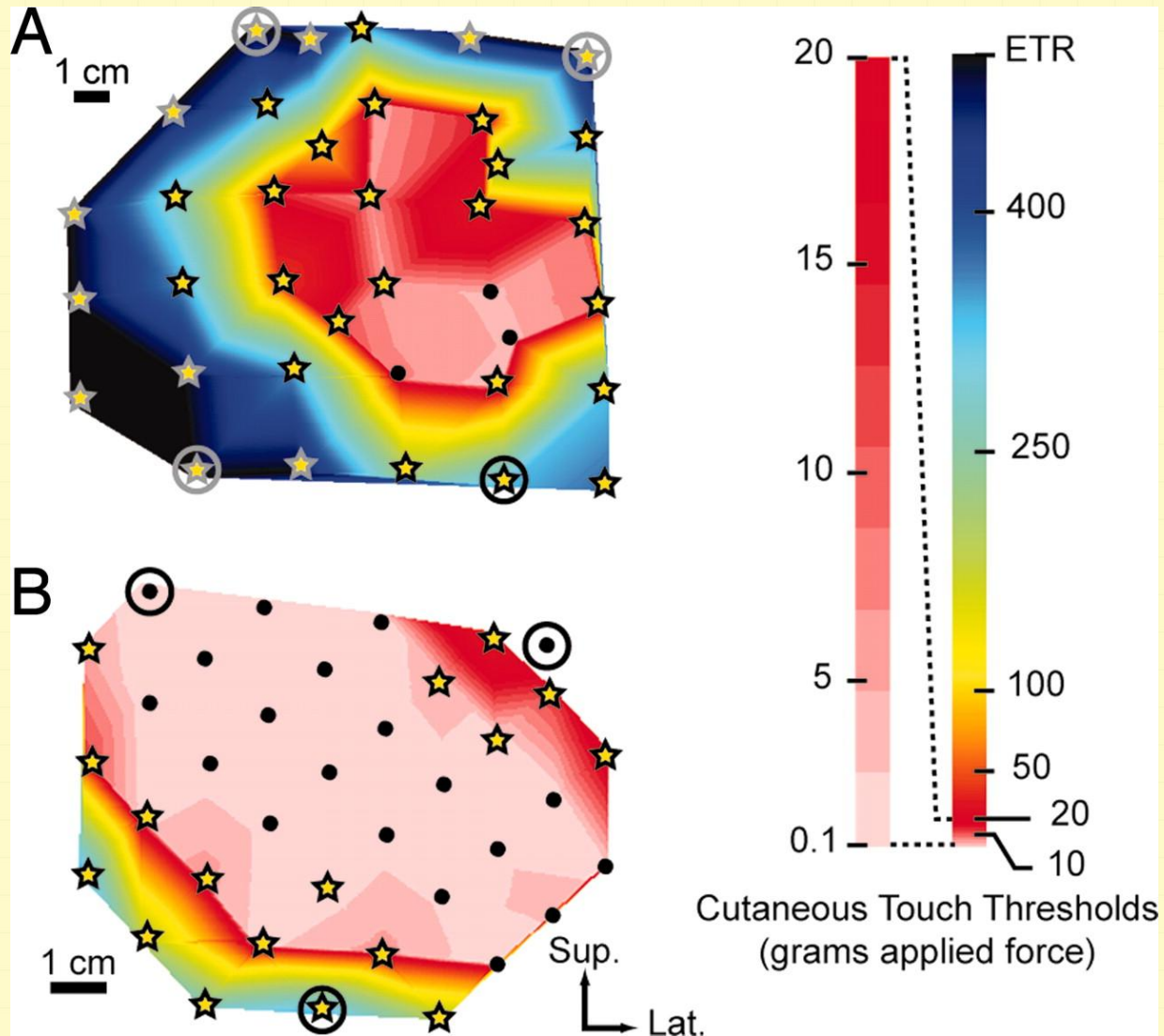
# TSR



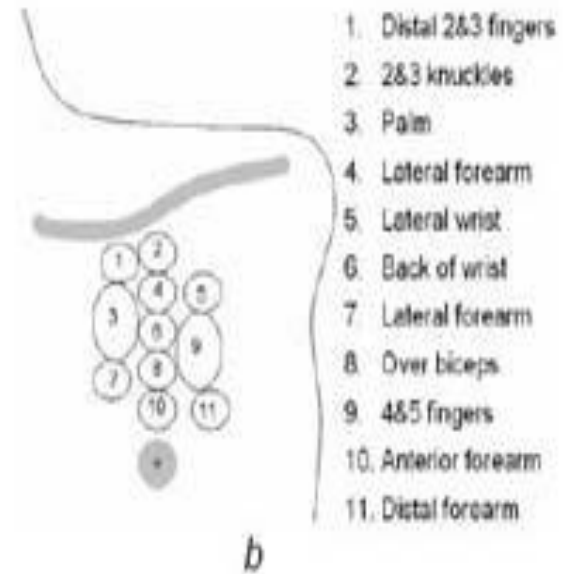
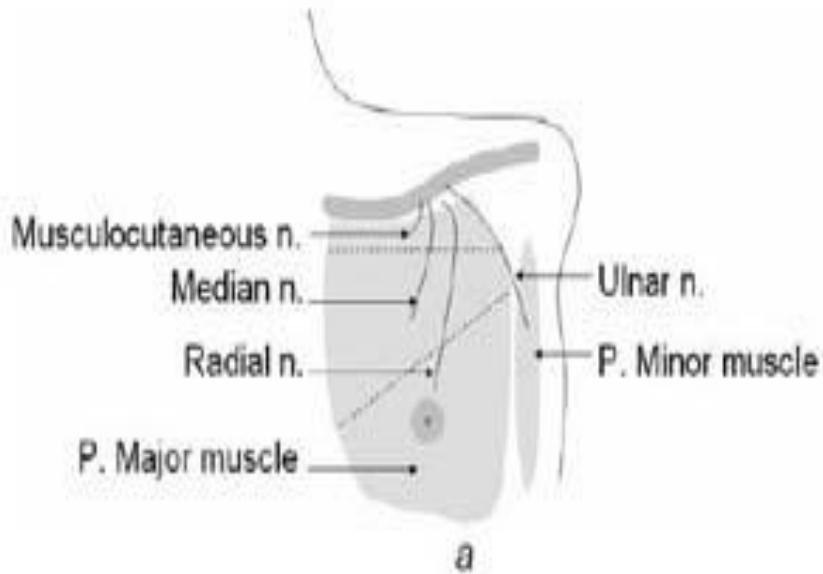
# TSR



# TSR



# TSR





# TR-TMR&TSR

## o Pros

More inputs

More sensitive

Enable sensory feedback

Available for elbow-up amputation

## o Cons

Standard surgery risk

More training and longer time is needed

Expensive

That's all!  
Thanks for listening.

*Q & A*