脊髓損傷病人利用機器人訓練與傳統職能治療之比較-經驗分享

SCI Rehabilitation: Robot-assisted training versus Traditional Occupational Therapy – Experience sharing

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Injury Level

C

S

取自台灣脊椎中心

Function

Poor

Prevalence of SCI in Taiwan

- 1000~1200 per year
- More in 20 y/o ~ 29 y/o
- 20 y/o ~ 49 y/o: 2/3
- Male : Female = 4 : 1
- more than 90% were due to accidents (traffic accident、fall、sports injuries etc.)

(社團法人中華民國脊髓損傷者聯合會)

臺北醫學大學附設醫院
TAIPEI MEDICAL UNIVERSITY HOSPITAL

Conventional Occupational Therapy

- Acute Stage (bedside therapy)
  - positioning
    - passive/active range of motion
    - splinting
    - muscle strengthening
    - ADL training
  - mental support
    - others

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Conventional Occupational Therapy (cont.)

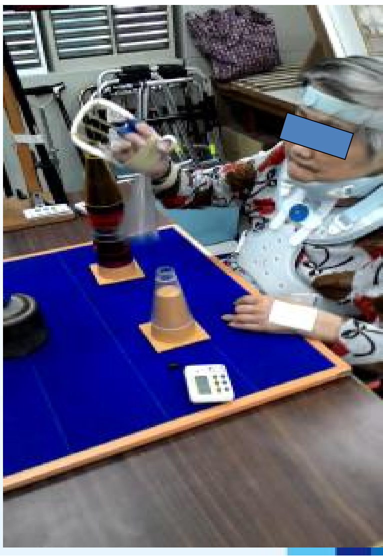
- Rehabilitation stage
  - passive/active range of motion
  - bed mobility
  - transfer training
  - muscle strengthening
  - ADL/functional training
  - splinting/ assistive devices
  - mental support
  - others

Conventional Occupational Therapy (cont.)

- Transfer training

Conventional Occupational Therapy (cont.)

- Functional training



Conventional Occupational Therapy (cont.)

- Ambulation training

Conventional Occupational Therapy (cont.)

- Limitation and disadvantage
  - time
  - energy
  - unsafe
  - patient
  - slow effectiveness

Robot-assisted training

Armeo®

Lokomat®

started in 2010-12

Robot-assisted training

(cont.)

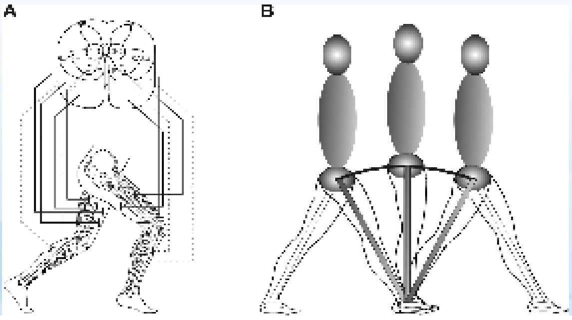
- Bottom-Up strategies
- Contributing sources:
  - Central Pattern Generators (CPGs)
  - Neuroplasticity
  - Motor output is enhanced by repetitive training

(Reggie et al., 2004)

Robot-assisted training

(cont.)

- Central Pattern Generation (CPG)
  - the spinal networks that can generate patterns of rhythmic activity for locomotion even in the absence of external feedback or supraspinal control



(Lacquaniti et al., 1999)

Robot-assisted training

(cont.)

- Neuroplasticity
  - The brain's ability to reorganize itself by forming new neural connections throughout life. Neuroplasticity allows the neurons (nerve cells) in the brain to compensate for injury and disease and to adjust their activities in response to new situations or to changes in their environment.

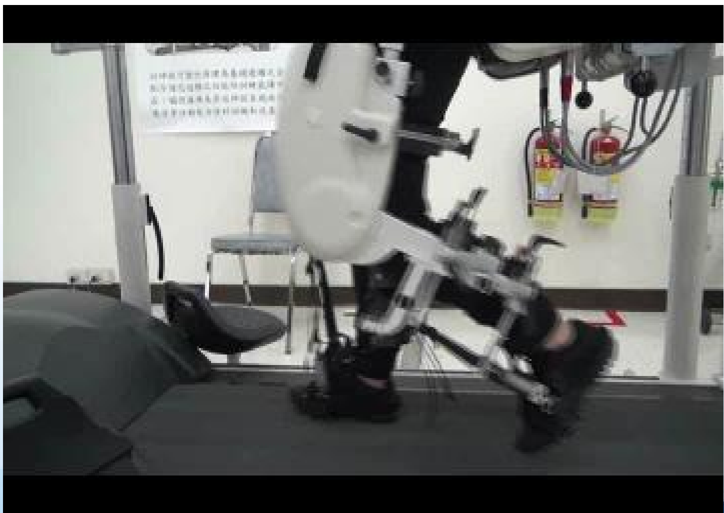
(MedicineNet.com)

Robot-assisted training

(cont.)

Robot-assisted training

(cont.)



Robot-assisted training

(cont.)

- Advantage
  - body weight support for patient
  - more concentration
  - task-oriented
  - computerized visual feedback system
  - large repetitive step-training (high intensity)

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Robot-assisted training

(cont.)

- Disadvantage
  - walking on a treadmill
  - not to practice balance, postural control tasks, stepping over objects, and walking on uneven surfaces

(Joseph Hidler, 2011)

Robot-assisted training

(cont.)

- Limitation
  - poor cognitive function
  - musculoskeletal problems
  - cardiopulmonary problems
  - osteomyelitis / infection
  - spasticity
  - postural hypotension

Conventioanl therapy combined with Robot-assisted Training

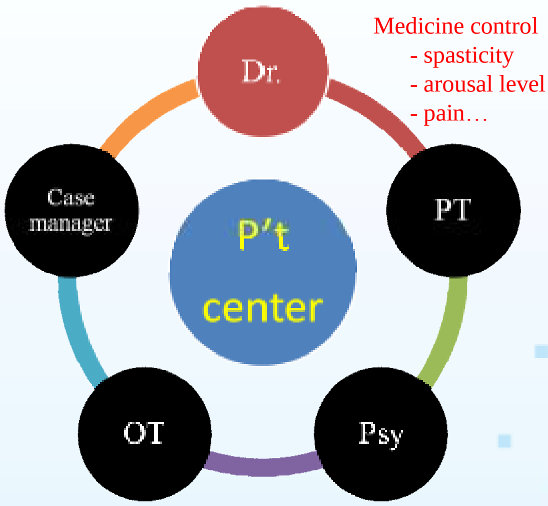
- Robotic therapy combined with conventional therapy may be more effective than conventional therapy alone in patients with greater motor impairment

(Morone, 2012)

Conventional therapy combined with Robot-assisted Training (cont.)

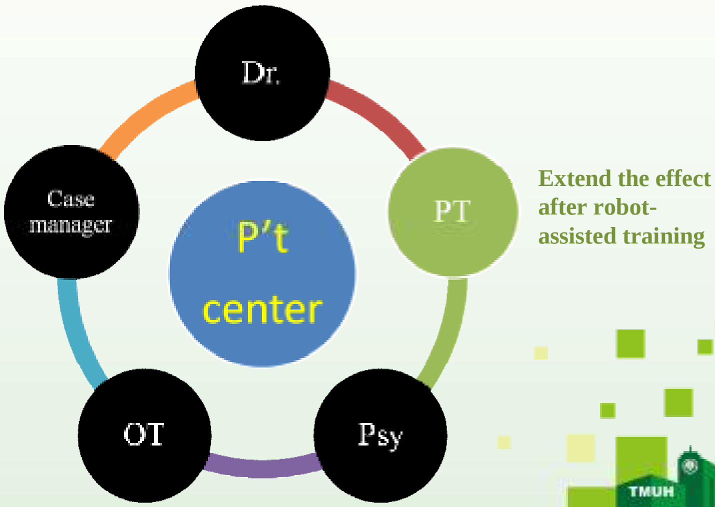
Team Work for p't with SCI

Conventional therapy combined with Robot-assisted Training (cont.)



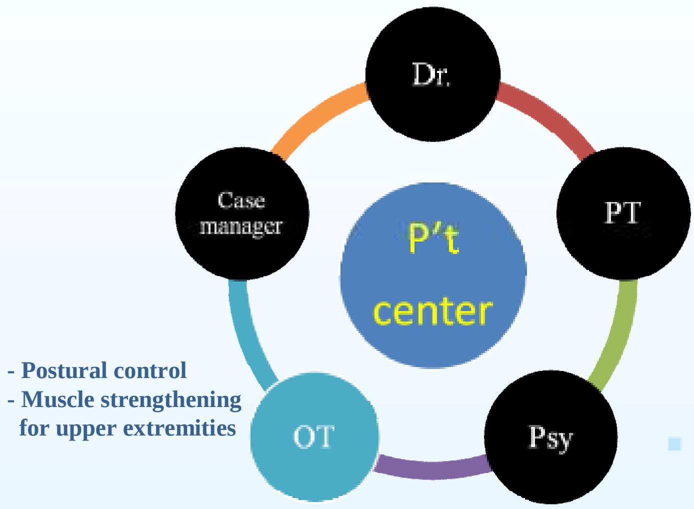
Team Work for p't with SCI

Conventional therapy combined with Robot-assisted Training (cont.)



Team Work for p't with SCI

Conventional therapy combined with Robot-assisted Training (cont.)



Team Work for p't with SCI

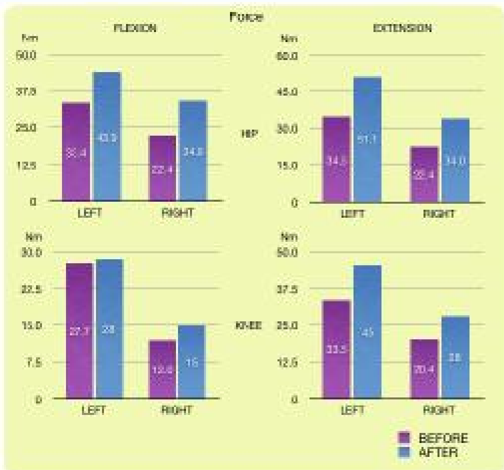
Conventional therapy combined with Robot-assisted Training (cont.)

- Postural control training
  - balance tasks
  - SR Soft Vision

sumitomoriko.co.jp

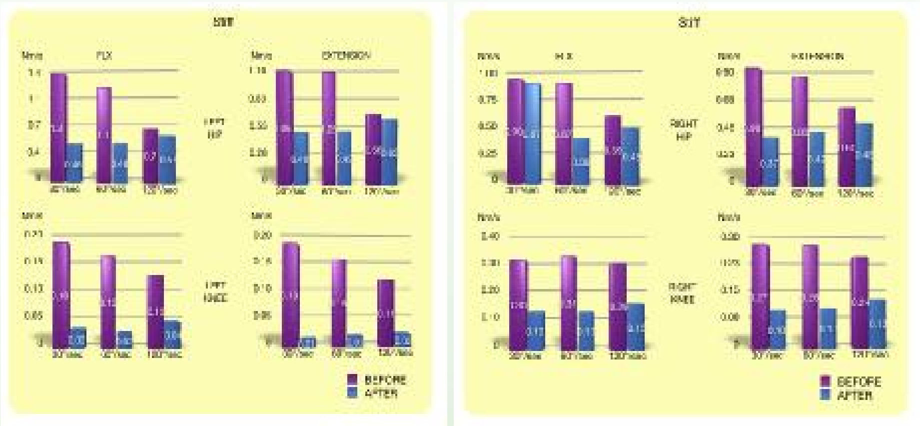
Conventional therapy combined with Robot-assisted Training (cont.)

- Preliminary data of Force from our report for SCI



Conventional therapy combined with Robot-assisted Training (cont.)

- Preliminary data of Stiffness from our report for SCI



In the future…

- Extra-skeletal Robot

ReWalk

shalomlife.com

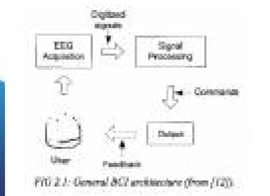
HAL

cyberdyne.jp

工研院二代機

walkingparalytic.blogspot.tw

- Brain-Machine Interface
-



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Thanks for your listening!

臺北醫學大學附設醫院