DEvice for FROzen Shoulder Therapy (DEFROST)

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PROJECT DESCRIPTION:

DEFROST is a mechatronic chain and sprocket trainer system with design features that enhance the effectiveness and usability of the simple shoulder pulley kit for frozen shoulder therapy currently in use at the Singapore General Hospital, Department of Physiotherapy. The system allows the therapist more control over the plane and range of patients’ arm motion during exercises. The system also provides real-time auditory and visual performance feedback and records the important performance indicators in an exercise session.

Summary

DEvice for FROzen Shoulder Therapy (DEFROST) is a mechatronic system which can be used to resolve the shortcomings of current commercial devices. By introducing more control on exercising motion, we can increase the effectiveness of training.

Introduction

Pulleys are used in the rehabilitation of patients with shoulder problems, to aid movement of the injured arm with their unaffected arm. Commercially available pulleys are simple pulleys with handles on each end of the rope. However, therapists are facing the following problems:

- Motion plane cannot be determined and is controlled solely by patients, therefore leading to ineffective training
- Patients with poor motivation may not exercise enough on the required range of movement
- Risk of further injuring with incorrect exercises

This project aims to customize a pulley system which allows for adjustments in plane of movement as well as extent of movement.

Design Features

- Plastic chain and sprockets:
  - prevent undesirable wrist rotation
  - exercise injured shoulder in a defined plane
- Target Release mode: a ratchet gear and pawl mechanism (controlled by a microprocessor) is used to prevent the patient to retract the chain before the arm is lifted beyond the desired height
• Free Running mode: no directional constrain on the user during exercise
• Provides real-time audio and LCD display feedback of training progress and history

Advantages
• Provide more control over the patients' exercise regime, for more targeted stretching of specific tissues or muscles
• Ensure that the targeted range of motion is achieved, thus increasing the effectiveness of exercise
• Train shoulder proprioception in patients with shoulder instability
• Audio and visual feedback allow training shoulder joint position sense, and serve as motivators during exercise

GRANT:
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PERSONNEL:

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PUBLICATIONS:

Refereed Journal (Published/In Press): Nil.

Refereed Conference (Published/In Press): Nil.

Book Chapter: Nil.