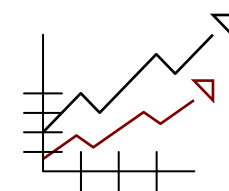


Motor Imagery as an Adjunct to Standard Physical Therapy for a 55 year-old Male Post Hemorrhagic Stroke: *A Case Report*

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UCSF/SFSU Graduate Program in Physical Therapy
May 3rd, 2008





Introduction: Problem

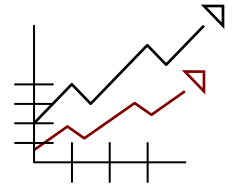


About 700,000 people experience a new or recurrent stroke each year.

The total direct and indirect costs of stroke were \$62.7 billion in 2007.

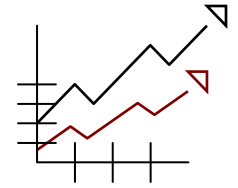
Stroke is a leading cause of disability in the United States.

(Rosamond 2007)

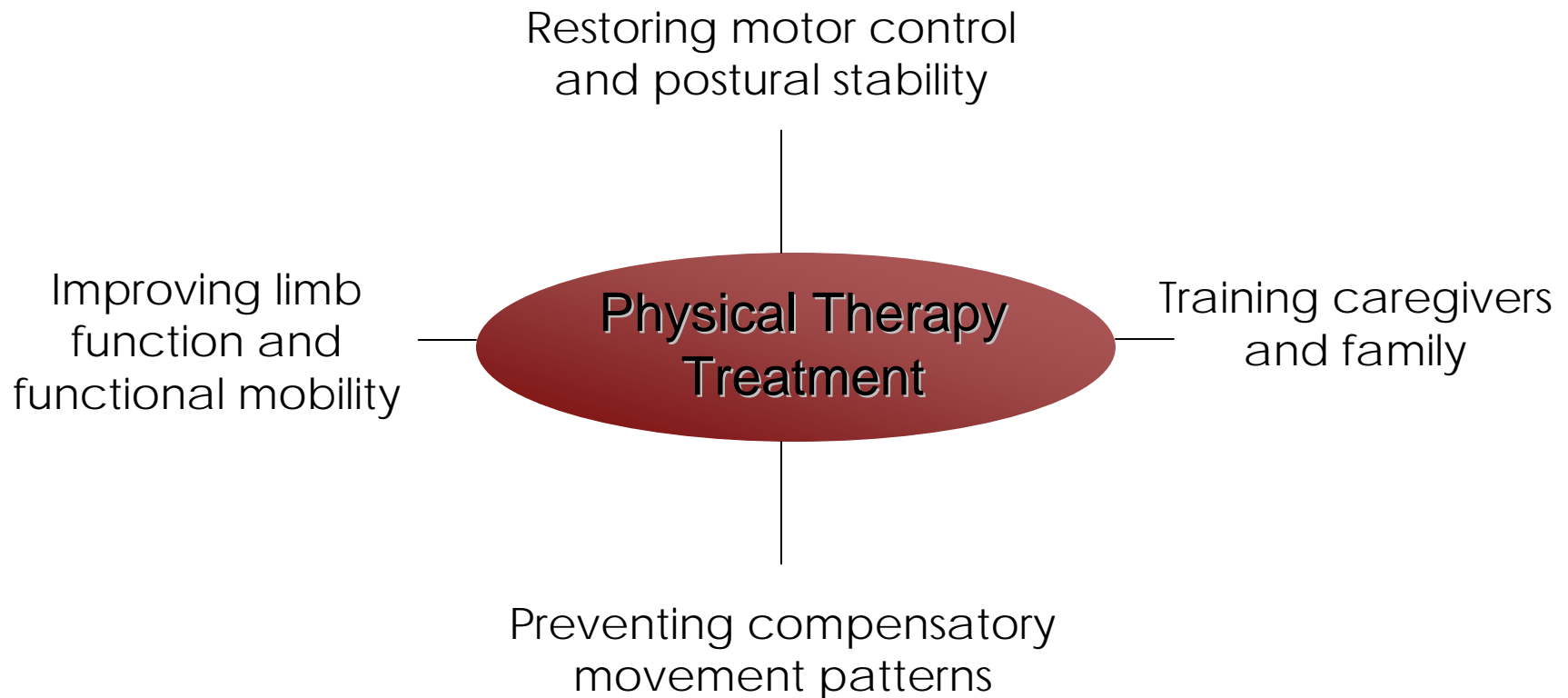


Introduction: Problem

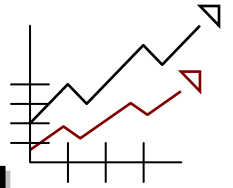
- Patients with stroke receive a limited amount of intensive 1:1 time with the PT.
- Need a therapeutic activity that patients can perform independently (Dijkerman 2004).
- PT's now include motor imagery in their treatments for stroke survivors (Braun 2006).
- Limited guidance for unsupervised motor imagery in stroke rehabilitation.



Introduction: Background

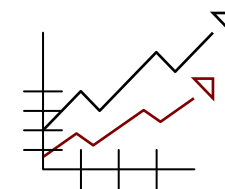


Introduction: Background



- **Motor Imagery**

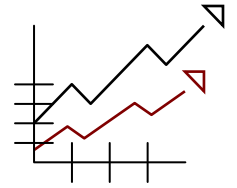
- The act of reproducing an internal representations of an action without motor output (Braun 2006; Jackson 2001).
- Common in sport psychology and performance training.
- Within stroke rehabilitation it is directed toward specific and functional movements.
- Patients can perform motor imagery independently and safely (Driskell 1994).



Introduction: Literature

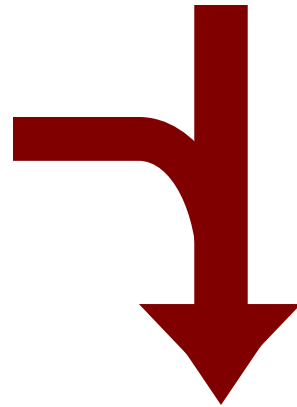
- Case reports (Page 2001)
- Case series (Page 2005)
- Experimental studies:
 - Chronic CVA: Greater improvements than physical practice plus relaxation training (Page, 2007).
 - Chronic CVA: Better performance on that same task after 4 weeks than a control group (Dijkerman 2004).
 - Acute CVA: Better performance on those same tasks after 3 weeks than a control group (Liu 2004).

Introduction: Literature

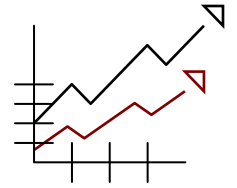


Standard physical therapy

Motor imagery



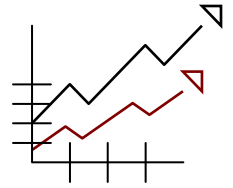
Maximal recovery of function skills



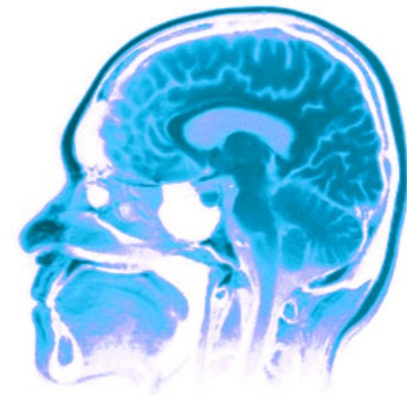
Introduction: Purposes

- The purposes of this case report are to:
 - Describe examination and treatment process for using motor imagery as an adjunct to physical therapy.
 - Document changes in motor function and functional mobility observed during this patient's treatment.

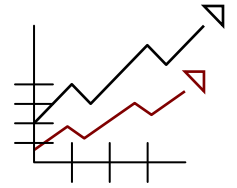
Patient Description: Profile



- Current setting: Acute rehabilitation facility
- 55 year old male
- Lived with his wife and adult children
- Prior level of function: Independent
- Medical diagnosis:
 - Status post left sided hemorrhagic stroke



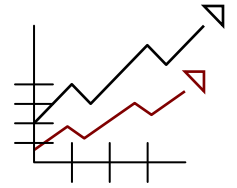
Patient Description: Current History



- Onset of right-sided numbness and language difficulties.
- Medical treatment: surgical resection of large hematoma in the basal ganglia.
- Stabilized and transferred to SNF for six weeks.
 - Complications

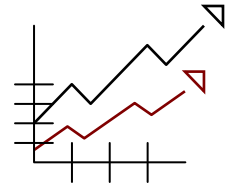
*Patient completed HIPAA and consent forms for this case report

Initial Examination: Functional Mobility



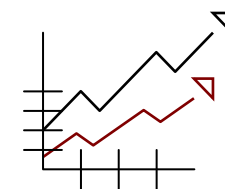
- Ability to perform daily functional movement tasks (O'Sullivan 1988).
- The Functional Independence Measure (FIM).
 - Clinical tool for measuring functional abilities.
 - Motor components have high intra-rater reliability when assessing patients with stroke.
(Chronbach's alpha=.93; Stineman 1996).

Initial Examination: Functional Mobility



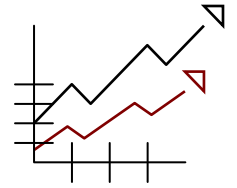
- The Functional Independence Measure (FIM)

Findings
Maximum assistance for Bed Mobility
Maximum assistance for Supine to Sit
Maximum assistance for Bed to Chair transfer
Stand by assist for Wheelchair Mobility



Initial Examination: Strength

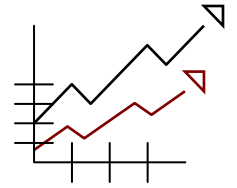
- Force exerted by a muscle to overcome a resistance in one maximal effort (APTA 1997).
- Manual muscle testing (MMT) for right lower extremity muscles (Kendall 2005).
 - Good intra-rater reliability (ICC= .63-.98).
- Findings:
 - Hip flexors: 0/5
 - Hip extensors: 0/5
 - Knee extensors: 0/5
 - Knee flexors: 0/5



Second Examination

- The patient was evaluated using additional measures at day 15 of his rehabilitation program.
 - Rationale:
 - In response to the patient's plateau in functional improvement.
 - To identify if this patient was an appropriate candidate for motor imagery.

Second Examination: Motor Function

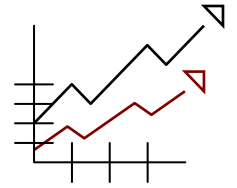


- Ability to learn or demonstrate the skillful and efficient control of voluntary postures and movement patterns.

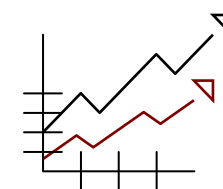
(APTA 2001).

- The Stroke Rehabilitation Assessment of Movement (STREAM).
 - Functional measurement tool used to assess motor function and movement in patients with stroke (Daley 1999).
 - Intra-rater reliability scores for the STREAM are good (GCC= .98 to .99; Daley 1999)
- The patient's score on the STREAM was **9 out of 70**.

Second Examination: Motor Imagery Ability



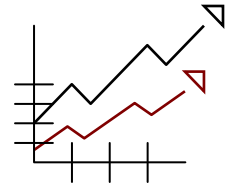
- The ability to effectively participate in motor imagery (Dickstein 2007).
- Movement Imagery Questionnaire-Revised (MIQ-R).
 - The subject visualizes certain tasks and then rates their ability to perform the motor imagery task.
 - Two portions of the MIQ-R were administered.
 - The patient reported his ability to visualize the motor tasks as high (6.5 out of 7).



Intervention: Problem List

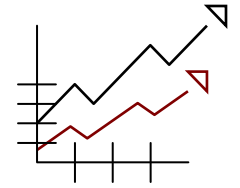
Impairments	
Communication	Expressive aphasia
Muscle tone	Right upper and lower extremity flaccidity
Balance	Poor dynamic sitting balance
Strength	0/5 MMT for right hip flexors/extensors, right knee extensors
Motor function and movement	Impaired (9/70 on STREAM)

Intervention: Problem List

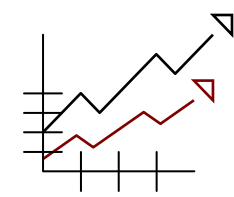


Functional Mobility Limitations	
Bed Mobility	Maximum assistance
Supine ↔ Sit transfer	Maximum assistance
Bed ↔ Chair transfer	Maximum assistance
Wheelchair Mobility	Standby assistance for 150'
Sit ↔ Stand	Not attempted
Gait	Not attempted

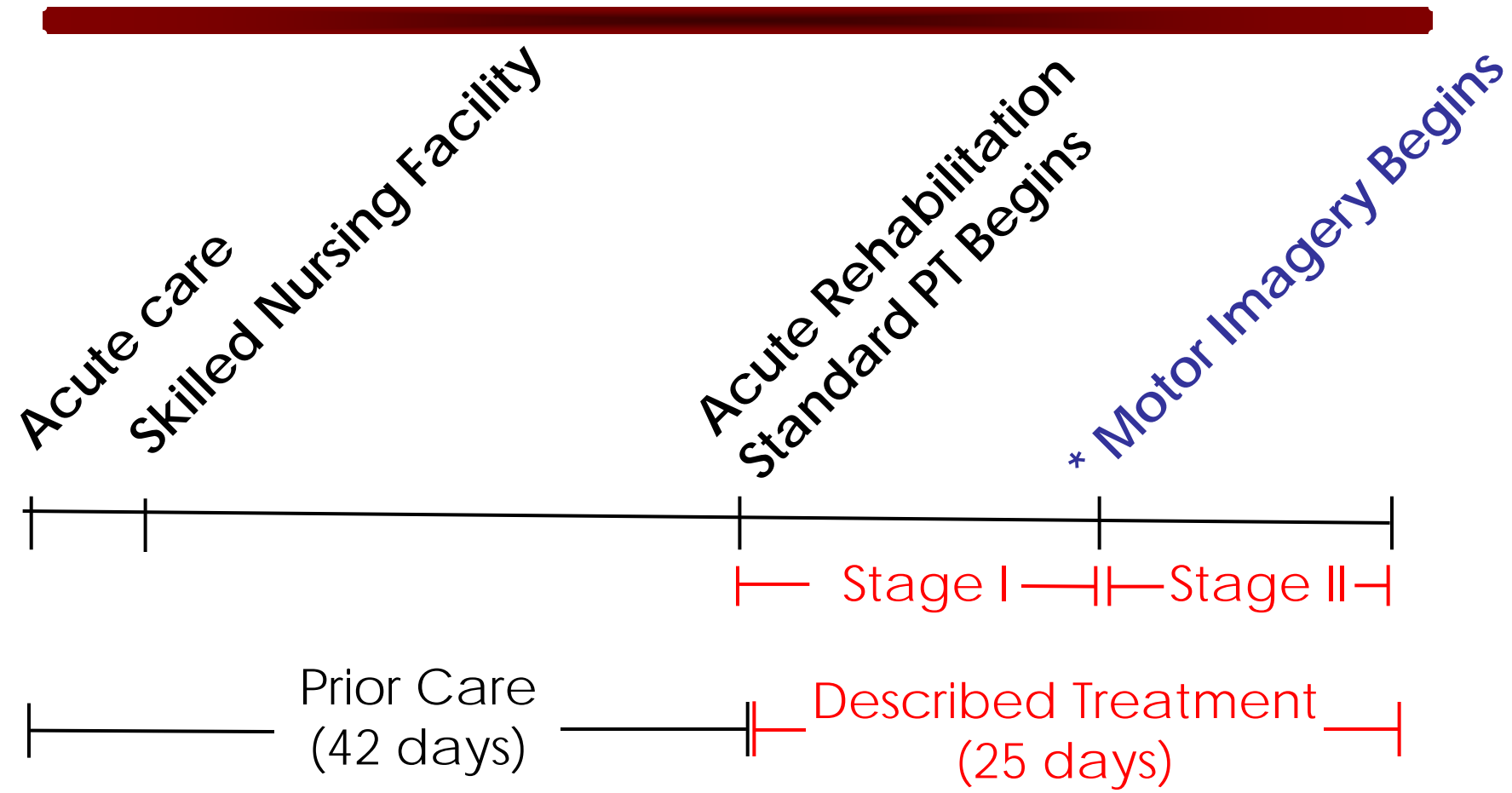
Intervention: Plan of Care



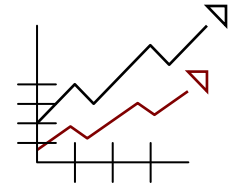
Functional Mobility Goals Three Weeks
Bed Mobility: Minimum assistance
Supine \Leftrightarrow Sit transfer: Minimum assistance
Bed \Leftrightarrow Chair transfer: Minimum assistance
Sit \Leftrightarrow Stand: Minimum assistance
Wheelchair Mobility: 150' with modified independence
Gait: 2-3 trials of pre-gait training with moderate assistance



Intervention : Timeline

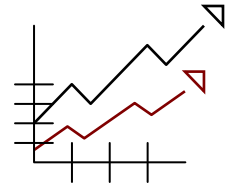


Intervention: Stage I- Standard Functional Mobility Treatment



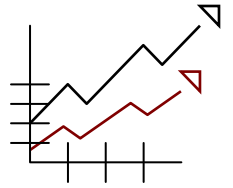
- 15 days with 24 treatment sessions of 45 minutes.
 - Treatment focused on:
 - Functional mobility training using motor learning principles.
 - Proprioceptive neuromuscular facilitation (PNF) techniques.

Intervention: Stage I- Standard Functional Mobility Treatment



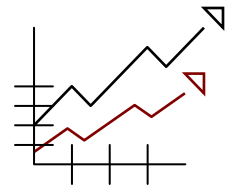
- Patient response:
 - Improved functional mobility and muscle strength.
 - Increased frustration with condition.
 - Affecting rehabilitation process.
 - Eager to learn an intervention to perform independently.
 - Relied on relaxation audio programs and yoga in the past to help cope with stress.

Intervention: Stage II- Mobility Treatment Augmented with Motor Imagery



- Motor imagery intervention:
 - 10-minute guided exercise.
 - Audio program recorded on a compact disc.
 - Frequency: Two times per day for 20 sessions.

Intervention: Stage II- Mobility Treatment Augmented with Motor Imagery



Motor Imagery Exercise



Opening Relaxation



Functional Movements

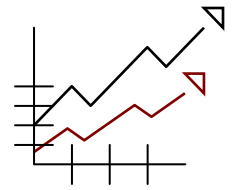


Functional Mobility

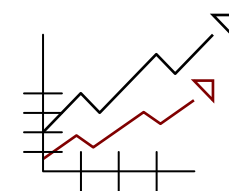


Closing Relaxation

Intervention: Stage II- Mobility Treatment Augmented with Motor Imagery



- Stage: Continued with standard PT.
- Patient's Response:
 - Continued with improvements in functional mobility, muscle strength, and motor function.
 - Patient and family noticed improvements in patient's outlook toward his condition.

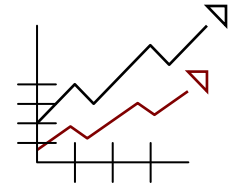


Outcomes

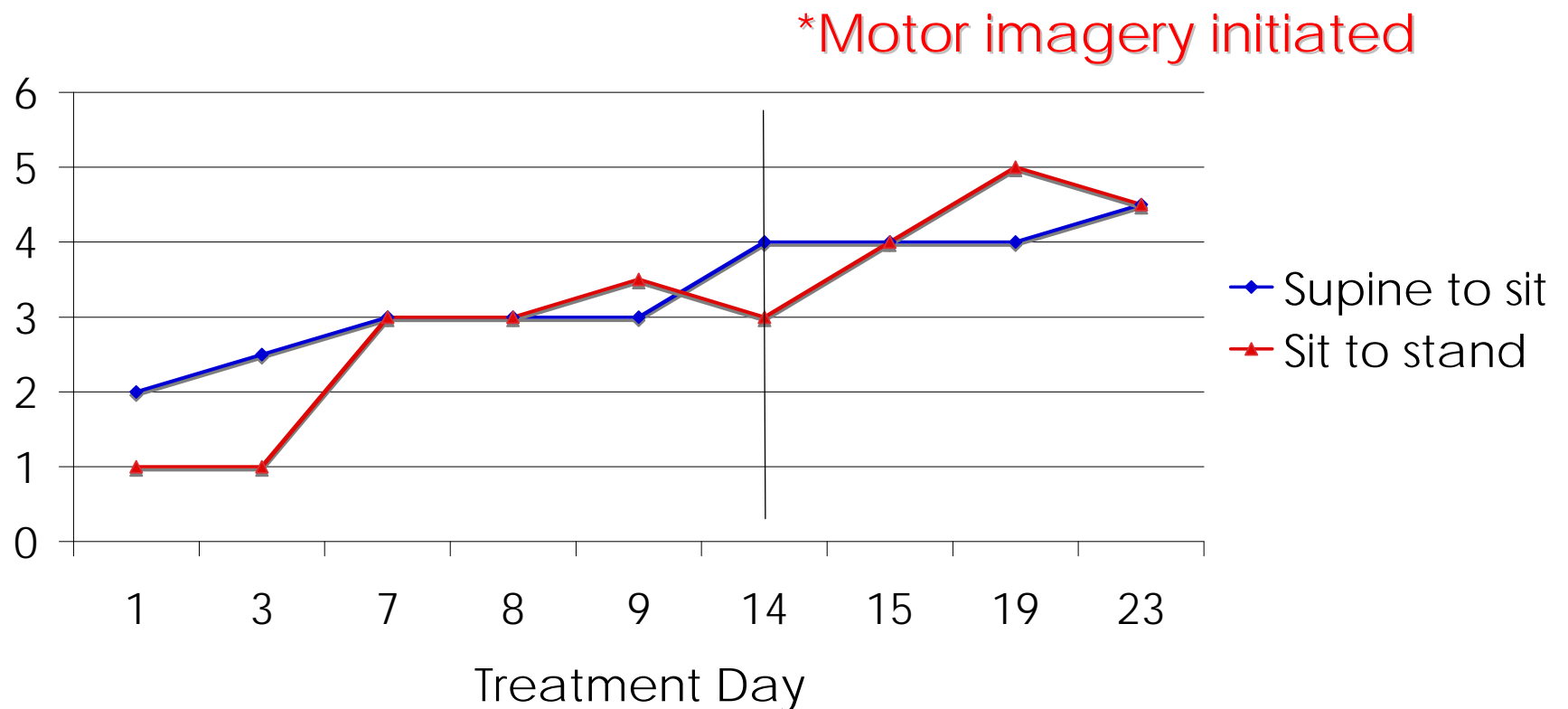
- Functional mobility outcomes

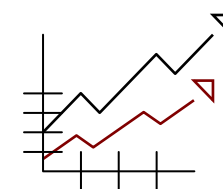
Activity	Supine ☒ sit	Bed ☒ chair	Sit ☒ stand	Gait
Level of Assistance Initial	Maximum assistance	Maximum assistance	Unable	Unable
Level of Assistance Post treatment	Contact guard assistance	Contact guard assistance	Contact guard assistance	Maximum assistance for 15' with hemiwalker

Outcomes



Functional Independence Measure Scores

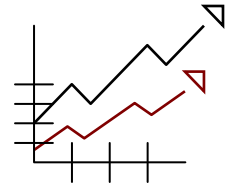




Outcomes

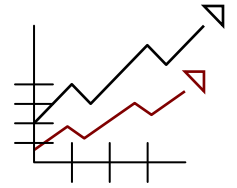
- Muscle strength outcomes

Muscle group	MMT Score Initial	MMT Score Post treatment
Hip extension	0/5	2+/5
Hip flexion	0/5	2-/5
Knee extension	0/5	3-/5
Knee flexion	0/5	1/5



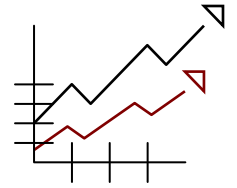
Outcomes

- Motor function and movement:
 - STREAM improvement from **9/70 to 20/70.**
- Improved outlook and decreased frustration.



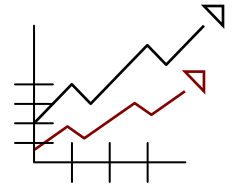
Discussion: Findings

- Functional mobility and motor function:
 - **Explanation:** Result of improved motor learning and motor pattern programming.
 - Possibly influenced by motor imagery.
- Supporting literature:
 - Motor imagery
 - Improve performance and quality of movement during tasks.
(Dijkerman 2004; Page 2001; 2005; 2007).



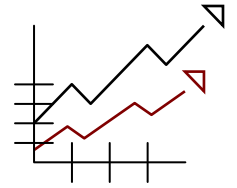
Discussion: Findings

- Strength:
 - **Explanation:** Functional training may result in muscle strength gain (Winstein 2004).
 - Motor imagery intervention may have influenced this improvement.
- Supporting literature:
 - Strength improvements less commonly reported.
 - Motor imagery results in a moderate improvement in strength (Yue 1992).



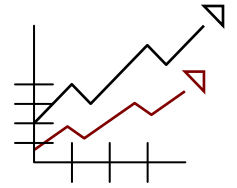
Discussion: Findings

- Behavioral:
 - **Explanation:** Improved confidence and comfort levels.
 - Motor imagery may have influenced this improvement.
- Supporting literature:
 - May lower stress levels in elite athletes.
(Oishi 2004)
 - Guided Imagery: Lowers anxiety and improves mood.
(Watanabe,E. 2005; Tusek 1997).



Discussion: Limitations

- Short duration of the motor imagery intervention.
 - Research: three to six weeks of motor imagery.
- STREAM selection:
 - Motor function improvements not reflected in the final STREAM score.

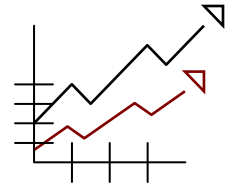


Discussion: Future Work

- Modern neuroimaging techniques:
 - Understand the activation of motor neuron pathways.
 - Conflicting evidence on activation.

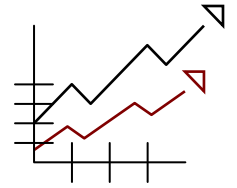
(de Lange 2005; Jackson 2003; Lacourse 2005).

- More conclusive understanding of the brain's response would help to design the most effective intervention.



Discussion: Conclusions

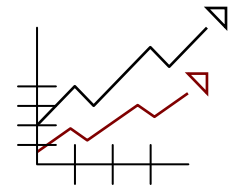
- Motor imagery may be incorporated as an adjunct to physical therapy.
 - Appropriate patient.
- Motor imagery has the potential to be an effective intervention for patient's recovering from stroke.



Thank You

-
- Peer review group
 - Laura Keyser, PT, MS
 - Dhara Solanki, PT, MS
 - Elaine Glueck, PT, MS
 - C.K. Andrade, PT, Ph.D.
 - Linda Wanek, PT, Ph.D.
 - Mike Gaddini, PT, DPT

Outcomes



Functional Independence Measure Scores

