Lokomat Advanced Training

North American Neurorehabilitation Symposium
August 27, 2010

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Hocoma

Integrating the Effective Use of the Lokomat: Maximizing Patient Outcomes

- Adopt a Training Protocol that is patient goal and outcome driven.
- Customize Lokomat settings to facilitate achievement of outcomes.
- Repeat objective outcome measures periodically to document progress.
- Integrate the use of the Lokomat with meaningful over ground practice.

Overview

J Perry. **Gait analysis:** normal and pathological function. SLACK Inc, 1992

Functional Tasks of Walking

Single Limb Support

- Stability during single limb support
- Forward progression of the body over the supporting limb

Swing Limb Advancement

- Limb advancement
- Foot clearance
- Preparation of the swinging limb for weight acceptance

Weight Acceptance

- Shock absorption
- Initial limb stability
- Preservation of forward progression

Four Phases of Lokomat Training

Phase I: Standing

Independent standing stability with assistive device (AD) and/or AFOs in preparation for walking or transfers

Phase II: Single Limb Support

Limb and trunk stability during SLS with or without AD

Phase III: Swing Limb Advancement

Limb advancement and foot clearance

Phase IV: Weight Acceptance/Higher level mobility tasks

Limb preparation for stance and shock absorption

Speed variations, turns, etc.

Phase of Training*	Priorities During Training	Objective Outcome Measures
Phase 1: Standing	Improved trunk control; hip and knee extension using biofeedback stance lines; decrease body weight support gradually (less emphasis on treadmill speeds)	1. L-Force – hip and knee extension 2. Ability (time in sec) to maintain knee and hip extension during quiet standing 3. Amount of assistance required to come to standing 4. Functional Reach in sitting
Phase II: Single Limb Support	Hip and knee extension using biofeedback stance lines; decrease body weight support gradually with moderate treadmill speeds; employ less guidance force as indicated	1. L-Force – hip and knee extension 2. Time (sec) to maintain standing balance 3. Time (sec) to maintain knee and hip extension on one leg during lateral weight shift with or without AD 4. Functional Reach in standing
Phase III: Swing Limb Advancement	Hip and knee flexion using biofeedback swing lines; increasing treadmill speeds	1. L-Force – hip and knee flexion 2. Ability to step with the leg without physical assistance 3. Ability to clear foot during swing 4. Step length
Phase IV: Weight Acceptance/ Higher level mobility tasks	· Dynamic BWS is essential · Decrease guidance force · Use of program for varying speeds · Augmented Feedback if available	1. Gait speed (10MWT or TUG) 2. HiMAT 3. Ability to adapt to terrain, change speeds, stopping and starting, turns 4. Temporal stride measures

Lokomat Training Progression

Phase of Training & Sessions	Body Weight Support	Treadmill Speed	Duration	Guidance Force	Special Notes
Standing: I (1-12)	40-50%	1.6 km/h (1 mph)	Short bouts up to 20 min total	100%	Progress to removing trunk strap and back support
Single Limb Support: II (13-24)	25-40%	2.0 to 2.4 km/h 1.2-1.5 mph)	20-30 mins	Decrease GF for short periods	May integrate quadriceps FES during stance
Swing Limb Advancement: III (25-36)	20-30%	2.5-3.2 km/h 1.6-2.0 mph	30-45 mins	Decrease GF	Increase negative hip offset to facilitate hip extension; may integrate use of peroneal FES during swing phase
Weight Acceptance: IV (37-48)	0-20%	Use random or pyramid setting on speed	45-60 mins	Decrease GF	If adequate dorsiflexion, remove footlifters for short bouts

Overground Practice

I Standing	• Coming to standing from progressively lower surfaces • Standing balance with AD and/or AFOs
II Single limb support	• Standing with weight shifts • Stepping in place • Over ground walking if possible with emphasis on stance stability
III Swing limb advancement	• Over ground walking with emphasis on gait speed
IV Weight Acceptance/ Higher level mobility tasks	• Practice over ground walking on different terrains, stairs, curbs • Walking tasks such as changing speeds, turns, stepping over obstacles

Non Locomotor Goals

1. Improved cardiovascular fitness.

Outcomes (1-2 month program) should be assessed using measures such as:

- Decreased resting HR and BP
- A decrease in the patient's rating at the same workload on the Borg Scale for Perceived Exertion

2. Decreased spasticity.

Outcomes (1-2 month program) should be assessed using measures such as:

- L-STIFF
- A decrease in modified Ashworth, SCATS, Spasm Score or other measures of spasticity
- Improvement in patient's ability to function
- Improvement in patient's wheelchair positioning

Referrals for patients to participate in Lokomat trainings for improved ROM, increased bone density or improved circulation are not appropriate.

Case 1

- Major gait problems:

1. Forward trunk lean during stance
2. Excessive UE weight bearing during swing
3. Inadequate ability to advance his limb without compensatory mechanisms
4. Poor weight acceptance (no heel strike or knee flexion at LR)

- What Lokomat training Phase?

II (Single Limb Support) → III (Swing Limb Advancement)

At Session 16 progressed to phase IV to emphasize speed and weight acceptance

- What outcome measures did we measure?

Assistive device use, Gait speed, 6 min walk test

Case 1

Case 2 SCI C6 ASIA C

Case 2

- Major gait problems:

1. Inability to advance limb during SLA (absent hip, knee flexion, and dorsiflexion)
2. Backward trunk lean during swing

- What Lokomat training Phase?

III (Swing Limb Advancement)

Integrated use of NMES during Lokomat and overground training

- What outcome measures did we measure?

WISCI, ability to advance LE without assistance

BWS 25%, TM speed 2.5 kmph, emphasize swing lines on biofeedback

Case 2

Case 2

Case 3 T4 ASIA D

Case 3

- Major gait problems:
  1. Inability to bear weight through right LE
  2. No weight acceptance
- What Lokomat training Phase?

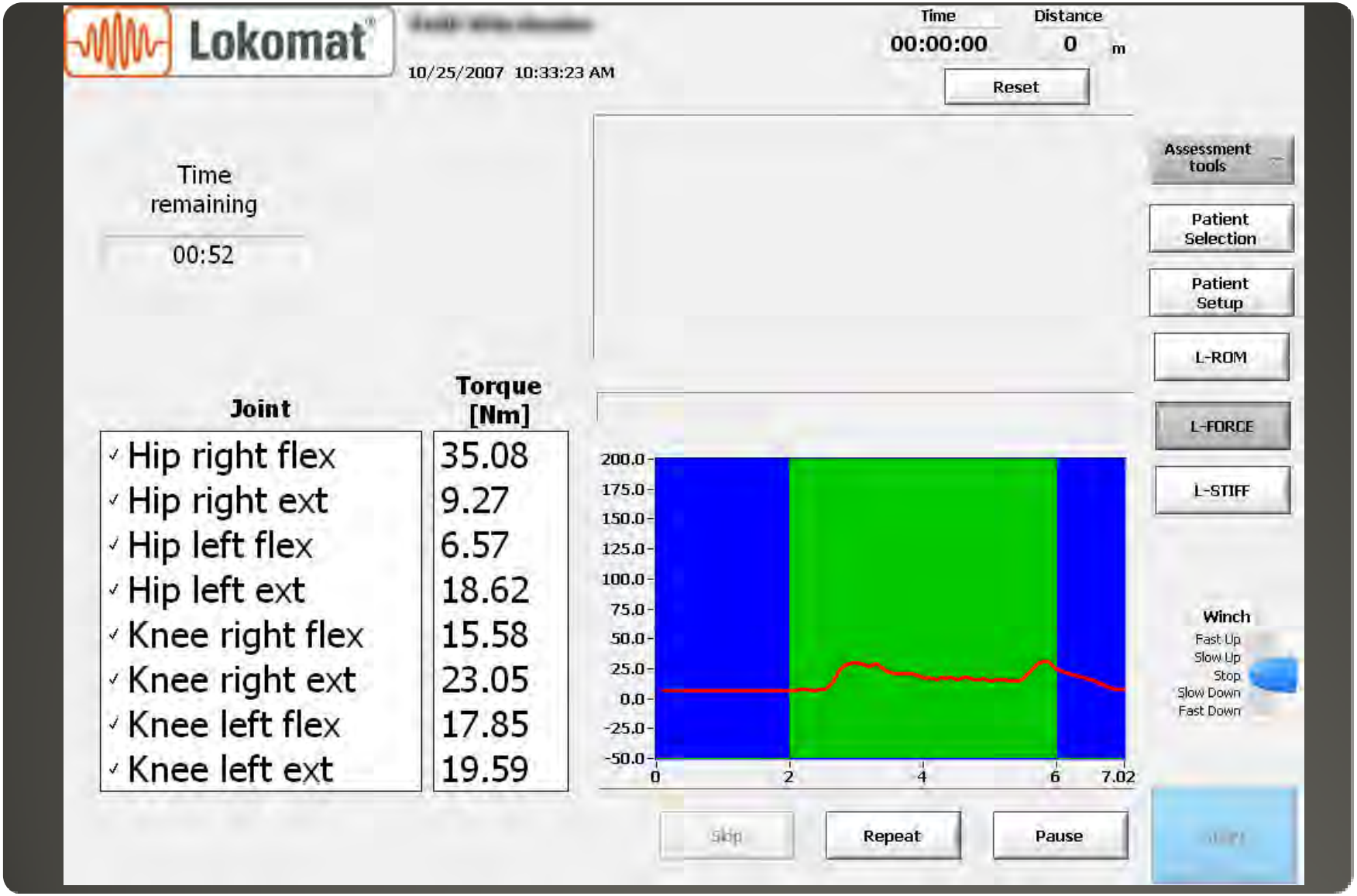
II (Single Limb Stability)

- What outcome measures would you measure?

L-Force – right hip and knee extension

Time (sec) to maintain knee and hip extension on one leg during lateral weight shift with AD

Case 3


Lokomat
10/25/2007 10:33:23 AM
Time
00:00:00
Distance
0
m
Reset
Time remaining
00:52
Assessment tools
Patient Selection
Patient Setup
L-ROM
L-FORCE
L-STIFF
Joint
Torque [Nm]
Hip right flex 35.08
Hip right ext 9.27
Hip left flex 6.57
Hip left ext 18.62
Knee right flex 15.58
Knee right ext 23.05
Knee left flex 17.85
Knee left ext 19.59
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
-25.0
-50.0
0
2
4
6
7.02
Winch
Fast Up
Slow Up
Stop
Slow Down
Fast Down
Skip
Repeat
Pause

Case 4 TBI secondary to MVA

- Major gait problems:

1. Excessive UE weight bearing
2. Inadequate ability to advance his limb without compensatory mechanisms
3. Poor weight acceptance (forefoot contact, excessive PF, toe clawing)

- What Lokomat training Phase?

III (Swing Limb Advancement)

- What outcome measures would you measure?

Ability to clear foot, Gait Speed, 2 MWT

Case 4

CASE 5 CP

Case 5

- What are the patient's major problems?

1. Forefoot initial contact
2. Inadequate TSw knee extension
3. Poor weight acceptance (absent knee flexion LR)

- Is Lokomat training appropriate? If so what phase?

IV (Weight Acceptance)

- What outcome measures would you measure?

Temporal stride measures

Case 5 Chorea

- What are the patient's major problems?
- Is Lokomat training appropriate? If so what phase?
- What outcome measures would you measure?

Case 6

Thank you for your attention

Questions?