ADDENDUM BIODEX ADVANTAGE SOFTWARE VERSION 4.59 (OR HIGHER)

HAMSTRING INJURY TEST PROTOCOLS

830-000 830-550 835-000 840-000 850-000 852-000





20 Ramsey Road, Shirley, New York, 11967-4704, Tel: 800-224-6339 (Int'l 631-924-9000), Fax: 631-924-9241, Email: info@biodex.com, www.biodex.com

This manual contains operating procedures for the following Biodex products:

830-000 System 3 QUICK-SET
830-550 Attachment, Hamstring (set)
835-000 System 3 PRO
840-000 System 4 QUICK-SET
850-000 System 4 PRO
852-000 System 4 MVP

Contact Information

Biodex Medical Systems, Inc. 20 Ramsey Road, Shirley, New York, 11967-4704 Tel: 800-224-6339 (Int'l: 631-924-9000) Fax: 631-924-8355 email: <u>supportservices@biodex.com</u> www.biodex.com

Table of Contents

CHAPTER 1 - Introduction	4
CHAPTER 2 - Protocol #1: Lengthened State Multiple Angle Comparison Test	5
CHAPTER 3 - Protocol #2: Mixed H/Q Ratio Test	8
CHAPTER 4 - Biodex Advantage Software Settings	10

1. Introduction

Regardless of whether you have an existing process for protecting and strengthening hamstrings, the objective test protocols offered with the Biodex System 4 will provide valuable, isolated muscle-performance data. Test results, combined with established targeted outcomes, can be used for pre-emptive injury screening, managing rehabilitation and determining readiness for return-to-play.

The hamstring injury/re-injury test protocols are designed to operate with Advantage Software version 4.59 or higher, on System 4 multi-joint systems only. The v4.59 update is free for S4 customers. To obtain a free download of the software, visit the System 4 Software Update page: www.biodex.com/software/s4.

NOTE: The software can also be delivered via CD, but a \$50 processing and shipping fee will be applied.

The protocols are easy to conduct. This user guide provides detailed and step-by-step instructions.

The two protocols covered in this addendum are:

- 1.) Lengthened state multiple angle comparison test
- 2.) Mixed hamstring/quadriceps ("H/Q") ratio

2. Protocol #1: Lengthened State Multiple Angle Comparison Test

This test examines isometric bilateral flexion peak torque symmetry where the limb position puts the hamstring in a lengthened (stretched) state. "Passive stretch" is the inherent force (or torque) produced by the hamstring in the lengthened state. When deficits are within 10%, predisposition to re-injury is significantly reduced.

To perform the Lengthened State Multiple Angle Comparison Test, a special set of knee attachments with a Range Of Motion (ROM) stop are required. These attachments provide an additional 30° of range so that when positioned, the patient's knee can reach 20° above horizontal.

The specialized attachments can be ordered from Biodex sales or customer service: Model # 830-550, KIT, HAMSTRING ATTACHMENT



Figure 2.1 Specialized hamstring attachments

NOTE: For this protocol, the use of any attachment other than the 830-550 Hamstring Attachment is considered outside proper and intended use.

The suggested protocol is a bilateral isometric test for hamstring flexion at the angles of: 40° , 20° , 0° and -20° . The hip is flexed at 130° , which puts the hamstring in a lengthened state.



Figure 2.2 Subject with right hamstring in lengthened state

Hamstring "tightness" can be captured independently for the right and left hamstring. It is noted as Passive Torque, or "Passive Tq" on the Multiple Angle Comparison report. A passive stretch is applied at 20° above the horizontal. The measurement is made in the Biodex Advantage Software through the gravity correction and is deducted from the flexion torque.

The goal is to not have any strength deficits greater than 10% at each angle.



Figure 2.3 Lengthened State Multiple Angle Comparison report

The Lengthened State Multiple Angle Comparison Test protocol and supporting research is the work of Timothy Tyler, et al:

Timothy F. Tyler, MS, PT, ATC, Brandon Schmitt, DPT, ATC, Joshua M. Gellert, DPT, Malachy P. McHugh, PhD. ECCENTRIC STRENGTHENING AT LONG MUSCLE LENGTHS REDUCES HAMSTRING STRAIN RECURRENCES. Orthopedic J Sports Med. Aug, 2014. (Abstract only; full report to be published soon.)

Quick Reference list for Lengthened State Multiple Angle Comparison Test protocol:

- Isometric contraction in the towards direction at 40°, 20°, 0° and -20°
- Dynamometer Orientation: System 4 Pro 90° System 4 Quick Set: 45°
- Dynamometer Tilt: 0°
- Seat Orientation: System 4 Pro 90° System 4 Quick Set: 45°
- Seatback Tilt: 70°-85°
- Hip flexed at 130°
- Knee Flexion from 90° to 0°
- Axis of Rotation: Axis is through the lateral femoral condyle on the sagittal plane
- Ready Position: Flexion at 80°

Parts needed:

- Dynamometer: Lengthen State Hamstring upper attachments with knee pad (Right and Left)
- Positioning chair: Limb Support Pad, T-Bar

For an instructional video on this topic, go to the Biodex eLearning Center: http://www.biodex.com/physical-medicine/biodex-university/interactive-elearning

3. Protocol #2: Mixed H/Q Ratio Test

The test uses a ratio of eccentric and concentric flexion peak torque. In athletes where this ratio was greater than 1.4, hamstring injuries were significantly reduced (Croiser, et al, 2008).

The Mixed H/Q Ratio Test protocol consists of two separate bilateral knee extension/flexion tests. One test is an isokinetic concentric/concentric test at 60° and 240° per second. The other test is done in the reactive eccentric mode at 30° and 120° per second. The completed report takes results from each test to present a mixed ratio based on the eccentric peak torque at 30° per second.



Figure 3.1 Subject positioned for Mixed H/Q Test

NOTE: This protocol utilizes a standard Biodex System 4 Knee Attachment.



Figure 3.2 Standard knee attachments

The goal is for a mixed HEcc/QConc ratio to be greater than 1.4

D: 123456 Involved: Left Protocol: Isokinetic Bilateral Birth Data: (Mdiyyyy) Cfinician: Pattom: Extension Flaxion H: Referral: Mode: Isokinetic Isokinetic Wit: 128.0 Joint: Knee Contraction: CONCON Bandor: Female Disgnosis: CONCENTRIC - 240 DEG/SEC on 05/20/15 CONCENTRIC - 240 DEG/SEC on 05/20/15 EXTENSION- OUADRICEPS Left Right Deficit Geal PEAK TORQUE (FT-LBS) 76.5 71.6 4.8 % < 5% HConor / QCone Ratio 0.49 0.54 >.55 ECCENTRIC - 30 DEG/SEC on 05/20/15 ECCENTRIC - 120 DEG/SEC on 05/20/15 EXTENSION- QUADRICEPS Left Right Deficit PEAK TORQUE (FT-LBS) 79.3 80.0 0.9 % PEAK TORQUE (FT-LBS) 79.3 80.0 0.9 % PEAK TORQUE (FT-LBS) 140.4 140.5 PEAK TORQUE (FT-LBS) 79.3 80.0 0.9 % PEAK TORQUE (FT-LBS) 140.5 140.5 -4.2 % PEAK TORQUE (FT-LBS) 140.5 0.1 % PEAK TORQUE (FT-LBS) 123.1 143.5		Tammy Hay	lon	Sassi	on:	5/20/2015	10:25:57 AM	Windowin	g: No	ne		
Birth Date: (Midyyy) Clinician: Pattern: Extension Flexion H: Referral: Mode: Isokinetic Isokinetic W1: 128.0 Joint: Knee Contraction: CON/CON Sendor: Female Diagnosis: Concentration: CON/CON CON/CON CONCENTRIC - 60 DEQ/SEC on 05/20/15 CONCENTRIC - 240 DEQ/SEC on 05/20/15 EXTENSION - OUADRICEPS Laft Right Deficit Cond PEAK TORQUE (F1-LBS) 76.5 71.6 4.8 % 5% PEAK TORQUE (F1-LBS) 28.6 28.7 4.8 % 5% PEAK TORQUE (F1-LBS) 37.7 38.3 1.5 % 4.5 % PEAK TORQUE (F1-LBS) 21.1 22.4 6.1 % 5% HConc / Oconc Ratio 0.49 0.54 >.55 HConc / Oconc Ratio 0.74 0.84 >.55 ECCENTRIC - 120 DEQ/SEC on 05/20/15 EXTENSION - QUADRICEPS Left Right Deficit PEAK TORQUE (F1-LBS) 78.2 62.7 4.1 % PEAK TORQUE (F1-LBS) T19.3 0	D:	123456		Involv	ed:	Left		Protocol:	Iso	kinetic Bi	latoral	
H: Reformal: Mode: Isokinotic Wi: 128.0 Joint: Knee Contraction: CON/CON Bender: Female Diagnosis: GET: 4 FT-LBS at 14 Degrees CONCENTRIC - 60 DEG/SEC on 05/20/15 CONCENTRIC - 240 DEG/SEC on 05/20/15 CONCENTRIC - 240 DEG/SEC on 05/20/15 EXTENSION - OUADRICEPS Left Right Deficit Geal PEAK TORQUE (FT-LBS) 76.5 71.6 4.8 % < 5% PEAK TORQUE (FT-LBS) 28.6 28.7 4.8 % < 5% PLEXION - HAMSTRINGS PEAK TORQUE (FT-LBS) 37.7 38.3 1.5 % < 5% PEAK TORQUE (FT-LBS) 21.1 22.4 6.1 % < 6% HConc / QConc Ratio 0.49 0.54 >.55 ECCENTRIC - 120 DEG/SEC on 05/20/15 55 ECCENTRIC - 30 DEG/SEC on 05/20/15 EXTENSION - OUADRICEPS Left Right Deficit PEAK TORQUE (FT-LBS) 79.3 80.0 0.9 % PEAK TORQUE (FT-LBS) 79.2 82.7 4.1 % PEAK TORQUE (FT-LBS) 110.4 110.3 0.1 % PEAK TORQUE (FT-LBS) 79.2 82.7 4.1 % PEAK TORQUE (FT-LBS)	Birth Date:		(M'd'yyyy)	Clinici	an:			Pattern:	Ext	ension/Fl	exion	
Wit: 128.0 Joint: Knee Contraction: CONCON Sendor: Female Diagnosis: GET: 4 FT-LBS at 14 Degrees CONCENTRIC - 60 DEQ/SEC on 05/20/15 CONCENTRIC - 240 DEG/SEC on 05/20/15 CONCENTRIC - 240 DEG/SEC on 05/20/15 EXTENSION - OUADRICEPS Left Right Deficit Geal PEAK TOROUE (FT-LBS) 76.5 71.6 4.8 % <5%	Ht:			Refer	ral:			Mode:	Iso	kinetic		
Bandor: Female Diagnosis: GET: 4 FFLBS at 14 Degrees CONCENTRIC - 60 DEG/SEC on 05/20/15 CONCENTRIC - 240 DEG/SEC on 05/20/15 EXTENSION - QUADRICEPS Left Right Deficit Goal PEAK TORQUE (FFLBS) 76.5 71.6 4.8 % 6 % PEAK TORQUE (FFLBS) 28.6 28.7 4.8 % 6 % PEAK TORQUE (FFLBS) 37.7 38.3 1.5 % 6 % PEAK TORQUE (FFLBS) 21.1 22.4 6.1 % < 5 % HCone / QCone Ratio 0.49 0.54 >.55 HCone / QCone Ratio 0.74 0.84 >.55 ECCENTRIC - 30 DEQ/SEC on 05/20/15 ECCENTRIC - 120 DEQ/SEC on 05/20/15 EXTENSION - QUADRICEPS Left Right Deficit PEAK TORQUE (FFLBS) 79.3 80.0 0.9 % PEAK TORQUE (FFLBS) 79.2 82.7 4.1 % PEAK TORQUE (FFLBS) 110.4 110.3 0.1 % PEAK TORQUE (FFLBS) 129.3 118.5 -9.2 %	Wt:	128.0		Joint:		Knee		Contractio	in: CO	NCON		
CONCENTRIC - 60 DEG/SEC on 05/20/15 CONCENTRIC - 240 DEG/SEC on 05/20/15 EXTENSION - QUADRICEPS Laft Right Deficit Goal PEAK TORQUE (FT-LBS) 71.5 71.6 Laft Right Deficit Goal PEAK TORQUE (FT-LBS) 37.7 38.3 1.5 % CONCENTRIC - 240 DEG/SEC on 05/20/15 PEAK TORQUE (FT-LBS) 28.6 CEXTENSION - QUADRICEPS Laft Right Deficit PEAK TORQUE (FT-LBS) 37.7 38.3 1.5 % <55 PEAK TORQUE (FT-LBS) 21.1 22.4 6.1 % <5% PEAK TORQUE (FT-LBS) 37.7 38.3 1.5 % <55 PEAK TORQUE (FT-LBS) 21.1 22.4 6.1 % <5% ECCENTRIC - 30 DEG/SEC on 05/20/15 EXTENSION - QUADRICEPS Laft Right Deficit PEAK TORQUE (FT-LBS) TOR CECENTR	Gender:	Female		Diagn	osis:			GET:	4 F	T-LBS at	14 Degre	es
EXTENSION - QUADRICEPS Lait Right Deficit Goal PEAK TORQUE (FFLBS) 76.5 71.6 4.8.% 6% FLEXION - HAMSTRINGS PEAK TORQUE (FFLBS) 77.7 38.3 1.5.% 6% PEAK TORQUE (FFLBS) 97.7 38.3 1.5.% 6% HCone / OCone Ratio 0.49 0.54 >.55 ECCENTRIC - 30 DEG/SEC on 05/20/15 ECCENTRIC - 120 DEG/SEC on 05/20/15 EXTENSION - QUADRICEPS Laft Right Deficit PEAK TORQUE (FFLBS) 79.3 80.0 0.9.% ELEXION - HAMSTRINGS PEAK TORQUE (FFLBS) 79.2 82.7 PEAK TORQUE (FFLBS) 110.4 110.5 0.1 % PEAK TORQUE (FFLBS) 129.3 118.5 -82.%	CONCENT	RIC - 60 DEG	SEC on Of	5/20/15			CONCENTR	C - 240 DEG/	SEC on (05/20/15		
PEAK TORQUE (FT-LBS) 76.5 71.6 -6.8 % < 5% PEAK TORQUE (FT-LBS) 76.5 71.6 -6.8 % < 5%	EXTENSION -	QUADRICEPS	Left	Right	Deficit	Goal	EXTENSION - O	UADRICEPS	Lot	Right	Doficit	Goal
FLEXION - HAMSTRINGS FLEXION - HAMSTRINGS FLEXION - HAMSTRINGS PEAK TORQUE (FF-LBS) 37.7 38.3 1.5 % < 5%	PEAK TO	AQUE (FT-LBS	5) 76.5	71.6	-6.8 %	< 5%	PEAK TOP	QUE (FT-LBS)	28.6	26.7	-6.8%	< 5%
PEAK TORQUE (FT-LBS) 37.7 38.3 1.5 % < 5% PEAK TORQUE (FT-LBS) 21.1 22.4 6.1 % < 5% HCone / QCone Ratio 0.49 0.54 >.55 HCone / QCone Ratio 0.74 0.84 >.55 ECCENTRIC - 30 DEG/SEC on 05/20/15 ECCENTRIC - 120 DEG/SEC on 05/20/15 ECCENTRIC - 120 DEG/SEC on 05/20/15 EXTENSION - QUADRICEPS Left Right Deficit PEAK TORQUE (FT-LBS) 79.2 62.7 4.1 % 2LEXION - HAMSTRINGS EXEMON - HAMSTRINGS PEAK TORQUE (FT-LBS) 140.4 140.5 -9.2 %	LEXION - HA	MSTRINGS					FLEXION - HAN	ISTRINGS			S)	
HConc / QConc Ratio 0.49 0.54 >.55 HConc / QConc Ratio 0.74 0.94 >.55 ECCENTRIC - 30 DEG/SEC on 05/20/15 ECCENTRIC - 120 DEG/SEC on 05/20/15 ECCENTRIC - 120 DEG/SEC on 05/20/15 EXTENSION - QUADRICEPS Lolt Right Doficit EXTENSION - HAMSTRINGS EXEMON - HAMSTRINGS ELEXION - HAMSTRINGS ELEXION - HAMSTRINGS EXEMON - GRAPHICE (FT-LBS) 129.3 118.5 -9.2 %	PEAK TO	AQUE (FT-LBS	s) 37.7	38.3	1.5 %	< 5%	PEAK TOP	QUE (FT-LBS)	21.1	22.4	6.1%	< 5%
ECCENTRIC - 30 DEQ/SEC on 05/20/15 ECCENTRIC - 120 DEQ/SEC on 05/20/15 XTENSION - QUADRICEPS Left Right Deficit PEAK TORQUE (FT-LBS) 79.3 80.0 9.9 % PEAK TORQUE (FT-LBS) 79.2 82.7 4.1 % REXION - HAMSTRINGS ELXION - HAMSTRINGS PEAK TORQUE (FT-LBS) 110.4 110.5 0.1 % PEAK TORQUE (FT-LBS) 129.3 118.5 -9.2 %	HConc /	QConc Ratio	0.49	0.54		>.55	HConc / G	Conc Ratio	0.74	0.84		>.55
FLEXION - HAMSTRINGS FLEXION - HAMSTRINGS PEAK TORQUE (FF-LBS) 110.4 110.5 0.1 % PEAK TORQUE (FF-LBS) 110.5	EXTENSION - PEAK TO	QUADRICEPS	Loft 5) 79.3	Right 80.0	Deficit 0.9 %		EXTENSION - O	OUADRICEPS	Loft 79.2	Right 82.7	Doficit 4.1 %	9
PEAK TORQUE (FT-LBS) 110.4 110.5 0.1 % PEAK TORQUE (FT-LBS) 129.3 118.5 -9.2 %	FLEXION - HA	MSTRINGS					FLEXION - HAM	ISTRINGS				
	PEAK TO	AQUE (FT-LBS	5) 110.4	110.5	0.1%		PEAK TOP	Roue (FT-LBS)	129.3	118.5	-9.2 %	
		CON 240 DEG	SEC Loft	Right		Goal						
ECC 30 - CON 240 DEG/SEC Loft Right Goal	ECC 30-		3.86	4.13	IJ	>1.4						
ECC 30- CON 240 DEGYSEC Left Right Goal	ECC 30-			<u> </u>	-	/						
ECC 30 - CON 240 DEGISEC Left Right Goal 3.66 413 > 1.4	ECC 30-	1										
ECC 30 - CON 240 DEG/SEC Left Right Goal 3.86 413 > 1.4 Mixed HEcc / QConc Ratio	ECC 30-	+			-	Mixe	d HEcc / QC	Conc Rati	0			

Figure 3.3 Mixed H/Q Ratio report

The Mixed H/Q Ratio Test protocol and supporting research is the work of Jean-Louis Croiser, et al:

Croisier JL, Ganteaume S, Binet J, Genty M, Ferret JM. STRENGTH IMBALANCES AND PREVENTION OF HAMSTRING INJURY IN PROFESSIONAL SOCCER PLAYERS. The American Journal of Sports Medicine. April 30, 2008.

www.biodex.com/research/15213

Quick Reference list for Mixed H/Q Ratio Test protocol:

- Dynamometer Orientation: System 4 Pro: 90° System 4 Quick Set: 45°
- Dynamometer Tilt: 0°
- Seat Orientation: System 4 Pro: 90° System 4 Quick Set: 45°
- Seatback Tilt: 70°-85°
- Knee Flexion from 135° (Toward) to 0° (Away)
- Axis of Rotation: Axis is through the lateral femoral condyle on the sagittal plane .
- Ready Position: Full Flexion •

Parts needed:

- Dynamometer: Standard Knee Attachment (Right or Left)
- Positioning chair: No additional parts required

For an instructional video on this topic, go to the Biodex eLearning Center: http://www.biodex.com/physical-medicine/biodex-university/interactive-elearning

4. Biodex Advantage Software Settings

Lengthened State Multiple Angle Comp	arison Test protocol settings:
Protocol Mode: Isometric	Joint: Knee
Pattern: Extension/Flexion	Contraction Direction: Toward
Bilateral	Number of Positions: 4
End by Reps: 2 at each position	Angle*: 40° 20° 0° -20°
Contraction Time: 5 seconds	Relaxation Time: 5 seconds
Anatomical Reference: 0	Rest Time: (between sets) 30 seconds

* **NOTE**: Drop-down angle selections will not contain these angles. The specific angle values must be typed in manually.

After configuring this protocol once, you can add it to your Favorites.

Protocol Favorites	Add Edit Save Cancel Of Delete Linked Close
Study Type	Bilateral
C Exercise	Number of Positions: 4
Node:	#1 #2 #3 #4 #5
isometric -	End By Reps: 2 2 2 5
Joint:	
Knee 🔄	Angle: 100 11 100 11 120 11 175 1
Pattern:	Use positive angles for Extension/Flexion
Extension/Flexion .	
Contraction Direction:	Contraction Time: 5 Secs Relaxation Time: 5 Secs
TOWARD -	
Description:	Anatomical Reference Attachment Sensitivity End By
hamstring lenghten state	90 1 - Knee - Reps
F Add to Favorites	Rest Time in secs Cushion
	20 1 - Hard -

Figure 4.1 Lengthened State Multiple Angle Comparison Test protocol set-up.

The Multiple Angle Comparison report is available immediately after completing test.



Figure 4.2 Report Generation screen.

From the Patient Management screen, you can repeat a test, obtain a report, or edit or delete the protocol.



Figure 4.3 Patient Management screen.

Mixed H/Q Ratio Test (Isokinetic Concer	ntric) protocol settings:
Study Type: Test	Protocol Mode: Isokinetic
Joint: Knee	Pattern: Extension/Flexion
Contraction: CON/CON	Bilateral
Number of Speeds: 2	
End by Reps: First Set: 3; Second S	et: 5
Speed Away: First Set: 60°/sec; Se	cond Set: 240°/sec
Speed Toward: First Set: 60°/sec; S	Second Set: 240°/sec
Anatomical Reference: 90	Rest Time: (between sets) 60 seconds

After configuring this protocol once, you can add it to your Favorites.

Protocol Favorites	Add Edit	Save Cancel	Delete Linked	Close
Study Type	Bilateral			
C Exercise	Num of Speeds:	2 -		
Mode:		#1 #2 #3	#4 #5	
Isokinetic	- End By Reps:	3 5 5	5 10	
Joint:	Canad Augus			
Knee	- Speed Away.	100 - 1240 - 190	· 120 · 180 ·	
Pattern:	Speed Toward:	60 - 240 - 90	<u>+</u> 120 + 180 +	
Extension/Flexion	- Torque	30 - 30 - 30	+ 30 + 30 +	
Contraction:	- Torque.			
CON/CON	·			
Description:	А	natomical Reference	Attachment Sensitivity	End By
Mix ratio con/con		90	1 - Knee +	Reps +
	🔽 Trial Reps	Rest Time in secs	- -	
M Add to Havorites			Cusnion	

Figure 4.4 Mixed H/Q Ratio Test (Isokinetic Concentric) protocol set-up.

Mixed H/Q Ratio Test (Reactive Eccentric) protocol settings:Study Type: TestProtocol Mode: Reactive EccentricJoint: KneePattern: Extension/FlexionContraction: ECC/ECCBilateralNumber of Speeds: 2End by Reps: First Set: 3; Second Set: 4Speed Away: First Set: 30°/sec; Second Set: 120°/secSpeed Toward: First Set: 30°/sec; Second Set: 120°/secTorque Limit Away*: First Set: 200; Second Set: 200Anatomical Reference: 90Rest Time: (between sets) 60 seconds

* **NOTE**: Torque limits will vary. When torque limits are set, the subject must exert at least onetenth (10%) of the torque limit to keep the dynamometer shaft moving. If the subject exceeds the limits, the unit will stop.

BB File Re 11 **'** 10 ** RÍ X Edit Linked Patient ² Study Type Bilateral Unilateral Protoce C Exercise Number of Speeds: 2 3 **1** #2 #3 Set ROM Mode: End By Reps: 2 2 15 5 4 Reactive Eccentric Speed Away: 30 + 120 - 90 + 120 + 180 + Report Joint: Ŧ Knee Speed Toward: 30 + 120 + 90 + 120 + 180 + AL Pattern: Curve Torque Limit Away: 30 - 30 - 30 - 30 - 30 -Extension/Flexion Torque Limit Toward: 30 - 30 - 30 - 30 - 30 -Contraction: Description: Anatomical Reference Attachment Sensitivity End By ham rec ecn 90 1 - Knee 🖬 Trial Reps Add to Favorites Rest Time in secs Cushion 30 1 - Hard

After configuring this protocol once, you can add it to your Favorites.

Figure 4.5 Mixed H/Q Ratio Test (Reactive Eccentric) protocol set-up.

The Mixed H/Q Ratio report is available immediately after completing test, or via the Patient Management screen. In both cases, <u>it is important to select concentric test first, and then the</u> eccentric test.



Figure 4.6 Patient Management screen.

Choose the report of desired date and protocol. Then select the eccentric test.



Figure 4.7 Report Generation screen.

The software will allow for allow for mixed ratio of other speeds as well. However, since the research was based on a Concentric protocol of 60/60 and 240/240, and also a Reactive Eccentric protocol of 30/30 and 120/120, the Mixed Ratio Goal of exceeding 1.4 is for that specific protocol. The opportunity to change the Mixed Ratio Goal if different protocols are used is available.

PH HE . Min rat	i contron	
cativita - Mik tab	o conveon	2
ed Ratio Goal		
4)	
	ノ	

If you are interested in adding Lengthened State Eccentric training to your current hamstring injury rehabilitation program, we suggest this paper. *Hamstring Injury Rehabilitation and Prevention of Reinjury using lengthen state eccentric training: A new Concept.* Brandon Schmitt, DPT ATC, Tim Tyler PT ATC and Malachy McHugh PhD. IJSPT Vol 7, No.3 June 2012, 333.

