APPENDIX A:

MEDICAL AND HEALTH QUESTIONNAIRE

VIRGINIA TECH LABORATORY FOR HEALTH AND EXERCISE SCIENCE
MEDICAL and HEALTH HISTORY QUESTIONNAIRE

Name:_____ Age:_____

Birth date:_____

Address:_____

Phone number: Home:_____ Work:_____

Person to contact in case of emergency:_____

Relationship:_____ Phone:_____

Primary Care Physician:_____ Phone:_____

Medical History

Please indicate any current or previous conditions or problems you have experienced or have been told by a physician you have had:

	Yes	**No**
Heart disease or any heart problems:	_____	_____
Respiratory disease or breathing problems:	_____	_____
Circulation problems:	_____	_____
Kidney disease or problems:	_____	_____
Urinary problems:	_____	_____
Reproductive problems:	_____	_____
Arthritis:	_____	_____
Osteoporosis:	_____	_____
Orthopaedic problems:	_____	_____
Diabetes:	_____	_____
Fainting or Dizziness:	_____	_____
Migraines/Headaches:	_____	_____
Thyroid problems:	_____	_____
Allergies:	_____	_____

If “yes” to any of the above please indicate the date, explain and describe:

_____

_____

_____

Please list any hospitalizations/ operations/ recent illnesses (Type/Date):

_____

_____

Do you experience chronic muscle and/or joint pain or swelling?

Rate on scale: None Moderate Severe

0 1 2 3 4 5

What do you consider your average leg extension work? (include frequency and intensity)

_____

_____

How long have you been training on a regular training program?

_____

_____

Please list all medications (prescription and over-the-counter) you are currently taking or have taken in the past week: _____

_____

Health Habits

	Yes	No
Do you add salt to your food?	_____	_____
Are you on any special type of diet?	_____	_____

If "yes" please describe_____

_____

Do you drink caffeinated beverages?		_____	_____
How many cups per day?	_____		
Do you drink alcoholic beverages?		_____	_____
How many drinks per week?	_____		
Do you smoke cigarettes?		_____	_____
Packs per day:	_____		
Do you take vitamins/supplements?		_____	_____

What kind?_____

Exercise Habits

	Yes	No
Do you engage in regular exercise?	_____	_____

If "yes" please list:

Activity	Frequency (times per week)	Duration (minutes)
_____		
_____		

Do you ever feel faint, short of breath, or chest discomfort with exertion?_____

If "yes" please explain:_____

_____

Are there any orthopedic limitations you may have that may restrict your ability to perform leg extension exercises? Yes___ No___

	Yes	No	Relationship	Age
Arthritis				
Heart Disease				
High Blood Pressure				
Stroke				
Kidney Disease				
Diabetes				
Osteoporosis				

Please sign to indicate the above information is correct:

I have read, understood and completed this questionnaire:

_____

Print Name Signature

Date: Witness:

APPENDIX B:

INFORMED CONSENT

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Informed Consent for Participants of Investigative Projects

Title of Study: An Evaluation of Performance After Overtraining the Quadricep Using the Knee Extension Exercise in Trained Males for Two Weeks
Principal Investigators: Kristina L. Bowser, Jay Williams, Ph.D., and Shala Davis, Ph.D.

Purpose of This Research

To compare the performance in quadricep strength at one repetition maximum (1 RM) using the knee extension nautilus equipment and measuring maximum force production using the Biodex after two weeks of overtraining one leg and standard training of the other leg. In addition, to compare the quadricep strength and force by using the same techniques after one week of reduced training for the overtrained leg. The workouts will be based upon the pre-test results. The overtraining sessions will consist of a controlled knee extension warm up and ten sets of 1 RM six days a week at 100% intensity. The standard training sessions will be two days a week at a low intensity of the 1 RM. The comparison will be determined from approximately ten trained males between the ages of 18 -35 years.

Procedures

Prior to being included in the training investigation, I will complete a medical/health history questionnaire. I will go through an orientation of the Biodex testing and leg extension exercises on the nautilus machine. If there are no discomforts or concerns with the training procedure and I am an appropriate candidate, I will report to the Human Performance Laboratory for pre-testing.

After pre-testing my muscle strength, I agree to perform two weeks of overtraining. I agree to report on time to the Hokie Gym six days a week to complete the

overtraining knee extension workouts in one leg. I will also complete my standard knee extension workout twice a week with my other leg. The overlapping days, I can complete my workouts at the same time. The times I train will primarily be at my convenience.

A post-test will be completed approximately twenty four hours after my last training session. The post-testing will test my quadricep performance on each leg after two weeks of training. Immediately after my post- test, I will train both legs at the same low intensity workout for one week. After the reduced training week, I will complete my final test on the Biodex. I will refrain from all caffeine, alcoholic beverages, nicotine products, and ibuprofen products at least twelve hours before training and testing. There will be a researcher with me at all times during training and testing to assist me if needed. There will be no expenses for me concerning this investigation. Each test and exercise session will last approximately 30 -45 minutes.

Risks and Discomforts

The possible discomforts I may experience in this study include leg fatigue, muscle soreness, and overall fatigue. I will be monitored during testing and training by a researcher who is CPR and First Aid certified in case of any possible abnormal changes ranging from shortness of breath, dizziness, fainting, or death. Risks will be minimized from the health/medical questionnaire and pre- testing results. The Human Performance Laboratory and the Hokie Gym has emergency protocols, equipment, and staff who are authorized and trained to use such equipment for emergency care. There is a working telephone in the testing and training areas. There is an emergency rescue squad on the

campus of Virginia Tech and their average response time to the Human Performance Laboratory and Hokie Gym is 4-5 minutes.

Benefits of Research

My participation in this study will provide the investigators with information that will establish clinical and research applicants in comparing performance in quadricep muscle strength after overtraining 1 leg and regularly training the other leg. In addition, the investigators will determine if a reduced training program helps the recovery after overtraining the quadricep. If I choose, I may receive a summary of this research when it is completed.

Compensation

I understand that no monetary compensation is available to me for my time and effort as a subject in this research. If I choose, I will receive a copy of my testing results and a recommended workout in order to maintain my quadriceps muscle strength.

Anonymity and Confidentiality

The results of this study will be kept strictly confidential. At no time will the investigators release the results of the study to anyone other than individuals working on the research project without my written consent. The information I provide will have my name and identity removed and a subject number will identify me during analyses and any written reports of the research.

Freedom to Withdraw

I am free to withdraw from this study at any time without penalty.

This research protocol has been approved by both the Institutional Review Board for projects involving human subjects at Virginia Polytechnic and State University and the Department of Human Nutrition and Foods.

Subject's Responsibilities

I know of no reason I cannot participate in this study. I accept that it is my responsibility to:

1. Accurately report medical history.
2. Arrive on time to testing and training sessions.
3. Refrain from caffeine, nicotine, alcohol, and ibuprofen products at least 12 hours prior to the exercise trials.
4. Comply with training protocols, and attend every training session.
5. Refrain from vigorous physical activity for 12 hours on all testing days.
6. Refrain from any other extraneous leg activity during the investigation.

Signature Date

Subject's Permission

I have read and understand the informed consent and conditions of this research study. I agree to undergo all screening procedures described above prior to acceptance into the study.

I understand it is my right to withdrawal from the study at anytime without penalty and that I can be dropped from the study by the investigators without my consent. I also understand the risks of my participation and the nature of any potential benefits. I have had the opportunity to ask questions. Any questions that I have asked have been

answered to my complete satisfaction. I hearby acknowledge the above and give consent for participation in this study.

Questions/Response:_____

_____

_____

_____	_____	_____
Print Name	Signature	Date

Should I have any questions about this research or its conduct, I may contact:

_____	951-4794
Kristina Bowser	
_____	231-8320
Dr. Shala Davis	
_____	231-8298
Dr. Jay Williams	
_____	231-9359
Tom Hurd Chair, IRB Research Division	

APPENDIX C:

COMPLIANCE QUESTIONNAIRE

A survey is being administered to determine if the six responsibilities have been met by you. This survey will be completed anonymously and can be returned to my mailbox in War Memorial Hall. The six responsibilities were:

1. Accurately report medical history.
2. Arrive on time to testing and training sessions.
3. Refrain from caffeine, nicotine, alcohol, and pain products at least 12 hours prior to all meetings.
4. Comply with training protocols, and attend every training session.
5. Refrain from vigorous physical activity for 12 hours on all testing days.
6. Refrain from any other extraneous leg activity during the investigation.

Please check one of the following:

I complied with all of the responsibilities during the study. _____

I complied with the responsibilities most of the time during the study. _____

I complied with the responsibilities some of the time during the study. _____

I did not comply with any of the responsibilities during the study. _____

Thank you for your participation in my study. I really enjoyed working with all of you, and your participation helped me tremendously.

Directions to my mailbox:

> As you go in to War Memorial Hall, make a left towards the offices on the first floor. Go through the door and immediately on your right(actually next to the door) as you walk in are the faculty and graduate mailboxes for the HNFE department. My name is Kristina Bowser.

Thanks again!!

APPENDIX D:

DESCRIPTIVE STATISTICS

Descriptive Statistics

Table 1- Descriptive Statistics for Peak Torque at 120 degrees

Column	N	Mean	Std Dev	Std Error
OT- Test 1	9	135.5	32.5	10.85
OT- Test 2	9	131.8	37.4	12.47
OT- Test 3	9	139.1	30.6	10.20
TR- Test 1	9	140.4	31.1	10.37
TR- Test 2	9	139.3	26.1	8.7
TR- Test 3	9	129.6	28.5	9.51

Table 2- Descriptive Statistics for Peak Torque at 240 degrees

Column	N	Mean	Std Dev	Std Error
OT- Test 1	9	107.0	20.0	6.67
OT- Test 2	9	107.4	26.2	8.74
OT- Test 3	9	106.9	19.5	6.50
TR- Test 1	9	106.7	15.3	5.09
TR- Test 2	9	106.4	21.2	7.08
TR- Test 3	9	110.2	20.6	6.88

Table 3- Descriptive Statistics for Peak Torque at 360 degrees

Column	N	Mean	Std Dev	Std Error
OT- Test 1	9	97.7	20.0	6.68
OT- Test 2	9	89.9	26.2	8.75
OT- Test 3	9	94.9	27.3	9.11
TR- Test 1	9	95.6	19.1	6.37
TR- Test 2	9	94.1	17.8	5.92
TR- Test 3	9	97.3	26.7	8.92

Table 4- Descriptive Statistics for Relative Torque at 120 degrees

Column	N	Mean	Std Dev	Std Error
OT- Test 1	9	73.2	16.1	5.38
OT- Test 2	9	71.4	20.0	6.68
OT- Test 3	9	74.5	14.4	4.81
TR- Test 1	9	75.7	12.9	4.29
TR- Test 2	9	75.6	15.9	5.30
TR- Test 3	9	69.2	12.5	4.15

Table 5- Descriptive Statistics for Relative Torque at 240 degrees

Column	N	Mean	Std Dev	Std Error
OT- Test 1	9	58.1	10.17	3.39
OT- Test 2	9	58.5	14.66	4.89
OT- Test 3	9	58.6	13.74	4.58
TR- Test 1	9	58.4	9.5	3.17
TR- Test 2	9	57.8	12.65	4.22
TR- Test 3	9	59.7	11.75	3.92

Table 6- Descriptive Statistics for Relative Torque at 360 degrees

Column	N	Mean	Std Dev	Std Error
OT- Test 1	9	52.8	8.02	2.67
OT- Test 2	9	49.0	13.78	4.59
OT- Test 3	9	48.7	14.83	4.94
TR- Test 1	9	52.1	10.41	3.47
TR- Test 2	9	50.3	10.15	3.38
TR- Test 3	9	52.4	12.50	4.17

Table 7- Descriptive Statistics for Average Power at 120 degrees

Column	N	Mean	Std Dev	Std Error
OT- Test 1	9	197.8	64.7	21.6
OT- Test 2	9	182.3	71.4	23.8
OT- Test 3	9	190.4	55.4	18.5
TR- Test 1	9	193.5	55.1	18.4
TR- Test 2	9	189.7	63.9	21.3
TR- Test 3	9	178.4	50.0	16.7

Table 8- Descriptive Statistics for Average Power at 240 degrees

Column	N	Mean	Std Dev	Std Error
OT- Test 1	9	220.6	76.8	25.6
OT- Test 2	9	220.9	81.3	27.1
OT- Test 3	9	208.6	50.1	16.7
TR- Test 1	9	218.8	59.7	19.9
TR- Test 2	9	218.8	76.7	25.6
TR- Test 3	9	213.7	49.3	16.4

Table 9- Descriptive Statistics for Average Power at 360 degrees

Column	N	Mean	Std Dev	Std Error
OT- Test 1	9	204.0	70.9	23.6
OT- Test 2	9	203.6	70.6	23.5
OT- Test 3	9	199.3	53.7	17.9
TR- Test 1	9	206.5	60.9	20.3
TR- Test 2	9	204.3	56.2	18.7
TR- Test 3	9	198.5	37.3	12.4

Table 10- Descriptive Statistics for One Repetition Maximum for the Overtrained Leg

Column	N	Mean	Std. Dev	Std. Error
Day 1	9	157.8	29.5	9.83
Day 2	9	164.4	29.6	9.88
Day 3	9	165.6	29.2	9.73
Day 4	9	176.3	23.3	8.22
Day 5	9	183.3	42.7	17.45
Day 6	9	178.8	35.6	12.60
Day 8	9	175.6	41.9	13.96
Day 9	9	185.6	41.6	13.86
Day 10	9	190.0	41.4	14.64
Day 11	9	188.8	44.2	15.63
Day 12	9	176.0	32.1	14.35
Day 13	9	188.9	44.0	14.67
Recovery Day 17	9	183.8	32.9	11.64
Recovery Day 18	9	187.8	27.7	9.25

Table 11- Descriptive Statistics for One Repetition Maximum for the Trained Leg

Column	N	Mean	Std. Dev	Std. Error
Day 3	9	163.3	25.5	8.50
Day 6	9	166.3	20.0	7.06
Day 10	9	173.8	16.9	5.96
Day 13	9	177.8	19.9	6.62
Day 17	9	172.5	22.5	7.96
Day 20	9	174.4	24.0	8.01

APPENDIX E:

STATISTICAL ANALYSES

Table 1. Two way repeated measures ANOVA table for peak torque at 120 degrees

Source of Variance	d*f*	SS	MS	F	*p*
Subject	8	37745.3	4718.2		
Condition	1	12.7	12.7	0.0521	0.8252
Condition x Subject	8	1953.2	244.2		
Test	2	120.7	60.4	0.1891	0.8295
Test x Subject	16	5107.5	319.2		
Condition x Test	2	748.8	374.4	2.9216	0.0829
Residual	16	2050.4	128.2		
Total	53	47738.7	900.7		

Power of performed test with alpha = 0.0500: for Condition : 0.0500
Power of performed test with alpha = 0.0500: for Test : 0.0500
Power of performed test with alpha = 0.0500: for Condition x Test : 0.330

Table 2. Two way repeated measures ANOVA table for peak torque at 240 degrees

Source of Variance	d*f*	SS	MS	F	*p*
Subject	8	17551.34	2193.92		
Condition	1	5.67	5.67	0.155	0.7037
Condition x Subject	8	291.91	36.49		
Test	2	34.09	17.05	0.172	0.8437
Test x Subject	16	1587.73	99.23		
Condition x Test	2	47.89	23.94	0.322	0.7292
Residual	16	1189.04	74.32		
Total	53	20707.67	390.71		

Power of performed test with alpha = 0.0500: for Condition : 0.0500
Power of performed test with alpha = 0.0500: for Test : 0.0500
Power of performed test with alpha = 0.0500: for Condition x Test : 0.0500

Table 3. Two way repeated measures ANOVA table for peak torque at 360 degrees

Source of Variance	d*f*	SS	MS	F	*p*
Subject	8	22286.3	2785.8		
Condition	1	30.2	30.2	0.606	0.4587
Condition x Subject	8	398.9	49.9		
Test	2	233.4	116.7	0.756	0.4858
Test x Subject	16	2470.9	154.4		
Condition x Test	2	92.1	46.1	1.053	0.3720
Residual	16	700.0	43.7		
Total	53	26211.9	494.6		

Power of performed test with alpha = 0.0500: for Condition : 0.0500
Power of performed test with alpha = 0.0500: for Test : 0.0500
Power of performed test with alpha = 0.0500: for Condition x Test : 0.0557

Table 4. Two way repeated measures ANOVA table for relative torque at 120 degrees

Source of Variance	d*f*	SS	MS	F	*p*
Subject	8	8929.04	1116.13		
Condition	1	2.76	2.76	0.0340	0.8583
Condition x Subject	8	648.29	81.04		
Test	2	61.44	30.72	0.3823	0.6883
Test x Subject	16	1285.64	80.35		
Condition x Test	2	232.85	116.42	2.6970	0.0979
Residual	16	690.67	43.17		
Total	53	11850.69	223.60		

Power of performed test with alpha = 0.0500: for Condition : 0.0500
Power of performed test with alpha = 0.0500: for Test : 0.0500
Power of performed test with alpha = 0.0500: for Condition x Test : 0.295

Table 5. Two way repeated measures ANOVA table for relative torque at 240 degrees

Source of Variance	d*f*	SS	MS	F	*p*
Subject	8	6406.081	800.760		
Condition	1	0.602	0.602	0.0555	0.8197
Condition x Subject	8	86.780	10.848		
Test	2	11.584	5.792	0.2494	0.7822
Test x Subject	16	371.510	23.219		
Condition x Test	2	7.164	3.582	0.1912	0.8278
Residual	16	299.769	18.736		
Total	53	7183.490	135.538		

Power of performed test with alpha = 0.0500: for Condition : 0.0500
Power of performed test with alpha = 0.0500: for Test : 0.0500
Power of performed test with alpha = 0.0500: for Condition x Test : 0.0500

Table 6. Two way repeated measures ANOVA table for relative torque at 360 degrees

Source of Variance	d*f*	SS	MS	F	*p*
Subject	8	5593.9	699.2		
Condition	1	26.6	26.6	1.871	0.2085
Condition x Subject	8	113.7	14.2		
Test	2	73.9	37.0	0.786	0.4726
Test x Subject	16	752.7	47.0		
Condition x Test	2	44.1	22.1	1.287	0.3032
Residual	16	274.4	17.2		
Total	53	6879.5	129.8		

Power of performed test with alpha = 0.0500: for Condition : 0.125
Power of performed test with alpha = 0.0500: for Test : 0.0500
Power of performed test with alpha = 0.0500: for Condition x Test : 0.0857

Table 7. Two way repeated measures ANOVA table for average power at 120 degrees

Source of Variance	d*f*	SS	MS	F	*p*
Subject	8	159742.8	19967.9		
Condition	1	118.2	118.2	0.305	0.5956
Condition x Subject	8	3097.4	387.2		
Test	2	1339.4	669.7	0.999	0.3900
Test x Subject	16	10723.3	670.2		
Condition x Test	2	860.5	430.2	3.148	0.0703
Residual	16	2186.7	136.7		
Total	53	178068.3	3359.8		

Power of performed test with alpha = 0.0500: for Condition : 0.0500
Power of performed test with alpha = 0.0500: for Test : 0.0500
Power of performed test with alpha = 0.0500: for Condition x Test : 0.366

Table 8. Two way repeated measures ANOVA table for average power at 240 degrees

Source of Variance	d*f*	SS	MS	F	*p*
Subject	8	189001.32	23625.17		
Condition	1	1.71	1.71	.00582	0.9410
Condition x Subject	8	2344.15	293.02		
Test	2	887.09	443.55	0.39481	0.6802
Test x Subject	16	17974.94	1123.43		
Condition x Test	2	147.8	73.90	0.20010	0.8207
Residual	16	5909.08	369.32		
Total	53	216266.10	4080.49		

Power of performed test with alpha = 0.0500: for Condition : 0.0500
Power of performed test with alpha = 0.0500: for Test : 0.0500
Power of performed test with alpha = 0.0500: for Condition x Test : 0.0500

Table 9. Two way repeated measures ANOVA table for average power at 360 degrees

Source of Variance	d*f*	SS	MS	F	*p*
Subject	8	150188.52	18773.57		
Condition	1	8.40	8.40	0.0129	0.9124
Condition x Subject	8	5216.09	652.01		
Test	2	399.02	199.51	0.3268	0.7259
Test x Subject	16	9767.65	610.48		
Condition x Test	2	24.27	12.14	0.0481	0.9532
Residual	16	4037.65	252.35		
Total	53	169641.61	3200.79		

Power of performed test with alpha = 0.0500: for Condition : 0.0500
Power of performed test with alpha = 0.0500: for Test : 0.0500
Power of performed test with alpha = 0.0500: for Condition x Test : 0.0500

APPENDIX F:

RAW DATA

Table 1. Raw data for the overtrained leg during week 2 (lbs)

Subjects	day 1	day 2	day 3	day 4	day 5	day 6	Average	Std. Error
1	110	120	120	** 60	120	140	122.00	10.95
2	150	170	180	170	190	190	175.00	15.17
3	170	170	180	170	190	190	178.33	9.83
4	160	160	160	180	** 160	** 150	165.00	10.00
5	170	180	180	190	210	190	186.67	13.66
6	200	210	210	220	240	250	221.67	19.41
7	190	190	170	160	150	160	170.00	16.73
8	120	120	120	140	** 110	140	128.00	10.95
9	150	160	170	180	** 130	170	166.00	11.40

** lifted at the nautilus room instead of the Hokie Gym

Table 2. Raw data for the overtrained leg during week 3 (lbs)

Subjects	day 1	day 2	day 3	day 4	day 5	day 6	Average	Std. Error
1	130	130	130	130	130	130	130.00	0.00
2	190	200	190	190	200	210	196.67	8.16
3	200	200	200	200	210	220	205.00	8.37
4	150	160	** 150	**140	** 120	140	150.00	10.00
5	210	210	200	180	180	190	195.00	13.78
6	250	270	270	280	** 160	270	268.00	10.95
7	160	160	150	150	160	150	155.00	5.48
8	140	150	180	180	** 150	190	168.00	21.68
9	170	190	200	200	** 160	200	192.00	13.04

** lifted at the nautilus room instead of the Hokie Gym

Table 3. Raw data for the overtrained leg during recovery (Week 4) (lbs.)

Subjects	day 3	day 6	Average	Std. Error
1	130	140	135.00	7.07
2	230	** 200	230.00	--------
3	220	210	215.00	7.07
4	190	170	180.00	14.10
5	180	200	190.00	14.10
6	220	200	210.00	14.10
7	150	180	165.00	21.20
8	170	160	165.00	7.07
9	210	200	205.00	7.07

** lifted at the nautilus room instead of the Hokie Gym

Table 4. Raw data for the trained leg during week 2 (lbs)

Subjects	day 3	day 6	Average	Std. Error
1	120	140	130.00	14.10
2	170	170	170.00	0.00
3	170	170	170.00	0.00
4	160	** 140	160.00	------
5	190	180	185.00	7.07
6	200	200	200.00	0.00
7	170	170	170.00	0.00
8	130	140	135.00	7.07
9	160	160	160.00	0.00

** lifted at the nautilus room instead of the Hokie Gym

Table 5. Raw data for the trained leg during week 3 (lbs)

Subjects	day 3	day 6	Average	Std. Error
1	140	140	140.00	0.00
2	170	170	170.00	0.00
3	190	200	195.00	7.07
4	** 160	170	170.00	------
5	190	180	185.00	7.07
6	190	210	200.00	14.10
7	170	180	175.00	7.07
8	170	170	170.00	0.00
9	170	180	175.00	7.07

** lifted at the nautilus room instead of the Hokie Gym

Table 6. Raw data for the trained leg during recovery (Week 4) (lbs.)

Subjects	day 3	day 6	Average	Std. Error
1	130	130	130.00	0.00
2	170	** 180	170.00	------
3	200	200	200.00	0.00
4	160	160	160.00	0.00
5	190	190	190.00	0.00
6	190	200	195.00	7.07
7	170	190	180.00	14.10
8	160	150	155.00	7.07
9	180	180	180.00	0.00

** lifted at the nautilus room instead of the Hokie Gym

Table 7. Raw data for Subject 1 during testing (both legs)

Biodex testing data (OT leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	91.4	90.1	79.5	107.5	102.7	75.9	123.3	105.8	89.4
relative peak torque (%)	55.7	54.9	48.5	65.5	62.6	46.3	75.2	64.5	54.5
average power (watts)	130.8	160.3	173.7	136.8	141.7	140.4	143.3	164.2	188.7

Biodex testing data (TR leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	95.9	95.8	73.0	129.1	104.5	84.1	115.7	109.2	90.7
relative peak torque (%)	58.5	58.4	44.5	78.7	63.7	46.3	70.5	66.6	55.3
average power (watts)	121.7	172.1	176.0	111.8	145.8	180.3	116.9	177.8	198.1

Table 8. Raw data for Subject 2 during testing (both legs)

Biodex testing data (OT leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	144.8	108.3	93.0	124.1	100.4	80.1	149.0	100.6	86.2
relative peak torque (%)	75.8	56.7	48.7	64.6	52.3	41.7	77.6	52.4	44.9
average power (watts)	218.4	190.4	180.3	171.6	203.8	168.0	210.3	200.6	194.6

Biodex testing data (TR leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	145.9	112.8	92.7	132.6	93.2	84.1	143.6	100.6	88.2
relative peak torque (%)	76.4	59.1	48.5	69.1	48.5	43.8	74.8	52.4	45.9
average power (watts)	220.8	208.6	203.4	173.0	160.1	144.6	205.2	217.6	195.4

Table 9. Raw data for Subject 3 during testing (both legs)

Biodex testing data (OT leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	147.6	107.6	107.0	153.5	108.6	102.1	155.8	119.2	113.8
relative peak torque (%)	80.7	58.8	58.5	82.5	58.4	54.9	83.3	63.7	60.9
average power (watts)	244.0	275.6	255.3	262.7	302.9	270.3	229.3	270.7	233.2

Biodex testing data (TR leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	153.8	114.4	98.3	160.5	120.4	104.5	146.2	115.4	113.1
relative peak torque (%)	84.0	62.5	53.7	86.3	64.7	56.2	78.2	61.7	60.5
average power (watts)	238.5	276.0	255.3	261.9	305.7	261.0	214.4	259.5	227.8

Table 10. Raw data for Subject 4 during testing (both legs)

Biodex testing data (OT leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	82.0	73.3	83.1	85.1	84.6	75.9	93.6	98.9	76.5
relative peak torque (%)	54.3	48.5	55.0	55.6	55.3	49.6	61.2	64.6	50.0
average power (watts)	83.1	78.3	75.5	89.5	137.5	134.2	108.1	151.2	134.7

Biodex testing data (TR leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	110.4	95.4	104.5	114.7	82.0	79.1	91.8	92.9	75.9
relative peak torque (%)	73.1	63.2	69.2	75.0	53.6	51.7	60.0	60.7	49.6
average power (watts)	102.4	101.9	101.6	117.2	126.1	120.4	90.6	126.6	113.2

Table 11. Raw data for Subject 5 during testing (both legs)

Biodex testing data (OT leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	142.0	105.7	97.4	84.6	65.3	47.5	118.4	67.4	54.1
relative peak torque (%)	53.4	39.7	36.6	31.1	24.0	17.5	43.2	24.6	19.7
average power (watts)	192.2	253.2	175.0	122.7	141.6	130.4	178.4	157.2	130.9

Biodex testing data (TR leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	140.6	90.3	87.9	107.0	80.4	81.1	137.3	89.1	77.5
relative peak torque (%)	52.9	33.9	33.0	39.3	29.6	29.8	50.1	32.5	28.3
average power (watts)	193.7	214.7	169.9	154.5	188.8	195.3	193.8	203.7	190.5

Table 12. Raw data for Subject 6 during testing (both legs)

Biodex testing data (OT leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	185.4	144.0	142.3	198.2	154.6	141.5	184.4	163.7	158.2
relative peak torque (%)	84.3	65.5	64.7	89.7	70.0	64.0	83.8	74.4	71.9
average power (watts)	308.5	346.5	327.2	313.9	373.5	334.9	292.8	325.8	307.4

Biodex testing data (TR leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	193.7	131.9	134.0	192.8	147.2	131.0	184.3	156.1	161.3
relative peak torque (%)	88.0	60.0	60.9	87.2	66.6	59.3	83.8	71.0	73.3
average power (watts)	260.7	292.9	313.3	307.2	356.7	302.5	247.9	302.2	248.0

Table 13. Raw data for Subject 7 during testing (both legs)

Biodex testing data (OT leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	163.9	122.9	101.2	162.9	126.8	104.1	161.0	118.1	96.0
relative peak torque (%)	94.2	70.6	58.2	93.1	72.5	59.5	92.5	67.9	55.2
average power (watts)	222.5	235.2	240.5	220.5	224.8	218.1	212.3	224.2	206.5

Biodex testing data (TR leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	160.3	114.1	102.6	151.1	128.2	109.5	154.0	116.5	98.9
relative peak torque (%)	92.1	65.6	59.0	86.3	73.3	62.6	88.5	67.0	56.8
average power (watts)	228.9	252.4	228.1	213.2	238.9	223.5	215.7	229.4	218.7

Table 14. Raw data for Subject 8 during testing (both legs)

Biodex testing data (OT leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	125.9	96.8	74.3	123.5	96.3	81.1	103.5	95.2	82.1
relative peak torque (%)	92.6	71.2	54.6	89.5	69.8	58.8	76.1	70.0	38.9
average power (watts)	179.1	189.4	169.8	174.3	193.2	185.7	140.7	187.3	174.4

Biodex testing data (TR leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	106.5	86.4	68.8	125.0	97.2	79.2	115.8	92.6	77.9
relative peak torque (%)	78.3	63.5	50.6	90.6	70.4	57.4	85.1	68.1	57.3
average power (watts)	154.1	189.3	173.0	174.6	193.2	185.7	153.2	208.7	192.8

Table 15. Raw data for Subject 9 during testing (both legs)

Biodex testing data (OT leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	136.6	114.1	101.4	146.9	127.7	101.3	162.8	125.2	87.9
relative peak torque (%)	68.0	56.8	50.4	70.6	61.4	48.7	77.9	59.9	42.1
average power (watts)	201.4	256.8	241.5	148.4	268.8	250.6	198.1	229.5	223.5

Biodex testing data (TR leg)

	Pre-test			Post-test			Final test		
	120^0	240^0	360^0	120^0	240^0	360^0	120^0	240^0	360^0
peak torque (ftlbs)	156.5	119.0	98.8	140.8	118.7	94.0	136.0	119.4	92.6
relative peak torque (%)	77.9	59.2	49.2	67.7	57.1	45.2	65.1	57.1	44.3
average power (watts)	220.7	260.9	237.6	193.7	240.2	225.3	176.7	197.6	202.3

VITA

Kristina Laurel Bowser was born in 1973. She spent most of her life living in Medford, NJ. During her teen years, she played in many competitive sports concentrating on tennis and swimming. She received all state honors in both activities. From a career ending shoulder injury her senior year during the swim season, Kristina spent a considerate amount of time with physicians and physical therapists. Due to this unfortunate experience, she developed a strong interest in the medical/health profession. After high school graduation, Kristina enrolled in the Exercise Science program at Virginia Tech in the fall.

Four years later with a B.S. in Exercise Science, Kristina decided to continue her education in order to gain more knowledge in the Exercise Science area. Currently, she is interning at Fitness for Health, a personal training/rehabilitation center. In her spare time, she is also working with an aquatics recreational therapist in order to gain more experience in the fitness profession.