Department of Biomechanics

Master Degree

2010

Author	**:**	**Abeer Farag Hanafy.**
Title	**:**	**Assessment Of Summated Extension Moment Of Lower Limbs Following Anterior Cruciate Ligament Reconstruction/**
Dept.	**:**	**Department of Biomechanics.**
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Degree	**:**	**Master.**
Year	**:**	**2010.**
Abstract	**:**	

The forces imposed on the body during landing must be attenuated primarily by the musculoskeletal system through eccentric muscle action of the lower limb extensors, so the summated extension moment (SEM) of lower limbs had been used as a measure for the shock absorption capacity of the limb. The purpose of this study was to assess the effect of ACL reconstruction using semitendinosus tendon as an autograft on the shock absorption capacity, through measuring the SEM of the lower limbs during jogging and forward single leg hopping tasks. Kinetic parameters were collected from both operated and non-operated lower extremities of 20 subjects; 6-12 months after ACL reconstruction (mean age 24.8 ± 5.1 year, mean height 1.76 ± 0.03 meter, and mean weight 75.6 ± 7.08 Kg). A within-subject design was selected to compare the operated and non-operated sides. Data were analyzed using two tailed paired t-test with an alpha level of 0.025.There was no significant difference in the SEM values between the operated and non operated lower extremities during jogging, or during hopping. Additionally, Hotelling's test (Multivariate Analysis of Variance (MANOVA), was used to compare each individual joint's extension moment within the operated sides to its respective contralateral joint. There was no significant difference between the operated and non-operated lower extremities during jogging or during forward hopping tasks. Correlation coefficient revealed a non significant negative correlation between the extension moments of the hip and knee joints of the operated lower extremities during jogging and hopping. These results may indicate that patients who underwent this operative technique developed an adequate shock absorption capacity in their lower extremities during highly demanding activities like jogging and forward hopping, the negative correlation also indicates a reestablishment of a sound neuromuscular adjustment pattern between the extensor muscles of the operated lower extremities which is essential for functional performance.

Key words	**1.**	**Anterior Cruciate Ligament Reconstruction (ACL)**
	2.	**summated extension moment.**
	3.	**support moment.**
	4.	**Lower Limbs.**
Arabic Title Page	**:**	**تقييم محصلة العزوم الباسطة للأطراف السفليه بعد إعادة بناء الرباط الصليبي الأمامي**
Library register number	**:**	**2133-2134.**

Author	**:**	**Asmaa Fouad Abdelmonem.**
Title	**:**	**Effect of Counterforce Brace on Isokinetic Measurements and Myoelectric Activity of Wrist Muscles in Lateral Epicondylitis.**
Dept.	**:**	**Department of Biomechanics.**
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Year	**:**	**2010.**
Abstract	**:**	

Counterforce braces are commonly used for treating the symptoms of lateral epicondylitis. The purpose of this study was to the examine the effect of the counterforce brace on the rmyoelectric (EMG) activity and isokinetic measures (torque, mechanical fatigue and agonist/antagonist ratio) of the dominant arm wrist extensors in subjects suffering from lateral epicondylitis. Thirty subjects with an age ranging from 35-50 years participated in this study. Patients were examined with and without using the counterforce brace. The EMG, agonist/antagonist ratio and peak torque were recorded after five maximal contraction using angular velocity of 120 degrees/sec. The post fatigue torque was also calculated after five maximal contraction at120 degrees/sec. The recorded EMG and isokinetic data were collected simultaneously and analyzed using repeated measure MANOVA with alpha level set at $p<0.05$. Results revealed that the counterforce brace significantly reduced the EMG activity and peak torque of the wrist extensor muscles(P=0.01 and 0.02) but had no effect on the mechanical fatigue or the agonist/antagonist ratio.

Key words	**1.**	**Counterforce brace**
	2.	**Isokinetic measurements**
	3.	**Myoelectric activity**
	4.	**Wrist muscles**
	5.	**Lateral epicondylitis.**
Arabic Title Page	**:**	**تأثير الرباط المضاد للقوي على القياسات الأيزوكينيتيكية و النشاط الكهربي العضلي لعضلات الرسغ في حالات التهاب نتوء المرفق الجانبي.**
Library register number	**:**	**2059-2060.**

Author	**:**	**Azza Hamed Ali Fahmy.**
Title	**:**	**Effect of Fatigue on Support Moments of Lower Extremities following Anterior Cruciate Ligament Reconstruction.**
Dept.	**:**	**Department of Biomechanics.**
Supervisors	**1.**	**Ghada Mohamed El-Hafez.**
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Degree	**:**	**Master.**
Year	**:**	**2010.**
Abstract	**:**	

It has been suggested that comprehensive evaluation of lower extremity function following ACL reconstruction involves functional testing under both fatigue and non-fatigue conditions. The purpose of the study was to investigate the effect of induced fatigue on lower extremity support moments in patients with single bundle semitendinosus ACL reconstruction during landing phases of jogging and single leg forward hopping. Kinetic gait parameters were collected from 20 patients with ACL reconstruction for at least six months prior to data collection, mean age was 24.8 years ± (5.1), mean height was 1.76 m ± (0.03), and mean weight was 75.6 kg ± (7.08). All patients performed general fatigue exercises in the form of stair climbing and six minutes walk test followed by local fatigue exercises in the form of single leg mini squats. A within subject design was selected to compare the operated and non-operated sides. Bilateral kinetic data were collected during jogging and hopping. Data were analyzed using two tailed Paired t-test and hotelling's test. There was no significant difference in the extension and support moments values between the operated and non operated lower extremities following fatigue. Additionally, there were insignificant negative correlations between the extension moments of each of the hip and knee and knee and ankle joints during jogging. While during hopping, there was insignificant positive correlation between the hip and knee extension moments. However there was insignificant negative correlation between the knee and ankle extension moments. The negative correlations between the hip and knee extension moments and the knee and ankle extension moments may indicate reestablishment of the feed forward adjustment of the central pattern generator that may reflect adequate neuromuscular recovery. These results may indicate that at the end of rehabilitation period, patients who underwent this surgical technique were able to attenuate the shock imposed on their lower extremities during jogging and single leg forward hopping following fatigue.

Key words	**1.**	**Anterior Cruciate Ligament Reconstruction (ACL)**
	2.	**Reconstruction.**
	3.	**Fatigue.**
	4.	**Extension moments.**
	5.	**Support Moments.**
	6.	**Lower Extremities.**
	7.	**Ligament Reconstruction.**
Arabic Title Page	**:**	**أثر الإجهاد على عزوم الثبات للأطراف السفليه بعد إعادة بناء الرباط الصليبى الأمامى.**
Library register number	**:**	**2131-2132.**

Author	**:**	**Bassam Ahmed Nabil Abd Elmaboud.**
Title	**:**	**Evaluation of Isokinetic Parameters and Core Stability in Swimmers with and without Swimmer's Shoulder Syndrome.**
Dept.	**:**	**Department of Biomechanics.**
Supervisors	**1.**	**Salam Mohamed El-Hafez.**
	2.	**Nagui Sobhi Nassif.**
	3.	**Ahmed Salama Yamani.**
Degree	**:**	**Master.**
Year	**:**	**2010.**
Abstract	**:**	

Swimmer's Shoulder syndrome (SSS) is the most common condition affecting both competitive and recreational swimmers and surfers. It is basically an overuse injury. The purposes of this study were to analyze the difference between normal swimmers and swimmers with shoulder problems (swimmer's shoulder syndrome) in shoulder isokinetic parameters, scapula isokinetic parameters, arm isokinetic parameters, trunk isokinetic parameters, agonist/antagonist ratio after maximal ten repetition at two velocities (60º/sec and 180º/sec) and to examine the relationship between shoulder external rotation peak torque and lumbar extension peak torque, pain level, Sahermann test, and unilateral bridge test. Thirty volunteer swimmers of both sexes, were divided into two groups: control group of 15 swimmers have no history of shoulder pain or instability and an experimental group of 15 matching swimmers suffering from SSS. Swimmers were examined by a) VAS for pain, b) Functional core stability score for core stability and c) Isokinetic assessment for peak torque and agonist/antagonist ratio recorded for shoulder, scapula, arm, trunk and lumbar movements. Data were analyzed using SPSS program and using repeated measure of MANOVA with alpha level set at $p<0.05$. Results revealed that swimmers with SSS had significant decreases in shoulder external rotation, lumbar extension, and all functional core stability tests compared to the control group. There was a significant increase in the pain level in swimmers with SSS compared with the control group. Moreover, shoulder external/internal rotation ratio, scapular protraction/retraction ratio, lumbar extension/flexion ratio decreased significantly in the experimental group compared with control group. On the other hand the shoulder external rotation peak torque (at 60º/sec) has a significantly positive correlation with lumbar extension peak torque, Sahermann test and unilateral bridge. Despite the importance of swimming as a sport, it produces muscular imbalances between flexors/extensors of the trunk, internal/external rotators of the shoulder. Care must be directed towards improving muscle balance more than concentrating strength towards one group of muscles.

Key words	**1.**	**Isokinetic Parameters.**
	2.	**Core Stability.**
	3.	**Swimmers.**
	4.	**Shoulder Syndrome.**
Arabic Title Page	**:**	تقييم الخواص الايزوكينيتيكية والثبات المحوري لدى السباحين الأصحاء والمصابين بمتلازمة كتف السباح.
Library register number	**:**	**2147-2148.**

Author	**:**	**Iman Akef Abdel Halim Khowailed.**
Title	**:**	**Effect of Exercise on Mechanical Properties of Skeletal and Cardiac Muscles in Rats with Induced Congestive Heart Failure Rats.**
Dept.	**:**	**Department of Biomechanics.**
Supervisors	**1.**	**Salam El Hafez.**
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Degree	**:**	**Master.**
Year	**:**	**2010.**
Abstract	**:**	

Contractile properties of slow and fast skeletal muscles and cardiac muscle are altered in congestive heart failure (CHF), suggesting a generalized fatigue in this disease .The aim of this study was to investigate the potential beneficial effects of different intensities of exercise on cardiac and skeletal muscles function in induced heart failure rats .Heart failure was induced by subcutaneous isoprenaline injection and another control groups of rats received placebo treatment .Rats were assigned to sedentary or to different intensities of exercise swimming-training groups for 10 weeks .We studied the effect of exercise on the contractile properties of fast-twitch extensor digitorum longus (EDL) and slow-twitch soleus (SOL) muscles and cardiac muscle in isoprenaline-induced CHF in rats .Data were analyzed using unpaired t-test with alpha level of 0.05 .In an animal model of CHF, mild and moderate exercise training improved significantly the cardiac muscle function but severe exercise worsened the myocardial function represented by significant reduction in maximum rate of pressure rise. In addition to the beneficial effect of exercise on cardiac muscle it had a similar effect on skeletal muscle where mild and moderate exercise training improved significantly the force of contraction of SOL and EDL muscles showing a significant increase in simple muscle tetanic twitch and tetanic twitch. Severe exercise is also associated with improvement of the force of both muscles; this improvement is more prominent in EDL in which the force of contraction showed complete recovery .Meanwhile, there was no significance difference in the contraction time and half relaxation time of the SOL and EDL muscles associated with CHF. Although, exercise recovered completely the effect of CHF on fatigue resistance of both SOL and EDL muscles denoted by a significant increase in the fatigue index. The result of this study provide solid evidence that exercise training attenuated the deleterious effect of heart failure and improved the contractile impairment that occurs predominantly in rat skeletal muscles.

Key words	**1.**	**Exercises.**
	2.	**Heart Failure.**
	3.	**Skeletal muscle.**
	4.	**Mechanical Properties.**
	5.	**Congestive Heart Failure Rats.**
	6.	**Rats - Cardiac Muscles.**
Arabic Title Page	**:**	**تأثير التمرينات على الخصائص الميكانيكية للعضلات الهيكلية والعضلة القلبية فى الفئران المصابة بهبوط محدث فى القلب.**
Library register number	**:**	**2151-2152.**

Author	**:**	**Mohamed Mostafa Mohamed Mohamed Essa.**
Title	**:**	**Effect of different frequencies of continuous ultrasound on mechanical muscle strain.**
Dept.	**:**	**Department of Biomechanics.**
Supervisors	**1.**	**Salam Mohamed El-Hafez.**
	2.	**Nagui Sobhi Nassif.**
	3.	**Sohair Mohamed Abdel Rahman.**
Degree	**:**	**Master.**
Year	**:**	**2010.**
Abstract	**:**	

The purpose of this study was to investigate the load-deformation response of skeletal muscle under the effect of different frequencies of continuous ultrasound. Thirty New Zealand male rabbits weighing 2-2.5 kg, aging 5-6 months were used and divided into three groups. Group(A) was treated with 1-MHz continuous ultrasound over the plantaris muscle for single dose, group(B) was treated with 3-MHz continuous ultrasound for single dose and group(C) received no treatment (control group). Then a dissection of plantaris muscle of the rabbits was done and taken for the mechanical testing experiment. A tensile testing machine (Instron instrument serial no.53479) was used to measure the load subjected to the specimen at high yielding point and its corresponding deformation. The result of the study showed that deformation of the samples in response to the applied load at the high yielding point revealed a significant difference between group(A) and control group(C), non statistically significant difference between group(B) and control group(C), non statistically significant difference between group(A) and group(B). The result of this study agrees with the findings in some clinical research which support the application of ultrasound within the program for musculoskeletal problem. Conclusion: With the limitations of this study it can be concluded that ultrasound, regardless of its frequency, prior to stretching, has significantly influenced the extensibility of the muscle.

Key words	**1.**	**Continuous ultrasound.**
	2.	**Ultrasound frequencies.**
	3.	**Mechanical strain.**
	4.	**Tensile strain.**
	5.	**Skeletal muscle.**
	6.	**Frequencies - ultrasound.**
	7.	**Muscle strain.**
Arabic Title Page	**:**	**تأثير الترددات المختلفة للموجات فوق الصوتية المتصلة على الإطالة الميكانيكية للعضلة.**
Library register number	**:**	**2157-2158.**

Author	**:**	**Reda Sayed Ashour Ali.**
Title	**:**	**Effect of Core Training on Body Center of Gravity Displacement during Walking.**
Dept.	**:**	**Department of Biomechanics.**
Supervisors	**1.**	**Ghada Mohamed El-Hafez.**
	2.	**Ahmed Waheed Mustafa.**
Degree	**:**	**Master.**
Year	**:**	**2010.**
Abstract	**:**	

The core is where our centre of gravity is located and where all movements begin. A strong core gives a more stable COG, so the purpose of the study was to examine the effects of core training on COG displacement during walking in the sagittal and transverse planes. Also to detect the changes in performance of core stabilizers after performing this program by using four tests (prone bridging, lateral bridging, flexion endurance, and extension endurance tests). Twenty eight healthy non athletic female subjects with mean age of 21.2 years ± (2.3), mean height of 1.6 m ± (6.2), and mean weight 60.5 kg ± (9.5) participated in the study. They were to perform the core training program that incorporated eight exercises performed three times per week for four weeks. Kinematic data were collected using the Motion Analysis System, while the improvement in core stability performance was indicated by an increase in the time spent in seconds performing the core stability assessment tests. MANOVA was used to investigate the difference of means between the pre and post exercise program conditions with the alpha level set at 0.05. Findings revealed insignificant differences in the COG displacement during walking in the sagittal and transverse planes pre and post the training course. However, our findings reported a highly significant increase in the time spent in seconds performing the four core stability assessment tests (p = 0.00) which reflects an increase in the performance of core stability muscles. Thus it could be concluded that core stabilization-training program may be clinically beneficent in improving the core muscles performance and endurance.

Key words	**1.**	**center of gravity displacement**
	2.	**core stabilization**
	3.	**lumbar stability**
	4.	**walking.**
	5.	**Effect of Core Training on Body Center of Gravity Displacement during Walking.**
Arabic Title Page	**:**	**تأثيرالتدريب المحورى على إزاحة مركز ثقل الجسم أثناء المشى.**
Library register number	**:**	**2127-2128.**