Department of Biomechanics

Doctoral Degree

2016

Author	**:**	**Fatma Mohamed Alfiky**
Title	**:**	**The Effect of Knee Osteoarthritis on Lumbar Proprioception**
Dept.	**:**	**Department of Biomechanics.**
Supervisors	**1.**	**Wadida Hassan AbdelKader El Sayed**
	2.	**Hassan Mahmoud Barakah**
	3.	**Amira Hussin Draz**
Degree	**:**	**Doctoral.**
Year	**:**	**2016.**
Abstract	**:**	

Background: Knee osteoarthritis (OA) is a common chronic disease affecting weight bearing joints. It alters kinetics and kinematics of all lower limb joints and lumbar spine. Purpose: The purpose of this study was to study the effect of chronic knee OA on Lumbar active repositioning accuracy level (LARAL), the effect of sex on LARAL, the association of LARAL with OA duration of chronicity, age, body mass index (BMI) and sex;and the association of LARAL with age, BMI and sex in healthy subjects. Methods: Sixty subjects participated in the study. Their age ranged between 40 and 60 years. The subjects were assigned into two groups; Study group (A): It was consisted of 30 patients with chronic unilateral grade II knee osteoarthritis. The duration of chronicity ranged from 6 months and 45 months. Control group (B): It was consisted of 30 healthy subjects. LARAL was measured by Biodex system III Pro at target angle 30^0. Results: There was a significant increase in LARAL (absolute error) in group (A) compared with group (B) (p= 0.0001). The mean ± SD values of LARAL in the group (A) and group (B) were 7.36 ± 2.39^0 and 1.15 ± 0.91^0 respectively. There was no significant difference in LARAL in female compared with male in group (A) and (B) (p= 351 and 0.597 respectively). The mean ± SD values of LARAL in the "female" and "male" in group (A) were 6.96 ± 2.31^0 and 7.95 ± 2.52^0 respectively. The mean ± SD values of LARAL in the "female" and "male" in group (B) were 1.09 ± 0.98^0 and 1.33 ± 0.76^0 respectively. There was positive strong significant association of LARAL with OA duration of chronicity (p= 0.0001). The regression equation is: LARAL = 3.035 + 0.937 × chronicity. There was no significant association of lumbar absolute error with age in Group (A) and (B) (p= 0.995 and 0.592 respectively). There was no significant association of lumbar absolute error with BMI in group (A) and (B) (p= 0.323 and 0.812 respectively). There was no significant association of LARAL with sex in group (A) and (B) (p= 0.474 and 0.06 respectively). Conclusion: Proprioception accuracy is decreased in knee OA. Lumbar proprioception is not affected by the sex in OA patients and healthy subjects. The duration of chronicity of knee OA has a strong direct association with proprioception deficit. Age, BMI and sex have no association with LARAL in knee osteoarthritic patients and healthy subjects.

Key words	**1.**	**lumbar active repositioning accuracy**
	2.	**knee osteoarthritis**
	3.	**duration of chronicity**
	4.	**kinematics**
Classification number	**:**	**000.000.**
Pagination	**:**	**177 p.**
Arabic Title Page	**:**	**تأثير خشونة الركبة على المستقبلات الحسية العميقة للمنطقة القطنية .**
Library register number	**:**	**5083-5084.**

Author	**:**	**Manal Sami Ibrahim Moustafa**
Title	**:**	**Biodex Balance System versus Virtual Reality-Based Balance Training in Enhancing Body Balance in Adults**
Dept.	**:**	**Department of Biomechanics.**
Supervisors	**1.**	**Salam Mohammed El Hafez**
	2.	**Ayman Goda Matar**
Degree	**:**	**Doctoral.**
Year	**:**	**2016.**
Abstract	**:**	

Background: However apparently a simple task, retaining equilibrium or balance while standing upright is an intricate motor skill. Balance is a staggered process requiring harmony of multiple sensory, motor, and biomechanical components. Traditional training programs are not attractive to some participants. Purpose: The aim of this study was to investigate the effect of virtual reality (VR) based-balance program on balance enhancement in adults as a low cost new modality compared to Biodex Balance System (BBS). Methods: Thirty normal adults participated in the study. They were divided in to two equal experimental groups. Group (I) was trained using the BBS and group (II) was trained using the Nintendo Wii® and its Balance Board as an innovative technique using virtual reality basis. All the participants were trained 3 times/week for 4 weeks. Their mean age was 41.9 (±7.01) years, mean weight 81.34 (±14.1) kg and mean height 166.56 (±8.5) cm. The overall balance of each subject was measured by the BBS before introduce the balance training programs. The time consumed to accomplish the balance test was also measured. Each participant answered a questionnaire concerning the usability, enjoyment, balance improvement and fatigue at the end of the training sessions. Findings: There was improvement of the overall balance (OLB) of both training groups. The OLB of group (I) increased by 5 % while the VR training group's OLB increased by 5.6%. There was no significant difference between the two training methods. There was an insignificant mean decrease in the time required to do the dynamic limit of stability test (DLOS) from pre to post training test results of the two training groups. About 80% of the participants found the VR training is highly enjoyable. Interpretation: The new Wii Fit Plus system with its balance board as a VR training technique is highly effective and enjoyable device in training body balance.

Key words	**1.**	**Biodex Balance System**
	2.	**Virtual Reality**
	3.	**Nintendo Wii Fit plus**
	4.	**Balance Training**
	5.	**Balance Board**
	6.	**Body Balance Enhancement**
	7.	**Adults.**
Classification number	**:**	
Pagination	**:**	**X, 117, 4p.**
Arabic Title Page	**:**	**نظام البيودكس للاتزان مقابل التدريب المبني علي الواقع الافتراضي الحقيقي في تحسين توازن الجسم في البالغين**
Library register number	**:**	**5011-5012.**

Author	**:**	**Mohamed Mostafa Mohamed Mohamed Essa**
Title	**:**	**Effect of Core and Treadmill Training on Isokinetic Core Muscles Strength and Skeletal Mineralization**
Dept.	**:**	**Department of Biomechanics.**
Supervisors	**1.**	**Salam Mohamed El-Hafez**
	2.	**Magdy Abd- Elaziz**
	3.	**Hossam Eddin Fawaz**
	4.	**Mariem Abd-Elmoniem**
Degree	**:**	**Doctoral.**
Year	**:**	**2016.**
Abstract	**:**	

Purpose: was to investigate the effect of core and treadmill training on isokinetic core muscles strength and skeletal mineralization in postmenopausal women with osteoporosis. Methods: Twenty post-menopausal women aging between 50 to 60 years and with body mass index (BMI) between 20.2 to 24.9 kg/m^2 participated in this study. They were randomly assigned in two equal experimental groups. Participants of the first experimental group (A) received core training program (three sessions per week for three months), while participants of the second experimental group (B) received treadmill training program (three sessions per week for three months). Bone mineral densities (BMD) were assessed in the lumbar spine (L2-L4) and right femoral neck by dual energy X-ray absorptiometry using Hologic QDR-4500 (Hologic, Bddford, MA, USA). Isokinetic dynamometer was used to measure the peak torque of trunk flexors, extensors, hip flexors, extensors, abductors, and adductors muscles. The participants were tested twice; before and after the interventions. Results: The statistical analysis revealed that there were significant increases in the hip flexors' peak torque, and femoral neck BMD in the post-treatment condition in group (B) only ($p<0.05$). While there was a significant increase in the trunk extensors' peak torque in group (A) only ($P=0.015$). Moreover, the statistical analysis revealed that there were significant increases in the peak torque of hip extensors, and abductors in the post-treatment condition compared with the pre-treatment condition for both groups ($p<0.05$). However, there were no significant differences in the trunk flexors, and hip adductors' peak torque, and lumbar spine BMD between the pre-treatment and post-treatment conditions for either group ($p>0.05$). Conclusions: It can be concluded that the treadmill and core training programs are effective in strengthening of hip extensors and abductors muscles. Also, the treadmill training program is an effective treatment policy to improve bone mineral density at the hip region and help in prevention of bone loss in postmenopausal women.

Key words	**1.**	**Core training**
	2.	**treadmill training**
	3.	**isokinetic strength**
	4.	**Muscles Strength**
	5.	**Skeletal Mineralization**
Classification number	**:**	**000.000.**
Pagination	**:**	**112 p.**
Arabic Title Page	**:**	**تأثير التدريب المحورى والمشايه على العزوم الايزوكينيتيكية للعضلات المحورية والكثافة العظمية.**
Library register number	**:**	**5141-5142.**

Author	**:**	**Yassmin essam mohamed**
Title	**:**	**Effect of Open Chain Exercises of Hip Versus Knee on Lower Limb Mechanics in Patellofemoral Pain Syndrome**
Dept.	**:**	**Department of Biomechanics.**
Supervisors	**1.**	**Ghada mohamed elhafez**
	2.	**Ibrahim ali nassar**
	3.	**Hossam eldien fawaz**
Degree	**:**	**Doctoral.**
Year	**:**	**2016.**
Abstract	**:**	

Background: Despite the fact that patients with patellofemoral pain syndrome (PFPS) have hip and knee muscle weakness that causes dynamic lower extremity malalignment, few studies that compare among the biomechanical effects of combined hip and knee, isolated hip and isolated knee strengthening exercises in these patients. Purpose: This study aimed to compare the effect of three different exercise programs on pain level, Kujala questionnaire scale, Q angle, femoral anteversion angle (FAA), and knee extensors', hip abductors' and external rotators' peak torques (PT) in patients with PFPS. The programs involve isolated hip strengthening, isolated knee strengthening and stretching, and combined hip and knee exercises. Methods: Thirty six patients with PFPS were randomly assigned into three equal groups (A, B and C). The mean age, weight, height and BMI were 23.33±5.39 years, 71.16±13.05 kg, 164.75±4.5 cm, and 26.21±4.71 kg/m² for group (A), 23.16±6.33 years, 69.41±18.14 kg, 164.66±7.27 cm, and 25.2±6.2 kg/m² for group (B) and 20.3±0.65 years, 65.08±11.98 kg, 165±7.85 cm, and 23.84±3.8 kg/m² for group (C). Group (A) received open kinetic chain hip abductors and external rotators strengthening exercises, while group (B) received open kinetic chain strengthening exercises for knee extensors and stretching exercises for quadriceps, hamstring, gastrocnemius, and iliotibial band and finally group (C) received combined hip and knee exercises. Each group consisted of twelve patients with PFPS and each one received three sessions per week for three weeks. The previously referred to variables were recorded before and after three weeks of exercises. Results: 3x2 Mixed Design MANOVA revealed that there was a significant increase in the mean values of the hip abductors' PT in addition to a significant decline in the mean values of the Q angle and FAA in group (A) compared with group (C) after three weeks of exercises ($p<0.05$). Additionally, there was a significant decline in the pain level in group (C) compared with groups (A) and (B) after three weeks of exercises ($p<0.05$). Conclusion: The combined hip and knee exercise program is more effective in reducing anterior knee pain compared with the isolated hip and knee exercise programs in patients with PFPS. However, the isolated hip strengthening program is more effective in increasing the hip abductors' PT and reducing the Q angle and FAA compared with the combined hip and knee exercise program in these patients.

Key words	**1.**	**Patellofemoral Pain Syndrome**
	2.	**Strengthening Exercises**
	3.	**Isokinetic PT**
	4.	**Q Angle**
	5.	**Femoral Anteversion Angle**
Classification number	**:**	
Pagination	**:**	**167 P**
Arabic Title Page	**:**	**تأثير استخدام تمرينات السلسله المفتوحه لمفصل الفخذ مقابل الركبة على ميكانيكية الطرف السفلي لمتلازمة آلام الرضفة**
Library register number	**:**	**4765-4766.**