25 - STAR EXCUSION BALANCE TEST APPLICATION IN SUBJECTS WITH LOWER LIMB INJURY UNDERGOING A PHYSIOTHERAPEUTIC TREATMENT

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INTRODUCTION

The proprioception is a component of the balance, together with the vestibular system and vision. Its importance is directly related to the neuromuscular control, which uses the proprioceptive afferents to the CNS to provide dynamic joint stabilization (Aquino et al., 2004; GREVE, 2007). This happened by information ways on position change, movement and joint stress when there is mechanical displacement of some tissue, initiating a reflex muscle contraction around the joint, providing stability and protection (ANDREWS, HARRELSON, WILK, 2000).

When an injury occurs, the mechanoreceptors are affected, causing changes in proprioceptive afference, compromising the protective mechanisms of neuromuscular control, occurring deficit in anticipatory muscle activity, exposing the static structures to lesions in the face of forces and abrupt trauma (PRENTICE; VOIGHT, 2007).

The literature agrees that proprioceptive deficits may be minimized, after injury, through of the neuromuscular control training, investigating the role stabilizing reflex and reducing the risk of new lesions (ANDREWS, HARRELSON, WILK, 2000; PRENTICE; VOIGHT, 2007; GREVE, 2007), and even emphasize that the proprioceptive training should be the rehabilitation basis (COOK, BURTON; FIELDS, 1999). However, to provide appropriate treatment and even have comparison parameters, the evaluation is required for damage caused by proprioceptive change because of injury. But still there are few ways to dynamically assess the effect of the deficit in proprioceptive neuromuscular control and functional performance (Aquino et al., 2004).

Most evaluations focus on the joint position sense and kinesthesia, through analysis that do not assess the patients functional performance and usually is used the isokinetic dynamometer, which as a high-cost equipment is hardly found in clinics and rehabilitation centers. The neuromuscular control evaluation can be performed with the Star Excursion Balance Test (SEBT), which is a low-cost test, which assesses the patient dynamically, determining the proprioceptive deficits, postural balance, the systems integrity and patient body protection evolution in their rehabilitation. This test has been used by different authors in the United States (EARL; HERTEL, 2001; HERTEL; MILLER, denied, 2000; OLMSTED; HERTEL, 2004; ALHE; HERTEL; OLMSTED-KRAMER, 2007; OLMSTED et al., 2002 ; Gribble et al., 2004; Gribble; HERTEL, denied, 2007; Gribble, HERTEL, 2003, Hubbard et al., 2007; HERTEL et al., 2006), but were not found records of their use in Brazil up to the present date. This study aimed to evaluate changes in neuromuscular control through SEBT in people who suffer from knee or ankle injury and were subjected to physical treatment.

MATERIALS AND METHODS

Participated in the study 20 individuals of both genders, being 12 men and 8 women, and the minimum age was 20 years, maximum 34 and average age 25.3 years. They were divided into two groups: the first group with 10 people without any history of knee or ankle involvement (control group) and the second group with 10 individuals with history of knee or ankle injury in one of the lower limbs (committed gruoup). In the control group (CG) the minimum age was 20 years, the maximum of 32 years, generating an average of 24.9 years of age. The group with lesions (GL) had a minimum age of 20 years, maximum of 34 years and average of 25.7 years of age.

Those in the impaired group had been by at least two weeks of physical therapy treatment due to knee or ankle physical injury, without the presence of pain, swelling and or inflammation, because according to Lobato et al. (2005) these factors sensitize a large number of nerve endings, due to chemical mediators, changing the proprioception. The maximum period of treatment was 32 weeks and an average of 6.7 weeks.

For GL, five individuals had some type of knee impairment, such as iliotibial tract syndrome, partial rupture of medial collateral ligament (MCL), rupture of anterior cruciate ligament (ACL), tendonitis and synovitis. The ankle changes also added 5 patients in cases such as sprains and fractures.

For the proprioceptive evaluation, we used the Star Excursion Balance Test (SEBT), which consists of eight straight lines of 120 cm long and three centimeters wide, made of Le Baron plastic or Napa put on the floor, and these lines, start on a single point, forming a center where there is an angle of 45 degrees between each line (Figure 1). The lines were sewn together in the center formed.

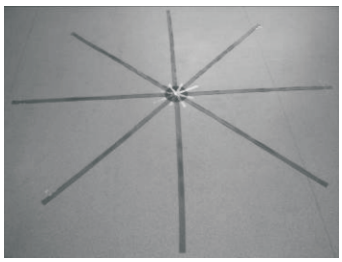

Figure 1 – Star Excursion BalanceTest – the provision of soil testing during the evaluation.

From the measurement of length and width of the patient's foot, barefoot, was marked at the foot geometric center (using a tape measure and marker of) which was positioned exactly at the intersection of straight lines (Fig. 1). According to Gribble and Hertel (2003), there isn´t significant data if the type of foot (cavo or plan) and range of motion affect the test.

The lines were named according to their direction from the lower limb for support: anterolateral (AL), anterior (ANT), anteromedial (AM), medial (MD), posteromedial (PM), posterior (PO), posterolateral (PL) and lateral (LAT). When the patient was making the reach in the lines PL and LAT, the leg was moved behind the support limb (Fig. 2). It followed the clockwise range of

straight lines when the left leg (LL) was fixed in the soil and counterclockwise when the right lower limb (RL) was fixed to the ground, both began with the end line and ANT on the line AL.

Figure 2 – Side reach.

The test was applied in the department of Orthopedics and Traumatology Rehabilitation at the Lusíada University. The examiner showed the test to be done before the individual, who practiced at least once in all eight directions, with each member. Before starting the test, the examiner, with your opposite leg out of the soil, had the distal portion of the hallux marked with a label (lipstick), and guided to move your foot as far he could, playing the most gentle possible the line in question. After the individual returned to the limb near the test center, maintaining the balance in bipedal support, was then given the measured time of 10 s of rest for the patient to reach the start line next. During the test, the patient mantained the heel in the ground and the hands on hips, to standardize the position of the upper limbs and avoid trying to maintain a balance with the aid of them (fig. 2). To complete the reach of all the lines, the examiner, one for all assessments, measure the distance from the center of the test until the mark left by the touch of the hallux on the line. The subjects repeated threetimes with the eight directions and each limb was an average of three measures.

The reach was discarded if: the examined withdraw the support foot heel to the ground, the foot support had left the intersection of straight lines (center); the individual could not touch the line; place the discharge of weight to play the straight hallux; bear hands waist or lose the balance in any way. Were given 10 s of rest after the error and then held back the scope of the line.

Data analysis using the Student t test, paired comparison to intra-group and not paired for comparison between groups, the value of significance was $p<0.05$.

RESULTS

For GL, the eight lines examined (ANT, AM, MD, PM, PO, PL, AL and LAT) between injured and healthy side in all were recorded differences in average values, with the affected side, with higher values, to achieve discharge of weight on the side not affected, but these differences were not significant ($p> 0.05$). Fact also observed for GC, by comparing the right and left sides ($p> 0.05$).

In the evaluation, the average values of the measures in eight straight, there was significant difference when comparing the injured side (70.54 ± 7.70 cm) with the healthy side (67.45 ± 7.69 cm, $p=0.0003$). Was not observed for the control group to compare the right side (69.31 ± 7.05 cm) to the left (69.60 ± 7.59 cm, $p=0.5258$). In the comparison between groups also no significant difference ($p>0.05$) (Fig. 3).

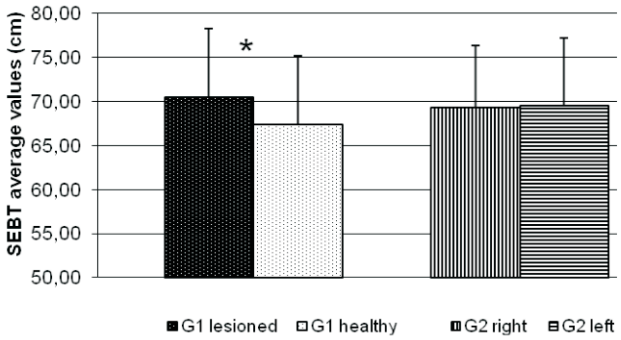

Figure 3 – Comparison of SEBT average values of groups 1 and 2. * Difference statistically significant intra-group to G1.

DISCUSSION

It is believed that the age and gender of individuals evaluated did not influence the results, due to the proximity of average values between groups. And according to Tookuni et al. (2005) is not necessary to separate by gender when it comes to young people.

People in the control group were tested with the purpose of acquiring the comparative parameters of normality between the two legs, because as described by Andrews, Harrelson and Wilk (2000) there is no proprioception normative data for comparison.

It should be noted that the SEBT is a test of dynamic neuromuscular control and some of the results of studies related to proprioception, are realized of static form. Aquino et al. (2004) also emphasize the need for dynamic analysis to determine the proprioceptive function in joint stability. According to Ingersoll et al. (2008), the dynamic analysis of the balance provides better representation of the neuromuscular system involvement in functional activities when compared to static tests.

The results between the control group and committed team demonstrate the effectiveness of the SEBT application to examine changes in neuromuscular control in subjects who suffered from knee or ankle injury in a lower limb. These changes are due to proprioceptors impairment, caused by injury, causing change in proprioceptive afference and neuromuscular control as a whole, and the balance (ANDREWS, HARRELSON, WILK, 2000; GREVE, 2007; PRENTICE; VOIGHT, 2007). The SEBT determine objectively the proprioceptive deficits, as Andrews, Harrelson and Wilk (2000) give it the ability to quantify the balance.

The data are in agreement with the study by Jay Hertel et al. (2006), which in an attempt to simplify the SEBT,

comparing people with and without chronic ankle instability and also found statistically significant differences.

The changed proprioceptive results found in patients with conservative treatment, particularly in the case of ankle committment, is described by Prentice and Voight (2007) not only by the ligament proprioceptive information decrease, but by the committment or joint receptors as well. The same authors also reported the possibility of individuals with chronic ankle injury to recovery proprioception in conjunction with time, but this was not observed in this evaluation and the patients have not yet had sufficient time to occur that recovery. One should take into account that patients were still under physiotherapeutic treatment.

Unlike the data of this research, the findings of Fonseca et al. (2003) with respect to individuals with ACL injuries treated conservatively, their results showed no difference between individuals without injury, and individuals who suffered injury. Despite Amatuzzi et al. (2007) describe the surgical treatment is imperative in this kind of injury and according to Nunes et al. (2003) good results can be obtained when individuals reduce the sport practice intensity. Fatarelli (2003), describes the lack of proprioceptive impairment in people with ACL injuries. However, for Paizante and Kirkwood (2007), there is proprioceptive deficiency after ACL injuries, by a possible slowly to the reflex response to control movements in the knee when compared with the contralateral limb. And in this study, although it was not assessed separately, individuals with lesions showed values in general, differences between the injured side and the healthy side, agreeing with the last study said.

In the patellar tendon tendinitis case, MCL partial rupture, synovitis and iliotibial tract syndrome, there is little information disseminated by articles and books by direct correlation of these disorders with proprioceptive acuity, making it difficult to discuss the matter. Therefore, as described by Pettitt and Dolski (2000) there is a need for further work involving the lesion and their proprioceptive changes.

The importance of determining the neuromuscular control impairment after an injury, can be justified by the work of Tookuni et al. (2005) who found that the isolated improvement of muscle strength is not able to completely restore the balance. What can be explained by Barret (1991), which emphasizes that to the limb role, during the activity, is used proprioceptive afferents more than muscle strenght. Thus, the return to sports activities, without fear, is improved with proprioceptive training, indicating this as the single most important measure to prevent recurrence (SAMPAIO; SOUZA, 1994; MOREIRA; ANTUNES, 2008).

Hale, Hertel and Olmsted (2007) described the SEBT use as a pre and post-test in subjects submitted to a four weeks treatment period because of chronic ankle instability, which was recorded improvement in results after physiotherapy. It is suggested then that the SEBT is applied not only as a means of evaluating the performance of the patient, but as a form of assessment and reassessment of the neuromuscular control, determining thus the effectiveness and benefits of the treatment.

This study had a small individuals number in the injury recovery phase, which limits the assertions made. As can be seen in the literature used in this work, many authors use the SEBT, but as described by Hertel et. al (2000) there is no scientific proof of its applicability within and between assessors. This should be explored in a new study, as well as the application of this test in a people larger number with similar injuries, to obtain more precise data for their effectiveness.

CONCLUSION

We conclude in this study, that in the SEBT assessment, individuals in the recovery phase of knee or ankle injury, showed proprioceptive deficits on the injured side compared to non-injured side.

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STAR EXCUSION BALANCE TEST APPLICATION IN SUBJECTS WITH LOWER LIMB INJURY UNDERGOING A PHYSIOTHERAPEUTIC TREATMENT

ABSTRACT:

This study aimed to evaluate changes in neuromuscular control using the Star Excusion Balance Test (SEBT) in individuals who have suffered injuries of the knee or ankle and undergoing physiotherapy treatment. The SEBT consists of eight straight lines of 120 cm long and 3 cm wide, and these straight start in a single point, forming a center, with angle of 45 degrees between each line. The test was performed in one-leg support in the center formed by the intersection of straight lines. It took the name for each line as its direction: anterolateral (AL), anterior (ANT), anteromedial (AM), medial (MD), posteromedial (PM), posterior (PO); posteroinferior lateral (PL) and lateral (LAT). The assessment was bilateral. The SEBT was applied in 20 individuals, 10 belonging to the control group and 10 to the group committed (injury of the knee or ankle) and used the t test for comparison between groups and sides. When comparing the average total of eight straight, there was a difference for the group committed, but not for the control group and the comparison between groups. It is concluded that the SEBT assessment for the sample studied, there are proprioceptive deficits on the injured compared to non-injured side.

Keywords: proprioception, neuromuscular manifestations, therapy.

APPLICATION DE L'ESSAI NEUROMUSCULAIRE COMMANDE CHEZ DES PERSONNES AVEC DES BLESSURES DES MEMBRES INFÉRIEURS QUI SUBISSENT UNE THÉRAPIE PHYSIQUE

RÉSUMÉ:

Cette étude visait à évaluer les changements dans le contrôle neuromusculaire à l'aide du Test Star Excusion Balance (SEBT) chez les individus qui ont subi des blessures du genou ou de la cheville et en cours de traitement de physiothérapie. Le SEBT se compose de huit lignes droites de 120 cm de long et 3 cm de large, de NAPA, et ces droites commencer en un point unique, formant un centre, avec angle de 45 degrés entre chaque ligne. Le test a été effectué en une seule jambe d'appui au centre formé par l'intersection de lignes droites. Il a pris le nom de chaque ligne de sa direction antéro-latéral (AL), antérieur (ANT), antéro-médial (AM), médian (MD), postérieure-médial (PM), postérieur (PO); posteroinferior latéral (PL) et latérale (LAT). L'évaluation a été bilatérale. Le SEBT a été appliquée à 20 personnes, 10 appartenant à un groupe de contrôle et 10 engagés dans le groupe (blessure du genou ou de la cheville) et utilisé le test t de comparaison entre les groupes et sur les côtés. Lorsque l'on compare la moyenne du total de huit droite, il y avait une différence pour le groupe en cause, mais pas pour le groupe de contrôle et de la comparaison entre les groupes. Il est conclu que l'évaluation de SEBT pour l'échantillon étudié, il existe des déficits proprioceptifs à la victime par rapport à la non-blessés côté.

MOTS-CLÉS: la proprioception, manifestations neuromusculaires, de la thérapie.

APLICACIÓN DE LA PRUEBA DE CONTROL EN NEUROMUSCULAR LOS INDIVIDUOS CON LESIONES DE LA EXTREMIDAD INFERIOR EN TERAPIA FÍSICA

RESUMEN:

Este estudio tuvo como objetivo evaluar los cambios en el control neuromuscular mediante la Estrella Excusion Saldo Test (SEBT) en los individuos que han sufrido lesiones de la rodilla o el tobillo y sometidos a tratamiento de fisioterapia. El SEBT consta de ocho líneas rectas de 120 cm de largo y 3 cm de ancho, de los PNA, y estas rectas en un comienzo solo punto, la formación de un centro, con ángulo de 45 grados entre cada línea. El ensayo se realizó en un tramo de apoyo en el centro formado por la intersección de líneas rectas. Tomó el nombre de cada línea de su dirección: anterior-lateral (AL), anterior (ANT), antero-medial (AM), medio (MD), posterior-medial (PM), posterior (PO); posteroinferior lateral (PL) y lateral (LAT). La evaluación fue bilateral. El SEBT se aplicó en 20 personas, 10 pertenecientes al grupo control y 10 comprometido con el grupo (lesión de la rodilla o el tobillo) y se utiliza la prueba de t para la comparación entre los grupos y partes. Al comparar el promedio total de ocho recta, había una diferencia para el grupo en cuestión, pero no para el grupo control y la comparación entre los grupos. Se concluye que la evaluación de SEBT de la muestra estudiada, hay déficit propioceptivos de los heridos en comparación con el lado no lesionado.

PALABRAS CLAVE: propiocepción, manifestaciones neuromusculares, la terapia.

APLICAÇÃO DO TESTE DE CONTROLE NEUROMUSCULAR EM INDIVÍDUOS COM LESÃO DE MEMBRO INFERIOR SUBMETIDOS A TRATAMENTO FISIOTERAPÊUTICO

RESUMO:

Esse estudo objetivou avaliar as alterações no controle neuromuscular por meio do Star Excusion Balance Test (SEBT), em indivíduos que sofreram lesão de joelho ou tornozelo e submetidos a tratamento fisioterapêutico. O SEBT consiste em oito linhas retas de 120 cm de comprimento e 3 cm de largura, feitas de NAPA, tendo estas retas início em um ponto único, formando um centro, com angulação de 45 graus entre cada reta. O teste foi realizado em apoio unipodal, no centro formado pela intersecção das retas. Deu-se o nome para cada reta conforme sua direção: antero-lateral (AL); anterior (ANT); antero-medial (AM); medial (MD); postero-medial (PM); posterior (PO); postero-lateral (PL) e lateral (LAT). A avaliação foi bilateral. O SEBT foi aplicado em 20 pessoas, pertencendo 10 ao grupo controle e 10 ao grupo comprometido (lesão de joelho ou tornozelo) e utilizou-se o Teste t para a comparação entre lados e grupos. Ao comparar-se a média da somatória das oito retas, houve diferença para o grupo acometido, mas não para o grupo controle e para a comparação entre os grupos. Conclui-se que na avaliação do SEBT, para a amostra estudada, há déficit proprioceptivo do lado lesado comparado ao lado não lesado.

PALAVRAS-CHAVE: propriocepção; manifestações neuromusculares; fisioterapia.

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