17 - ASSESSMENT OF NEUROMUSCULAR CONTROL OF COMPETITORS IN TAEWKONDO TATHLETES HROUGH THE STAR EXCURSION BALANCE TEST

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INTRODUCTION

Taekwondo is one of the several kinds of martial art that were originally developed more than 120 centuries ago in Korea. It is single by the predominantly use of kicking techniques, including the simplest to the most complex techniques, making an intensive use of legs in the attack and in the defense.The practice of this sport also involves a lot of flexibility, jumps and dislocations, which requires excellent physical conditioning and perfect technical and tatical skills.

In addition, there are techniques that generate imbalances, projections and rotations, and thay also require a good postural control from these athletes (Pereira, 2000).

The maintenance of balance and body orientation is essential for carrying out daily life activities and physical activity and sport (Duarte Freitas, 2010).

As a major determinant for the balance, proprioception is directly correlated to neuromuscular control, in which mechanoreceptors send proprioceptive afferentsto the CNS to provide dynamic joint stabilization, by detecting the movement and the knowledge of joint position in space (AQUINO et al., 2004).

The joint stability may be defined as the ability of the joint to return to its original state after suffering a disturbance; it is an essential requirement for performing functional movements, maninly for athletes (FONSECA, OCARINA, SILVA, 2004).

A very common factor, when it comes to sport, are injuries.According to studies, the body part most often injured in Taekwondo are the lower extremities, especially the sole of the foot (Ramos & Martínez, 2009). When this occurs, proprioception, neuromuscular control and normal joint stability are compromised (Silvestre, LIMA, 2003).So martial arts athletes need to have an efficient mechanism of neuromuscular control and dynamic joint stability for better control over their balance, mainly because they are subject to unexpected external perturbations imposed by their opponents in order to unbalance them and take them down (Yoshitomi et al. 2006), as well as in the case of taekwondo athletes.

Therefore, taekwondo practitioners are expected to have an improved a better neuromuscular control than individuals who do not practice this sport, since that in the practice of an athletic movement, their afferent mechanisms are precisely ordered all the time, as in the case of kicks in one foot, in which ordering the best position to maintain balance, distribution and control of body weight is essential to the efficiency of the blow.

There are still few ways to dinamically evaluate the effect of neuromuscular control in functional performance (Aquino et al., 2004).Most evaluations of joint position sense, does not assess the functional performance of patients and it is usually used expensive equipment, which are hardly found inrehabilitation centers and clinics.(Artioli; PORTOLEZ; Bertolini, 2011).

The evaluation of neuromuscular control may be performed using the Star Excursion Balance Test (Sebt),a low-cost test which evaluates the patient dynamically.It has been used to assess proprioception, postural balance, the integrity of the body armor.

Thus, it helps to identify athletes with increased risk of injury the lower limbs. Researches show that the performance is improved after Sebt training, which is an widely used instrument for the reassessment of the patient during rehabilitation.(PLISKY et al. 2009).

It is important to assess the neuromuscular control of athletes who practice taewkondo due to the shortage of scientific papers related to the sport, that really informs whether the training of an athletic movement of the sport improves significantly the neuromuscular control of individuals.The objective of the study was based on assessing if taewkondo influences on neuromuscular control individuals practitioners.

METHODOLOGY

The present study it is not a randomized clinical trial, cross-sectional quantitative.

Sample

For both the sample was divided into two groups: Control Group (CG) was composed by 12 individuals, nine men and three women, avarage age of 15.25 years, body mass index (BMI) of 21.19 ± 2.562 kg/m2, in which all participants reported greater stability in one foot in the MID. In Taekwondo Group (WG), also with 12 people, nine were men and three were women, avarage age 15.41 years, mean BMI of 20.53 kg/m2 ± 2.979, all of them reported greater stability in one foot support in the MID. There were no significant differences between groups, thus showing to be perfectly homogeneous and that it is possible to use them to make comparisons.

For inclusion in GT, it was considered people who have practiced taekwondo as a competitive sport, for, at least, 4 months. The inclusion criteria for CG were individuals who did not play any sports as a competitive sport and that have similar characteristics similar the GT, relevant to the study as: age, weight and height.

It was excluded from the search any individual with lower limb injuries in the last six months, history of lower limb surgery, history of brain injury, visual or vestibular disorders, respiratory infections or inner ear infections, who did not appear in more than two days pre -scheduled to perform evaluation, or that because of some reason was unable to complete the test.

The researchers contacted the teens, these ones aged between twelve and eighteen, and later to a presentation they provided clarification about the study, its objectives and its means of realization. For individuals who have agreed verbally to participate, it was asked to a responsable to read and sign a consent form (ICF).

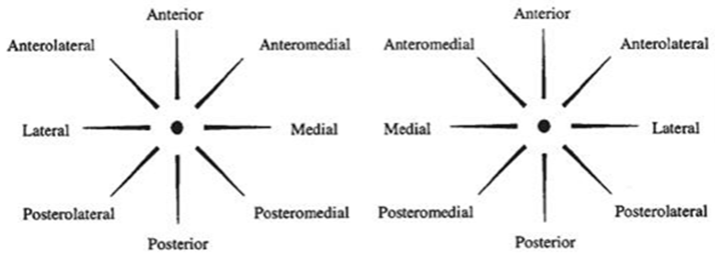
Star Excursion Balance Test

To perform the evaluation proprioceptive, it was used the Star Excursion Balance Test (Sebt), which consists of a functional test, in which the individual performed one foot of a leg, with a maximum range of the member opposite, following the examiner's directions. The supporting foot was positioned in the center of a star made of masking tape on the floor. This star

consisted of 8 lines of 120 cm and 45 degrees of angulation between the lines, starting at a single point, forming a union of lines in the center.

The eight lines were marked according to the direction of the tour on the position of the limb: anterolateral (AL), anterior (A), anteromedial (AM), medium (M), posteromedial (PM), posterior (P), posterolateral (PL) and lateral (L). We followed the clockwise range of lines when the left lower limb (LLL) was fixed on the ground and the counterclockwise when the right lower limb (RLL) was fixed to the ground (Figure 1).

Figure 1 - Lines to perform the Sebt to the left and right lower limb, respectively.



The evaluation was conducted in the Physical Therapy Clinic at the State University of West Paraná. All analysis were previously scheduled and confirmed with the volunteers.

The examiner showed the test before it be conducted by the person, who practiced at least once every eight directions, with each member. Before starting the test, the volunteer had the distal portion of his/her big toe of the contralateral lower limb marked with a bullet (lipstick).

For testing, the volunteer had to keep one foot on the ground and hands still on hips, balancing his/her body weight. Then he/she used the contralateral limb to achieve the greatest possible distance along the vector indicated by the examiner. Finally,the individual should lightly touch the farthest point possible, with the most distal hallux marked with lipstick, in order to ensure that stability has been adequately achieved, using neuromuscular control of postureof the limb.

Then the person positioned in bipedal support, maintaining the equilibrium position.The examiner, only one for all the assessments,measured the distance from the center of the lines to the point of touching the feet, using a measuring tape to measur in centimeters (COTEet al., 2005).

The examination allowed 10-second pauses between each range vector, it was performed three times each range line and the measure used was the average of the three.

The test was repeated when: the examinee took the heel of the supporting soil, or the support foot out of the intersection of the lines (center), when the individual could not touch the line, made in weight-bearing toe touching the line; when he/she took his hands off the waist or when he/she lost his/her balance anyway. In case of error, the person rested for 10 seconds and he/she then realized the scope of the line again.

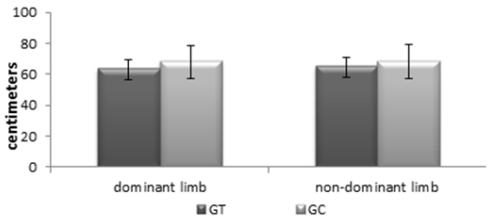
Statistical Analysis

For data analysis we used the Student t test, paired for comparison within groups and unpaired for comparison between groups, with significance level $p<0.05$.

RESULTS

Significant differences were not found in the comparison of the dominant and non dominant limbs of the GT and the GC, and the means found were 63.79 ± 5.753 in TG and 68.76 ± 10.06 in CG for the dominant limb, however the non-dominant limb the averages found were 65.39 ± 7.367 in TG and CG 68.82 ± 11.39. (figure 2)

Figure 2- Graphic with average range of the dominant and non-dominant limb of both groups.



In the comparison between the groups, significant differences were only found for the dominant limb in two lines of reach.For the non-dominant limb it was not found differences in any line.The average values for the range of the line are specified in figure 3.

Figure 3- Avarege values of range of the dominant and non-dominant limb for all the lines

LINE OF RANGE	CONTROL GRUP		GRUP TAEKWONDO	
	DOMINANT LIMB	NON-DOMINANT LIMB	DOMINANT LIMB	NON-DOMINANT LIMB
AL	67,75	62,03	62,94	67,94
A	71,25	68,31	66,42	71,53
AM	76,03*	70,14	68,03*	73,17
M	74,08*	68,75	65,75*	73,36
PM	72,92	68,86	66,44	73,81
P	67,06	68,81	64,28	66,86
PL	63,25	64,06	61,67	62,75
L	57,78	57,89	54,81	55,44

DISCUSSION

It is believed that the age and gender of the respondents has not influenced the results, due to the proximity of avarage values between the groups.And according to Tookuni et al. (2005), it is not necessary to separate by sex young people.The results between the control group and the taekwondo group proves that there is no difference in neuromuscular control between these individuals, and it may be attributed to the lack of specific training of proprioception and neuromuscular control during the training of taekwondo athletes however the control group has not undergone specific training either.

Therefore, specific training of proprioception and neuromuscular control would be very important to taekwondo athletes perform better, as inathletic movement sports, the demand of such systems is much higher compared to individuals who do not practice any sport in a competitive way.

Similarly, studies show that exercise programs that stimulate the proprioceptive sensory pathways may improve athletes' postural control, reducing the incidence of injury in sports, and this way, creating one more advantage of specific training (Verhagen et al.2004).

Another factor that may have been decisive for the results is that despite the participating athletes did not suffer injury in the lower limbs in the last six months, the act of athletic sports, consisted mainly by kicks, is likely to microtrauma, which may influence the proprioceptive system and the neuromuscular control.

Any change in these systems, either sensory or motor, influences directly on postural control, which may cause the performance degradation and even injuries. (Bressel et al. 2007).

Studies show that younger athletes, aged less than 18 years, have more injuries than more experienced athletes, possibly because the first ones do not have a high-performance of motion control(Kazemi et al. Al. 2009). In this context, the application of proprioceptive exercises becomes more important for both prophylactic action and for rehabilitation of musculoskeletal injuries in young taekwondo athletes.

It is then suggested the Sebt to be applied not only as a meanof evaluating the athletes' performance, but as a mean of assessment and reassessment of neuromuscular control, thereby determining the effectiveness of specific training, when it exists, to this control, which is the key to achieve this sportive gesture(Pereira, 2000).

There are still few ways to evaluate dynamically the effect of neuromuscular control (Aquino et al., 2004), so the Sebt becomes a viable option, because it is a low-cost test which evaluates the athlete in a dynamic way. Thus, it is suggested the appliance of this test to a larger number of athletes with similar characteristics, inorder to obtain more precise datas of the test effectiveness.

CONCLUSION

It is concluded in this study, by the Sebt evaluating, that taekwondo does not influence significantly on neuromuscular control of athletes.

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ASSESSMENT OF NEUROMUSCULAR CONTROL OF COMPETITORS IN TAEWKONDO TATHLETES HROUGH THE STAR EXCURSION BALANCE TEST

SUMMARY:

The taewkondo is a martial art that uses mostly a struggle the lower limbs, constantly making use of kicks.Thus, the maintenance of balance and body orientation is essential for this sport.The neuromuscular control is crucial for balance and it must be effective in taekwondo athletes, who are subject to unexpected external perturbations imposed by their opponents.It is known that the lack of proprioception or balance may damage neuromuscular control which leads to in injuries.This study had as goal to evaluate whether taekwondo influences on neuromuscular control of who practice the sport. For both the sample was divided into two groups: Taekwondo Group (GT), formed by individuals who practiced taekwondo as a competitive sport, and

Control Group (CG), with individuals who did not practice any sport in a competitive way. The proprioceptive evaluation was performed by Sebta, the test was performed bilaterally in one foot in the center formed by the intersection of lines. Significant differences were not found in the comparison the dominant and non dominant limbs of the GT and the GC, and the means found were 63.79 ± 5.753 in TG and (CG) 68.76 ± 10.06 in CG for the dominant limb, however the non-dominant limb the averages found were 65.39 ± 7.367 in TG and CG 68.82 ± 11.39. In the comparison between the groups, significant differences were only found for the dominant limb in two lines of reach. In this study, we conclude that taekwondo does not influence in a significant way the neuromuscular control of athletes.

KEY WORDS: Neuromuscular Control, Taekwondo,SEBT

L'ÉVALUATION DU CONTRÔLE NEUROMUSCULAIRE ATHLÈTES DETAEKWONDO CONCURRENT STAR EXCURSION BALANCE TEST

RÉSUMÉ:

Le Taekwondo est un art martial qui utilise principalement une lutte des membres inférieurs, sans cesse en utilisant des coups de pied. Ainsi, le maintien de l'équilibre et l'orientation du corps est essentielle pour ce sport. Le contrôle neuromusculaire est crucial pour l'équilibre et devrait être effective dans les athlètes de taekwondo, qui sont soumis à des perturbations inattendues externes imposées par leurs adversaires. Il est connu que le manque de proprioception ou de l'équilibre peuvent altérer le contrôle neuromusculaire qui conduit à une blessure. Cette étude visait à évaluer si l'influence de taekwondo sur le controle neuromusculaire des praticiens individuels. Pour les deux l'échantillon a été divisé en deux groupes: Taekwondo (GT), forméepar des individus qui ont pratiqué le taekwondo comme un sport de compétition, et le groupe témoin (GC), avec des personnes qui ne pratiquent pas un sport compétitif. L'évaluation a été effectuée par SEBT a proprioceptive, le test a été réalisé de façon bilatérale dans un pied, le centre formé par l'intersection des lignes. Il n'y avait pas de différences significatives lorsque l'on compare la dominante et nondominante par rapport au GT et GC, et les moyens trouvés pour 63,79 ± 5,753 dans les TG et CG 68,76 ± 10,06 pour le membre dominant, comme pour les moyennes des membres non-dominants ont été trouvés 65,39 ± 7,367 dans les TG et CG 68,82± 11,39. En comparant les groupes n'étaient pas significatives diferences entrées pour deuxdroites membre dominant de portée. Dans cette étude, nous concluons que le taekwondo n'influence pas significativement le contrôle neuromusculaire des athlètes.

MOTS CLÉS: contrôle neuromusculaire, le Taekwondo, SEBT

EVALUACIÓN DEL CONTROL NEUROMUSCULAR EN LOS ATLETAS DE TAEKWONDO COMPETENCIA A TRAVÉS DE LA PRUEBA STAR BALANCE EXCURSION

RESUMEN:

Taekwondo es un arte marcial que utiliza principalmente una lucha de los miembros inferiores, constantemente haciendo uso de patadas. Por lo tanto, el mantenimiento de la orientación y el equilibrio del cuerpo es esencial para este deporte. El control neuromuscular es crucial para el equilibrio y debe ser eficaz para los atletas de taekwondo, que están sujetas a perturbaciones externas inesperadas impuestas por sus oponentes. Se sabe que la falta de propiocepción o el equilibrio puede afectar el controlneuromuscular que conduce a la lesión. Este estudio tuvo como objetivo evaluar si la influencia de taekwondo en el control neuromuscular de los profesionales individuales. Por tanto la muestra se dividió en dos grupos: Taekwondo (GT), formado porpersonas que practican taekwondo como un deporte competitivo, y el grupo control(GC), con individuos que no practicaban ningún deporte de forma competitiva. La evaluación fue realizada por SEBT propioceptiva, la prueba se llevó a cabo de forma bilateral en un pie, el centro formado por la intersección de las líneas. Comparando los grupos no se encontraron diferencias significativas para las entradas de dos membros recta dominante de su alcance. En este estudio, se concluye que el taekwondo no tiene influencia significativa en el control neuromuscular de los deportistas.

PALABRAS CLAVE: Control Neuromuscular, Taekwondo, SEBT

AVALIAÇÃO DO CONTROLE NEUROMUSCULAR EM ATLETAS COMPETIDORES DE TAEKWONDO POR MEIO DO STAR EXCURSION BALANCE TEST

RESUMO:

O taekwondo é uma arte marcial que utiliza na maior parte de uma luta os membros inferiores, fazendo uso constantemente de chutes. Assim, a manutenção do equilíbrio e da orientação corporal é essencial para essa prática esportiva. O controle neuromuscular é determinante para o equilíbrio e deve ser eficiente em atletas de taekwondo, que estão sujeitos a perturbações externas inesperadas, impostas pelos seus adversários. É sabido que a falta da propriocepção ou equilíbrio podem prejudicar o controle neuromuscular o que leva a lesões. Este estudo teve como objetivo avaliar se o taekwondo influencia no controle neuromuscular de indivíduos praticantes da modalidade. Para tanto a amostra foi dividida em dois grupos: Grupo Taekwondo (GT), formado por indivíduos que praticavam taekwondo como modalidade competitiva; e Grupo Controle (GC), com indivíduos que não praticavam nenhuma modalidade esportiva de forma competitiva. A avaliação proprioceptiva foi realizada pelo SEBT, o teste foi realizado, bilateralmente, em apoio unipodal, no centro formando pela intersecção das retas. Não foram encontradas diferenças significativas na comparação entre os membros dominantes e não dominantes quando comparado o GT e GC, sendo as médias encontradas de 63,79 ± 5,753 no GT e 68,76 ± 10,06 no GC, para o membro dominante, já para o membro não dominante as médias encontradas foram de 65,39 ± 7,367 no GT e 68,82 ± 11,39 no GC. Na comparação entre os grupos só foram entradas diferenças significativas para o membro dominante em duas retas de alcance. No presente estudo, conclui-se que o taekwondo não influencia de forma significativa no controle neuromuscular de atletas.

PALAVRAS CHAVES: Controle neuromuscular, Taekwondo, SEBT