96 - PROPRIOCEPTION TRACK FOR PREVENTION AND TREATMENT OF SPORTIVE LESIONS

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Introduction

There are a large variety of sports, and each has its own physiologic requirements with its specifications. The athletic success depends on the ideal combination between skills, psychological and physiological factors, which are proper for each sport in particular (RODRIGUES, 1994). The sportive lesions, traumalogic or not, they are the biggest negative effects of sport, because they interrupt the training and diminish the physical fitness (ANDREWS et al, 2000), may lead to complications by agonist/antagonist unbalances (DVIR, 2002) and postural alterations. The physiotherapists so may act at the multidisciplinary team following and helping the elaboration of the training regularity, coming up with micro-cycles of recovering, for example, hydroisokinetictherapy, the postural reeducation, stretching classes, rhythm, coordination and relaxation. These classes or physiotherapy sessions incorporate Prevention Programs or Sportive Treatment, without removing the athlete from his training environment and helping the ideal come back, with all the considerable physical capacities. It well reported in the literature that sportive lesions are a serious problem and they are on the increase in the sport, and that rarely the proprioceptive factors are considered in a Preventive Program (GOLD, 1993). Prevention Programs can help the sportive practice to enhance its benefits to the athletes' health and minimize the occurrence of lesions (ELLENBECKER, 1992; WILK et al, 1993). It should be made clear that an athlete with a good balance and reaction time will be less susceptible to lesion. The athlete will be able to avoid situations that cause lesions and he/she will need to work less vigorously to repair the position of the body after losing the balance (GOLD, 1993). The most common lesions in the sports are the ones on the knee and ankle, being violent distensions the most frequent (SALGADO, 1990; RIBEIRO et al, 2003). In Salgado (1995), we find that after ankle and knee lesions a great part of the patients presents instabilities or even great sensitivemotor perturbations, leading to recidivous traumas. Patients with chronic instabilities by mal treated violent distensions present constant sinovite before successive violent distensions, pain to the moves and articular weakness, forming a repetitive cycle that gets worse progressively. It occurs claudicating on the march going to an increase of the deficit of the articular mechanics. Whatever the etiology, the repetition of the violent distensions involves the join, and if the vicious cycle is not broke there will probably be arthrosic and degenerative lesion, which also may reach the knees (SALGADO, 1990). According to Kuprian (1989) “the repairing through the function” is the treatment that will prepare the athlete to resume the training and, this way, is ready for the competition. The objectives of the Prevention or the Physiotherapeutic Treatment are: the repairing of the normal function, the strengthening of the neuroligamental set and the correction of the improper balance. Salgado (1995) defines the proprioceptive reeducation as a sequence of procedures whose objective is to repair the function or alter the experiences of a new neuromotor program. The functional physiotherapy is a facilitation of motor activity based on scheme of reflex activity, of local and general coordination through the various techniques, turns the mioarticular system more prepared (SALGADO, 1995).

Objectives:

•Prevent knee and ankle lesions;
•Prepare the joins avoiding the repetitious one.

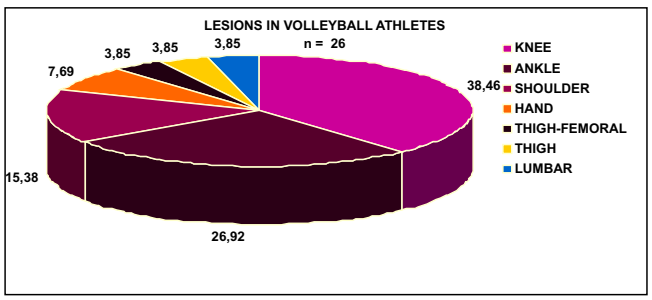
Material and Methods

This is a field research within two steps: the first a transversal and the second a longitudinal. In the first 26 volleyball athletes hurt during an international championship held annually by the Curitibano Club, Curitiba - Paraná, were evaluated in order to check the most common lesions into a competition of juvenile volleyball athletes. The second step longitudinal started from the physiotherapeutic evaluation constituted by anamnese, posture evaluation, measuring, perimetria, articular mobility test, subjective test of muscle strength and special tests (HOPPENFELD, 1997), applied to 12 juvenile male volleyball athletes of the Curitibano Club, at the time Juvenile Paranaense Team, that took part as control group. The data were arranged in columns and organized in the Excell 2005 program. From the data collect, one accomplished a bibliographic survey trying to set the specific angulations of the joins as well their biomechanics and lesions mechanisms. It were also accomplished analyses of the cinesiotherapic techniques and of the sport with the objective of building a Proprioception Track found for athletes. The Proprioception Track of knee and ankle was elaborated with ten stations, with the objective of reproducing the moves of the lesions mechanisms from the specific calculus in order to build ramps, degrees and scales, and of the elaboration of combined moves with the physiologic biomechanics of the knee and ankle joints. The Proprioception Track was used twice a week, for ten minutes of treatments. The athletes were reevaluated and accompanied for two years consecutive. To the data arranged in column, it was applied the T Student test, to the comparisons between the lesions presented between the first and the second evaluation. The lesions of the superior limbs were discarded. The statistic significance was adopted in 5% (*p<0.05), using the Student parametric T test, for dependent variable in an even group of analyzed individuals (SIDNEI SPIEGEL, 1981).

Results

In the transversal step 26 athletes hurt during the international games promoted by the Curitibano Club, in Curitiba - Paraná, were evaluated. Of these 38.46% (10 athletes) had knee lesions, 26.92% (7 athletes) had ankle lesions, and 15.38% (4 athletes) had shoulder lesions, still 19.24% (4 athletes) had other kinds of lesion (Figure 1).

Figure 1: Lesions noticed on the athletes who took part in the International Championship promoted by the Curitibano Club (in percentage).



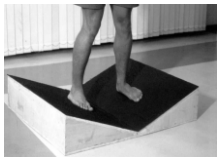
In the longitudinal step where 12 volleyball athletes of the Curitibano Club, Curitiba - Paraná, at the time Juvenile Paranaense Team, were evaluated and two knee joint distensions were found, one degree 1 but chronic and the other degree III. On the knees 4 lesions were found: 2 tendonitis on the knee, 1 Osgood Schlatter and 1 osteocondritis. There was 1 subcromial bursitis associated to tendonitis of supraspikes and tendonitis of long head of the biceps. In hand, a joint distension of interfalangeana of medium finger. Every evaluated by the physiotherapy, also diagnosticated by the private athletes' orthopedist doctor and confirmed by complementary examinations. The athletes were undergone to a physiotherapeutic treatment and traditional doctor, and after also undergone to the use of the proprioception track. According to the incidence of lesion before the application of the Proprioception Track, there were 67% of athletes occasionally hurt, being 50% of lesions of inferior limbs: knee and ankle.

The Proprioception Track was elaborated with 10 steps, and applied twice a week, for 10 minutes before the trainings.

The Proprioception Track owns 10 steps that seek to impose different stimuli to promote the reeducation of the muscle leading it to have quicker answers to the unbalances caused during a match or training. The steps are formed in a progressive way in order to neuromotor learning, varying the speed of passage on the track and with or without sneakers and socks. The changes on the angulations and of the articular rhythms over the passage on the steps are fundamental.

The steps are:

STEP 1: EVERSION RAMP
Material: wood, non-sliding rubber.
Size: 80cm of width by 80cm of length.
Angulation: 30 (in “v” form to actuate simultaneously on the two feet).
How it works: promotes the neuromuscular control; articular instability provoking the muscle contraction opposite to the asked movement, that is, defense reaction; head and members control; different ground perception.



STEP 2: INVERSION RAMP
Material: wood, non-sliding rubber.
Size: 80cm of width by 80cm of length.
Angulation: 30 (with decline opposite to the eversion ramp).
How it works: promotes neuromuscular control; head and members control; articular instability provoking the muscle contraction opposite to the asked movement, that is, defense reaction; different ground perception; but with emphasis on the inversion movement.



STEP 3: BOX WITH RUBBERS
Material: wood, punched rubber (e.v.a).
Size: Box of 80cm of side by 30cm of height.
How it works: promotes instability allowing the athlete develops the articular protection; neuromuscular control; promotes coordination of trunk, head, inferior and superior members.



STEP 4: DEGREES OF FOAM
Material: Foam with density, Box of wood.
Size: Degrees with 50cm of side being 2 degrees with 20cm of height, 2
degrees with 40cm of height, 1 degree 60cm of height.
How it works: promotes the articular instability; the neuromuscular control; the cinesthesic perception; different ground perception.



STEP 5: DORSI-FLEXION RAMP
Material: wood, non-sliding rubber.
Size: 80cm of width by 1m of length.
Angulation: 20
How it works: from the instability one goes to get muscular contraction opposite to the asked movement, promoting defense reaction of the joints; perception of a different ground; proprioceptive reeducation.



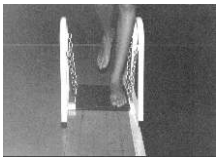
STEP 6: PLANTI-FLEXION RAMP
Material: Wood, non-sliding rubber.
Size: 80cm of width by 1m of length.
Angulation: 40
How it works: from the instability one goes to get muscular contraction opposite to the asked movement, promoting defense protection of the joints; perception of a different ground; proprioceptive reeducation; emphasizing the planti-flexion movement.



STEP 7: CIRCULAR BALANCE BOARD
Material: Wood, carpet, iron.
Size: 1m of diameter.
How it works: provokes unbalance that the athlete tries to correct, favoring the neuromuscular control and promoting the watching and concentration state.



STEP 8: ALTERNATED TRACK OF FOAM
Material: Cubes of foam of different density, flakes of foam,
boxes of wood for each cube.
Size: Each cube has 50cm of side by 30cm of height.
How it works: promotes the maximum of instability where the athlete is going to move by the non-hurt segment and after on the hurt segment; neuromuscular control; perception of different textures.



STEP 9: ANKLE SWING
Material: Iron, chains wood non-sliding rubber.
How it works: propitiates major balance favoring the propriceptive reeducation; neuromuscular control; rotational stability of knee and ankle; head, trunk and members coordination.

STEP 10: ELASTIC PLATFORM



How it works: uses the provoked and controlled unbalance to produce major number of proprioceptive information to the level of knee and ankle; associated to the sport basis promotes ability, concentration, and head, trunk and members coordination.

The athletes were evaluated each 6 months and followed diary by the physiotherapist. Referring to the knee and ankle lesions through this research followed, there was a meaningful reduction $p<0.008$ of 50% of the inferior members lesions. There was not found ankle lesion above 1 degree and this only on an athlete who has already presented chronic lesion, valgo ankle and flat foot, with articular instability. This athlete presented consecutive tendon distensions, but after the two years of application of the Track, the tendon distensions reduced and the joint presented more stability. For the Osgood Schlatter lesion, it was reduced the volume of training and undergone to the physiotherapeutic treatment taking part regularly in the training and of the Track. The athlete who presented osteocondritis was absent of the training and of the program, he remained practicing physiotherapy. Over the years of following and of application of the Proprioception Track the athletes presented neither knee nor ankle lesion, even traumatic.

Discussion

The noticed results into the statistic survey of the lesions occurred over the International games of the Curitibano Club are according to the expected following the present in the literature (SALGADO, 1990 and 1995; RIBEIRO et al, 2003). Salgado (1995) has already pointed to the knee and ankle lesions as the most common between athletes of different modalities. Ribeiro et al (2003) carried out a study with 50 federates male athletes of a paulista club of futsal with age between 9 and 16 years, who practiced futsal, once the most common lesions were: 46% foot and ankle and 19% knee. Among the various reasons of the incidence of these lesions are possibly the great number of leaps (lesions for efforts) and the need of sudden stops and fast movements required by the volleyball (lesions for traumas) or still fall on the opponent's foot upon retaking a blockade or an unbalanced cut too near the net (lesion for trauma). These signs may be stronger with unprepared muscles or a treatment that neglects the balanced effort of the agonist/antagonist relation of the musculature of the ankle and knee (DVIR, 2002). The permanent conditions of the court (small irregularities, loosen boards, etc.) or even those provoked by the own sport (wet or sweat on the court) are also possible reasons (ANDREWS et al, 2000). Instability and overload produced in the various sport practices, alterations in irregular ground, sport of contact, capsule-ligaments instability and muscular defaults are the most common factors that predispose to the joints lesions. On the maltreated sharp lesions occurs breaks or distensions of the ligament structures, which are articular bridles, with associated lesion of the sensitive elements of joint.

These sensitive elements send signs to the superior centers and transmit information about the direction, strength speed of the executed movements. Once they are not trained again, there will be defaults on the articular movements of the ankle and knee, getting new lesions.

In different cases the athletes come back to the competitions before the hurt ligaments reach 90% of normal resistance (SALGADO, 1990; DVIR, 2002). The reactions of the neuromuscular mechanism are improved, refined, and accelerated by the stimulation of the proprioceptors. The use of complex movements is based on the basis of the maximum stimulation of the neuromuscular device with the additional help of an entire movement. The muscle and joint receptors are important elements within the stimulation of the motor system (KUPRIAN, 1989). The functional instability is due to a lack of motor coordination having, however, the proprioceptive reeducation activate the joint receptors through the coordination of the proprioceptive reflexes and muscular reorganization, in order to set the stability and the balance of the hurt segment (SALGADO, 1990).

The main objectives of the Track are the proprioceptive neuromuscular reprogramation, which acts as reflexive training and increases the quality and speed of the answer of muscular protection. Thus, it gives conditioning and increases proper capacity improving the articular defense. Moreover, also promoting dynamic control of the hurt joint through the specific training of the neuromuscular coordination (ANDREWS et al, 2000; HAMILL e KNUTZEN, 1999; SMITH et al, 1997). The steps act individually and all together promoting the proprioceptive training through provoked unbalances favoring the neuromuscular control. According to Salgado (1995) the athletes will develop proprioceptive vigilance (“continuous attention state”) getting so muscle answers adapted more efficient, these, nevertheless, tend to disappear if there is no training anymore.

The importance of repetitious factor is fundamental, having the participants automatize it through schemes and adjusted to external factors, repeating the key movements over their everyday activities (GOLD, 1993).

The steps are put up in a progressive way forming a Proprioception Track, in order to get neumotor learning, once it can vary the moves speed onto the track and with or without sneakers and socks. The changes of the angulations and of the articular rhythms over the track on the steps are fundamental. Its exercises follow a progression inasmuch as all the joint structures and muscles related to the ankle and knee are required during its application. The use of the track may be different for the prevention and treatment cases. In physiotherapeutic treatments this may be considered as an integrant part of the protocol and be always led by the skilled professional on the behalf. In the case the objective is the prevention it can be used before and after the treatment taking into account part of this or of a Preventive Physiotherapy Program.

Gold (1993) cites that, independently of the specification of the strength and stretching activities, the corporal positions must considerate posture and coordination in order not to occur instability of a region in due to other, for the muscular systems try to escape from the muscle disturbs during the development for the muscle fitness.

In programs of physical activities, the muscle function does not depend only on the strength, resistance and flexibility, but also of the coordination, being this import for not occurring lesions by the own physical conditioning. The coordination careless makes difficult the accomplishing of physical exercises not usual and complex (GOLD, 1993). One needs to know the largest number of techniques that are based on these principles and choose, working in details, according to each lesion and, individually, on predetermined objectives, requesting a muscle, a muscle group, or any structure of the locomotor set (SALGADO, 1995). The Proprioception Track works the proprioceptive reeducation exciting the nervous ends in order to get in an automatic or reflexive way the muscular contractions, with the purposes of protection or learning the movement. This way, we can justify the reached benefit through the Proprioception Track on athletes of volleyball, preventing the lesions or their repetitive ones on ankles and knees.

Conclusion

The proprioception track was elaborated and built up based on scientific evidences, on bibliographic basis an tested for two years. It presented meaningful reduction $p<0.008$ of 50% of lesions on inferior members, after using by male volleyball athletes, so it may be part of sport training, target to prevention or as a treatment in the way of lesions recovering, getting in an automatic way, reactions of protection to the mechanism of trauma.

Key words: Proprioception track, athletes, lesions.

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PROPRIOCEPTION TRACK FOR PREVENTION AND TREATMENT OF SPORTIVE LESIONS
ABSTRACT

Prevention programs can help the sport practice to enhance their benefits to the athletes' health and minimize the occurrence of lesions (ELLENBECKER, 1992; WILK et al, 1993). Preventing knee and ankle lesions through proprioception is the issue of this research. This is a field research within two steps: the first a transversal and the other longitudinal. In the first 26 volleyball athletes hurt during an international championship held annually by the Curitibano Club, Curitiba - Paraná, were evaluated in order to check the most common lesions into competition. The second step stated from the physiotherapeutic evaluation of 12 juvenile male volleyball athletes of the Curitibano Club, over juvenile Paranaense selection season, that took part in as a control group. From this data survey a proprioception track for knee and ankle was elaborated. The proprioception track has been used for two years, twice a week, for ten minutes. The athletes were reevaluated by the T Student test, for the comparisons between the lesions reported at the first and the second evaluation. At the transversal step, one noticed that the major lesions (65%) were on inferior limbs 38% knee and 27% ankle. So it has been made a bibliographic survey based on scientific evidences for building the proprioception track. That track owns ten steps with different stimuli. Steps sequence: eversion ramp, inversion ramp, box with rubbers, foam degrees, dorsi-flexion ramp, planti-flexion ramp, circular balance board, foam alternated track, ankle swing, and elastic platform. After two years of use of the proprioception track there were 50% of meaningful reduction ($p<0.008$) of the inferior limbs lesions. The track acts making the proprioceptive neuromuscular reprogramation, which acts as reflexive training increasing the quality and speed of muscle protection, diminishing the lesions signs of knee and ankle.

KEY WORDS: Proprioception track, athletes, lesions.

VOIE DE PROPRIOCEPTION POUR PRÉVENTION ET TRAITEMENT DE BLESSURES RAPPORTÉES AU SPORT
RESUME

Des programmes de prévention peuvent assister la pratique sportive à exacerber leurs bénéfices à la santé des athlètes et à minimiser la présence de blessures. (ELLENBECKER, 1992 ; WILK et al, 1993). Prévenir des blessures de genou et de cheville à travers proprioception est l'objectif de cette recherche. Celle-ci est une recherche de champ, avec deux étapes : la première transversale et la seconde longitudinale. Dans première ont été évalués 26 athlètes de volley-ball blessés pendant le Tournoi International promu annuellement par le Club Curitibano, Curitiba - Paraná, objectivant de l'incidence de blessure dans concurrence. La seconde étape longitudinale, est partie de l'évaluation physiothérapeutique de 12 athlètes de volley-ball masculin de la catégorie juvénile, du Club Curitibano, à l'époque sélection Paranaense Juvénile, qui a participé comme groupe contrôle. À departir de cette enquête de données a été élaborée une voie de proprioception de genou et de cheville. La Voie de Propriocepção a été utilisée par deux ans, deux fois dans la semaine, par 10 minutes. Les athlètes ont été réévalués en s'appliquant l'essai T de Student, pour les comparaisons entre les blessures présentées dans première et dans la seconde évaluation. Dans l'étape transversale, s'est observé que la majorité des blessures 65%, était dans des membres inférieurs, du genou 38% et cheville 27%. alors a été réalisée une enquête bibliographique basée sur des évidences scientifiques pour la construction de la voie de perception propre. La voie possède dix postes avec de différentes stimulations. Ordre des postes : pente d'éversion, d'inversion, de boîte avec des caoutchoucs, d'étapes de écume, de pente de flexion dorsale, de flexion plantaire, plaque d'équilibre circulaire, voie alternative de mousses, équilibre de cheville, lit élastique. Après deux ans d'utilisation de la voie de perception propre, a y eu 50% de réduction significative ($p<0,008$) des blessures de membres inférieurs. La voie agit en faire la reprogrammation neurone musculaire de proprioception qui agit comme entrâinemente réfléchissante en augmentant la qualité et la vitesse de la réponse de protection musculaire, diminuant l'indice de blessures de genou et de cheville.

MOTS CLES: Voie de perception propre, athlètes et blessures.

PISTA DE PROPIOCEPCIÓN PARA PREVENCIÓN Y TRATAMIENTO DE LESIONES DEPORTIVAS
RESUMEN

Programas de prevención pueden ayudar a la práctica deportiva a exacerbar sus beneficios a la salud de los atletas y reduciendo la ocurrencia de lesiones. (ELLENBECKER, 1992; WILK et al, 1993). Prevenir lesiones de rodilla y tobillo a través de propiocepción es el objetivo de este estudio. Esta es una investigación de campo, en dos etapas: la primera transversal y la segunda longitudinal. En la primera fueron evaluados 26 atletas de voleibol lesionados durante el Torneo Internacional promovido anualmente por el Club Curitibano, Curitiba - Paraná, objetivando incidencia de lesión en competición. La segunda etapa longitudinal, partió de la evaluación fisioterapéutica de 12 atletas de voleibol masculino de la categoría juvenil, del Club Curitibano, en la época selección Paranaense Juvenil, que participó como grupo control. A partir de este levantamiento de datos fue elaborada una pista de propiocepción de rodilla y tobillo. La Pista de Propiocepción fue utilizada por dos años, dos veces por semana, por 10 minutos. Los

atletas fueron reevaluados aplicándose el teste T de Student, para las comparaciones entre las lesiones presentadas en primera y en la segunda evaluación. En la etapa transversal, se observó que la mayoría de las lesiones el 65%, era en miembros inferiores, rodilla el 38% y tobillo el 27%. Fue entonces realizado un levantamiento bibliográfico basado en evidencias científicas para la construcción de la pista de propiocepción. La pista posee diez estaciones con diferentes estímulos. Orden de las estaciones: rampa de eversión, de inversión, caja con gomas, escalones de espuma, rampa de dorsi-flexión, de planti-flexión, tabla de equilibrio circular, pista alternada de espumas, movimiento de tobillo, cama elástica. Después de dos años de utilización de la pista de propiocepción, hubo el 50% de reducción significativa (p<0,008) de las lesiones de miembros inferiores. La pista actúa haciendo la reprogramación neuromuscular propioceptiva que actúa como entrenamiento reflexivo aumentando la calidad y velocidad da respuesta de protección muscular, reduciendo o índice de lesiones de rodilla y tobillo.

PALABRAS-CLAVE: Pista de Propiocepción, atletas y lesiones.

PISTA DE PROPRIOCEPÇÃO PARA PREVENÇÃO E TRATAMENTO DE LESÕES ESPORTIVAS

RESUMO

Programas de prevenção podem auxiliar a prática esportiva a exacerbar seus benefícios à saúde dos atletas e minimizar a ocorrência de lesões. (ELLENBECKER, 1992; WILK et al, 1993). Prevenir lesões de joelho e tornozelo através de propriocepção é o objetivo desta pesquisa. Esta é uma pesquisa de campo, com duas etapas: a primeira transversal e a segunda longitudinal. Na primeira foram avaliados 26 atletas de voleibol lesionados durante o Torneio Internacional promovido anualmente pelo Clube Curitibano, Curitiba - Paraná, objetivando incidência de lesão em competição. A segunda etapa longitudinal, partiu da avaliação fisioterapêutica de 12 atletas de voleibol masculino da categoria juvenil, do Clube Curitibano, na época seleção Paranaense Juvenil, que participou como grupo controle. A partir deste levantamento de dados foi elaborada uma pista de propriocepção de joelho e tornozelo. A Pista de Propriocepção foi utilizada por dois anos, duas vezes na semana, por 10 minutos. Os atletas foram reavaliados aplicando-se o teste T de Student, para as comparações entre as lesões apresentadas na primeira e na segunda avaliação. Na etapa transversal, observou-se que a maioria das lesões 65%, era em membros inferiores, joelho 38% e tornozelo 27%. Foi então realizado um levantamento bibliográfico baseado em evidências científicas para a construção da pista de propriocepção. A pista possui dez estações com diferentes estímulos. Ordem das estações: rampa de eversão, de inversão, caixa com borrachas, degraus de espuma, rampa de dorsi-flexão, de planti-flexão, prancha de equilíbrio circular, pista alternada de espumas, balanço de tornozelo, cama elástica. Após dois anos de utilização da pista de propriocepção, houve 50% de redução significativa (p<0,008) das lesões de membros inferiores. A pista atua fazendo a reprogramação neuromuscular proprioceptiva que age como treinamento reflexivo aumentando a qualidade e velocidade da resposta de proteção muscular, diminuindo o índice de lesões de joelho e tornozelo.

PALAVRAS-CHAVE: Pista de Propriocepção, atletas e lesões.