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Original

PHYSIUM EN LA REDUCCIÓN DEL RIESGO DE LESIONES EN JUGADORES DE FÚTBOL SALA DE ÉLITE: UN ESTUDIO PILOTO

PHYSIUM IN RISK REDUCTION OF INJURIES IN ELITE INDOOR FOOTBALL PLAYERS: A PILOT STUDY

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RESÚMEN

Antecedentes: La reducción del riesgo de lesiones es crucial para los clubes de fútbol. Las lesiones previas que presentan los jugadores les producen importantes restricciones miofasciales que son el factor de riesgo más importante para posteriores lesiones. Physium puede ser un dispositivo útil para prevenir el riesgo de lesión.

Objetivo: Evaluar la seguridad y la eficacia de PHYSIUM en la reducción de lesiones de riesgo y re tasa de lesiones durante una temporada en jugadores de futbol sala de elite con riego de lesionarse.

Material y métodos: 9 jugadores de fútbol sala entre 18- 35 años de edad, con una lesión crónica fueron incluidos en el estudio clínico confirmatorio. El riesgo de lesión fue evaluada por el fisioterapeuta mediante la prueba biomecánica de Saló Darder (SD). Los jugadores que presentaban restricciones miofasciales fueron tratados con 1 ó 2 sesiones de de 90 minutos con Physium antes del siguiente partido.

Resultados: Physium reduce el nivel de riesgo de lesiones 2n 1,8 puntos (Puntuación máxima del test de SD = 3) en los jugadores profesionales. Todos los jugadores se declararon aptos para jugar el próximo partido después de la terapia.

Discusión: Physium es un dispositivo diseñado para mejorar la recuperación muscular y prevenir las lesiones deportivas. La presente investigación es innovadora en el campo de la recuperación de las lesiones de jugadores. PHYSIUM parece ser seguro y reducir el riesgo de lesiones en jugadores de fútbol. Sin duda las conclusiones alcanzadas ayudarán a mejorar la salud de muchos jugadores y de otros atletas. Futuros estudios podrían demostrar el papel PHYSIUM® en la reducción del riesgo de lesiones.

Palabras clave: masaje, lesión crónica miofascial, prevención, extralimitación, entrenamiento, rendimiento.

ABSTRACT

Background: Reduction of the risk of injury is crucial for football clubs. Previous injuries are the most important risk factor for football injuries due to important myofascial restrictions. Since now no effectiveness procedures were observed. Physium may be a useful device that could be used to prevent risk of injury.

Objective: To evaluate the safety and the effectiveness of PHYSIUM in the reduction of risk injuries and re injury rate over one season during the indoor football matches in players that prese*nt* a risk of injuries.

Material and methods: 9 indoor football players between 18- 35 years of, with a chronic injury were included in the study confirmed clinically. The risk of injury was assessed by the physiotherapist using the biomechanical test of Saló Darder (SD). Players with myofascial restrictions before a match received 1 or 2 sessions of 90 minutes treatment of PHYSIUM once a week.

Results: Physium reduce the risk of injuries in 1,8 points (SD Score, maximum 3) in the professional players. All players were declared fit to play the next game after therapy.

Discussion: Physium is a device designed to improve muscle recovery and prevent sports injuries. The present research is innovative in the field of recovery of injury to players. PHYSIUM appears to be safe and reduces risk of injuries in football players. No doubt the conclusions reached will help improve the health of many players and other athletes. Future comparative studies would prove the PHYSIUM® role in reducing the risk of injury.

Keywords: massage, myofascial chronic injury, prevention, overreaching, training, performance.

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INTRODUCTION

Football is the most popular sport worldwide with around 265 million players (FIFA, 2006). Every sport has a unique profile of injury and risk of injury. Injury prevention is a crucial point. According to the van Mechelen model 1 prevention of sports injury can be seen as a four step sequence: (1) the extent of injury is evaluated through surveillance; (2) risk factors and mechanisms of injury are established; (3) on the basis of this information preventive strategies are introduced; (4) preventive strategies are evaluated by repeating first step (Mechelen et al, 1992).

Previous injuries are the most important risk factor for football injuries. Players that had a previous hamstring injury, groin injury, and knee joint trauma have an increased risk of an identical injury, independently of age (Hägglund et al., 2006). Muscle rupture is of special concern in sports that involve explosive action and full speed running, mainly due to its high incidence and the high rate of recurrence (Hägglund et al., 2006).

Based on published studies (Arnason et al., 2008; Caraffa et al., 1996; Croisier et al, 2008; Emery and Meeuwisse, 2010; Gabbe et al., 2006; Gilchrist et al., 2008; Holmich et al., 2009; Kirkendall et al., 2010; Waldén et al., 2012), we emphasize the importance of prevention strategies that take into account the multifactorial nature of this injury, emphasizing the analysis and correction of strength deficits agonist / antagonist and adjacent muscles alterations and fundamentally influential on the pelvis.

When a link (at any point of the chain) comes under tension, a tensional chain is initiated. This link where the tensional chain begins is called the “primary injury”. The primary injury will tense all of the subsequent myofascial units (links) and joints in sequential order. This tension along the myofascial chain (starting from the primary injury) will create a “tensional chain”. This will lead to biomechanical compensations in the body; leading to tension in antagonistic muscles of the affected tensional chain, which will lead to a symptomatic injury. Research will focus on determining the role of the tensional chain as a relevant risk factor and to test whether deep massage treatment is a good preventive measure to prevent injury. These techniques will provide the professional sports clubs a basic knowledge of the individual tensional chains for each player. This personalized knowledge will be used to prevent injury.

Saló-Darder (SD) test evaluates the tensional chain and the risk of injuries. This is a biomechanical diagnostic test to find the primary injury in chronic disease. The SD method is based on the premise that the state of stress in tissues (muscles, fascias, joints, nerves, blood and lymph vessels, organs, viscera), traumatic injury to these, or degenerative processes bring about retraction (muscular system) and adherences (fascial system), and/or scarring fibrosis can cause limitation of movement (muscular, joint and fascial),as well as pain and inflammation (muscular, joints and fascial), and may be linked to stenosis in the aponeurosis of the vascular and nervous systems. Individuals make unconscious muscular-articular-fascial to compensate for movement limitations through the intervention of tissue tensional chains (muscles, fascias and articular joints).

PHYSIUM is a device that has a carriage with eight adjustable arms, ending in 8 head applicators to treat eight body areas at once, and two mobile units. Head applicators produce on the treated tissue of a mechanical stimulus by kneading/compression, that acts on the muscle-connective, vascular, lymphatic, and neurologic tissues. This stimulus has two components, the suction force or pressure and rate or duration of applied pressure, which can vary greatly depending on the therapeutic goal. Treatment is applied once a week in sessions of 90 min. PHYSIUM is a safe non-invasive device that reduces tension and prevents injury.

This study aims to evaluate the safety and effectiveness of PHYSIUM in the reduction of injuries risk and re injuries rate during the indoor football matches over one season in players at risk of injuries. In addition, the effectiveness of PHYSIUM as standard rehabilitation device was tested for acute injury recovery, muscle fatigue, muscle and joint balance, and to recover from post-stress muscle fatigue, prevent injury and improve athletic performance after a strong exercise.

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METHODS

A pilot study designed as an interventional, analytical, longitudinal, prospective, before-and-after trial was performed during the 2012-2013 season.

Study Population and selection criteria

All the players of an indoor football team were included in the study. These 10 professional players were male between 18 and 35 year old, without any prior serious medical illness. They were assessed by a sport physician after each match over the whole football season (September 2012 to July 2013), following international guidelines for surveillance of football injuries (Hägglund et al, 2005; Fuller et al, 2006).

When the physician diagnosed an episode of overload, muscle pain or injuries, a physiotherapist assessed the muscles of players that were in a retractable process by the test of Saló Darder (SD). This test determines the existence of a tension in a myofascial unit, evaluating eight potential tensional myofascial chains and one local myofascial chain related to the scapula to identify the state of tension or health of the myofascial unit and the joint.

Evaluation phases

The evaluation has 4 phases: (1) placement of the patient in the position to allow the evaluation (2) location of the anatomical point to be examined in the myofascial unit and positioning of the fingers on it; (3) observation of the direction in which the evaluation points move; (4) determination of the correct or incorrect direction of the movement and the degree of tension in the myofascial unit or joint being evaluated. The movement is correct when it shows a physiological movement and incorrect when a limited or pathological movement is observed. The movements in the myofascial units are evaluated at each point and established a rating scale depending on the seriousness of the limitation. If the myofascial unit is stretched, an incorrect movement may (or may not) be detected and the seriousness of the limitation may be determined in inverse proportion to the extent to which the myofascial unit is stretched.

The SD test assesses the degree of injury risk in 4 categories: 3: maximum risk, 2: medium risk, ≤ 1 low risk; 0: no risk (table 1). Only subjects with an evaluation of ≤ 1 are allowed to play.

Injuries were classified as first- or second-degree strains based on SD's 3 description and with a mechanism of injury likely leading to strain injury of the muscles, tenderness to palpation within the muscle-tendon unit of the hamstring, pain with passive tension testing using a passive straight leg raise test, and a limitation of daily or sport activity.

The diagnosis of the primary injury is essential to consider the optimal treatment program to be administered with PHYSIUM.

The most important and prevalent injuries in the indoor football players are hamstrings injuries (biceps femoris and semimembranosus-semitendinosus). The SD test identifies stressed hamstring muscles and risk of muscle breakage. To assess the hamstring rate, two groups of muscles, biceps femoris and semitendinosus-semimembranosus are evaluated, in order to detect which groups are working properly and which are in a retractable process.

The subject is placed in bipedestation with separated legs at the hips level to evaluate the *biceps femoris* by the SD test. The evaluator stands behind the player, with one knee on the floor and the other bent on and the the portion postero-external of the common tendon is assessed. This tendon has a fixed point at a distal insertion (fibular head) and a mobile point at the hamstring tuberosity. The purpose of the SD test in the evaluation of biceps femoral is to tense the fascial system from the valuation point to the mobile point. The physiotherapist puts the tip of his thumb perpendicular to the tendon. The distal phalanx is at 45º and in contact with the poster-external tendon edge. The player performs a slow and progressive cervical, thoracic, lumbar, and hip flexion and has to maintain the knee strain throughout the movement; otherwise produce false diagnosis. The physiotherapist contact and fix the fascia at the point of valuation and performs a fascia caudal traction without losing contact or depth. In normal conditions the movement is cranial associated with external ringing, but in pathologic cases a caudal movement represents hamstring strain. A cranial movement without being associated with the external ringing movement, corresponds to a connective disorganization in the insertion of the hamstring complex or a large strain of the major gluteus.

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Table 1. Diagnostic Test of Saló Darder

Grade	Symptoms	Salo Darder Test Degree of Risk	Playing recommendation
3	Immediately on stretching the myofascial unit, then the myofascial unit is subject to maximum tension	Maximum risk	Not recommended for high-performance exercise
2	At the midpoint in stretching the myofascial unit as far as possible, then the myofascial unit is subject to an intermediate degree of tension	Medium risk	Not recommended for high-performance exercise
1	When the myofascial unit is stretched as far as possible, then the myofascial unit is subject to moderate tension	Low risk	fit to play
0	When the myofascial unit is stretched the myofascial unit is not subject to tension	No risk	fit to play

The subject is placed in bipedestation with separated legs at the hips level to evaluate ***semitendinosus-semimembranosus*** by the SD test. The evaluator stands behind the player, with one knee on the floor and the other bent on. The physiotherapist assesses the postero-internal portion of the common tendon. This tendon has a fixed point in a distal insertion (medial surface of the tibia and pes anserine bursitis) and a mobile point in the hamstring tuberosity. The purpose of SD semitendinosus-semimembranosus test is to tense the fascial system from the valuation point to mobile point. The physiotherapist put the tip of the thumb perpendicular to the tendon. The distal phalanx is at 45º and contact the poster-external tendon edge. The player, as in the biceps femoral test, performs a slow and progressive cervical, thoracic, lumbar, and hip flexion and has to maintain knee strain throughout the movement; otherwise it may lead to wrong diagnose. The physiotherapist contact and fix the fascia at the point of valuation. He carries a caudal traction of the fascia without losing contact or depth. In normal conditions the movement is cranial associated with external ringing, but in pathologic cases the caudal movement represents a semitendinosus and semimembranosus strain. A supero-internal or internal translation corresponds to a complex adductor strain; and a cranial movement correspond to a strain of the insertion of the hamstring complex or high major gluteus strain.

The SD test classifies both muscles groups (biceps femoris and semitendinosus-semimembranosus) of players in 4 levels: Grade 3 - hip flexion from 0 to 20°; Grade 2 - hip flexion between 20 to 40 °; in Grade 1 – hip flexion> 40 °; and in Grade 0 - the subject has a normal physiological movement.

Intervention

When a player presented a retractable process in a tensional myofascial chain, with a SD test value >2, the football club standard recovery therapy was combined with a massage applied with **PHYSIUM** in the retractable areas for 90 minutes per session. If necessary, a second session was performed before the next match. Only subjects with a grade of ≤ 1 were considered fit to play. Following the assessment, the physiotherapist contacted with the responsible of the Football Club Medical Services to evaluate the availability of the players for the next game.

Additional treatment sessions could be required if other acute injuries were present. A lymphatic drainage in the antagonist area was administered if an inflammatory process was present in the first session. The lymphatic drainage with PHYSIUM follows the direction of physiological pathways of the lymphatic drainage, and its action is similar to that developed by manual massage, with the advantage that PHYSIUM performs a pumping from the deep tissue to the surface (REF o unpublished data).

Response variable

The primary endpoints were the reduction of injuries risk after the treatment assessed by the SD test, and the injuries or re-injuries observed after a strong exercise match or strong training) in players which risk of injuries reduced to SD ≤ 1. The secondary

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endpoints were sport muscle recovery after a strong exercise evaluated by recovery of acute injuries, reduction of muscle discomfort, increase of muscle strong, and mobility. Adverse events observed by the therapist or reported by the player were recorded

RESULTS

9 of 10 players were treated with PHYSIUM at least once over the season. All of them presented different chronic injuries (Table 2). Players received a variable number of PHYSIUM sessions depending on the number of times that they were at risk previous a match and the level of injury risk they had. In total 162 sessions were performed (range 2-41; mean 18,0) over the season.

Table 2. Injuries treated during the study

Tensor	52 (15,7)	**Knee**	9 (2,7)
Psoas	52 (15,7)	**Gluteus**	8 (2,4)
Hamstrings	47 (14,2)	**Trapeze**	8 (2,4)
Abductor	25 (7,5)	**Straight**	7 (2,1)
Lumbar Square	17 (5,1)	**Biceps femoris**	7 (2,1)
Twin	16 (4,8)	**Lumbosacral**	7 (2,1)
Ankle	15 (4,5)	**Pyramidal**	6 (1,8)
Tendon	13 (3,9)	**Tibial**	6 (1,8)
		Others *	37 (11,1)
All injuries (season 2012-2013)			**332 (100.0)**

* Others (number of cases <5)

At baseline, before any session, players had a SD grade = 3 in 152 cases (93,8%), a SD grade =2 in 9 cases 5,6%) and a SD grade =1 in one case (0,6%) (table 3). The SD grade mean score was 2,9 points.

Table 3. Effect of PHYSIUM in indoor football players with risk of injury assessed by the Salo Darder Test (Score: 0 to 3 points)

SD Score	Before sesión N (%)	After sesión N(%)
3	152 (93,8)	1 (0,0)
2	9 (5,6)	0
1	1 (0,6)	161 (100,0)
Mean	2,93	1
Absolute Risk Reduction		1,93 points
Relative Risk Reduction		65,90%

After the treatment sessions with PHYSIUM all players, except one, had levels reduced to a grade = 1. The absolute risk reduction was 1,9 points and the relative risk reduction was 65,9% (table 3). All players were declared suitable to play the next game after treatment.

Concomitant interventions like diathermia, massage oils were used in 7% of sessions

Subjects also presented some acute injuries. If these injuries produced pain or important disturbances, the players were treated with PHYSIUM, even if the chronic lesion in the baseline was evaluated as grade 1 in the SD test. After treatment with PHYSIUM 98% of complaints were solved .

The safety profile of PHYSIUM was good. No serious injuries were reported during the study.

DISCUSSION

The injuries in indoor football elite players are common. Prevention of injuries or re-injuries would be beneficial for players, clubs, insurance companies, and society. However, nearly one third of these injuries recur within the first year following a return to sport, with subsequent injuries often being more severe than the original. Several factors likely contribute to the high rate of reinjury (Orchard J, Best, 2002) like the persistent weakness in the injured muscle, the reduced extensibility of the musculotendon unit due to residual scar tissue, and the adaptive changes in the biomechanics and motor patterns of sporting movements following the original injury. In addition to these injury-induced risk factors, there other modifiable risk factors. Evidence shows that the risk of reinjury can be minimized by utilizing objective measures to assess reinjury risk, and strategies to prevent injury occurrence, combined with objective measures to assess musculofascial recovery and readiness to return to sport.

This pilot study was designed to evaluate the effect of Physium in the reduction of risk injuries and re injury rate over one season during the indoor football matches in players that present a risk of injuries, supported by an adequate diagnostic examination of the football injury, that has a great value to determine the risk of the injury and its location.

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The strengths of our study include a combination of objective measures to diagnose the reinjury risk, and therapeutic strategies to prevent injury occurrence with Physium, to assess musculofascial recovery and readiness to return to sport. Other strengths are the absence of non-standardised treatments that don't permit to control how much and how well the massages were performed, and make the research of massage therapies difficult to conduct, to interpret and to reach clear conclusions (Cherkin et al, 1996). The standardization achieved with PHYSIUM facilitates study design and execution, and data interpretation, which increases the robustness and reliability of the study compared to other studies that evaluate other methods of massage that are less reproducible.

The *primary limitation* of this study is the relatively small number of subjects, but this fact was conditioned by the number of team players with risk of injuries and because it was a pilot study. It should be remarked that subjects with risk of injury treated with Physium wasn't injured in the following match after the treatment. Other *limitation* is the absence of a control group, but the observed effects are big enough to let us conclude that PHYSIUM has an important and beneficious effect on injury and re-injury prevention in indoor football players. Thus, the population included in the study was extremely challenging in order to show efficacy for a novel treatment, because the need to play as much frequent as possible. Other concern is that diagnoses were made clinically by physical therapists, and MRI exams were not performed to confirm the clinical diagnosis.

The main finding in this study was that a 90 minutes PHYSIUM program reduced the overall rate of risk of injury in indoor football players. Additionally, we saw a preventive effect for severe injury and any acute injury in players treated. Results indicate that Physium could reduce the incidence of risk of re-injuries in elite indoor football players.

These results have a direct application in indoor football players and other athletes, because these preventive measures in football could have a substantial effect on the injury burden. These measures could increase the number of matches and minutes played, extend the professional life of players and also dramatically diminish the costs associated with treatment. The direct costs of surgery and hospital care for injuries are high (Tyler et al, 2002; Holmich et al, 2009), and additional costs are associated with non-surgical treatment, postoperative rehabilitation, and disability claims. Secondarily this treatment could recover players faster.

In the future, other clinical trials comparing PHYSIUM with standard therapy with a larger sample size will be performed. Massage therapy delivered by PHYSIUM will increase homogeneity and standardization of treatments and will allow the design of treatment protocols with broad applicability, as recommended elsewhere (Cherkin et al, 1996).

CONCLUSIONS

From an injury perspective the treatment with PHYSIUM appears to be safe and reduces risk of injuries in in this player population, and gets the most in the competition in a short period of time, with an adequate safety profile. In this study PHYSIUM reduces risk of injuries in elite athletes and gets the most in the competition in a short period of time, with an adequate safety profile. Future comparative studies versus other treatments and comparing different seasons could show that PHYSIUM is a sport device that could be effective and well tolerate in the reduction of the injuries risk.

The present research is innovative in the field of recovery of injury to players. No doubt the conclusions reached will help improve the health of many players and other athletes.

REFERENCES

1. Arnason A; Andersen TE; Holme I; L. Engebretsen L; Bahr R. (2008). *Prevention of hamstring strains in elite soccer: an intervention study*. Scand J Med Sci Sports.18:40–8.

2. Caraffa, A., Cerulli, G., Projetti, M., Aisa, G., & Rizzo, A. (1996). Prevention of anterior cruciate ligament injuries in soccer. *Knee surgery, sports traumatology, arthroscopy*, *4*(1), 19-21.

3. Cherkin DC; Deyo RA; Street JH; Barlow W. (1996). Predicting poor outcomes for back pain

Journal of Sport and Health Research 2016, 8(3):223-230

seen in primary care using patients' own criteria. *Spine*.21:2900-2907.

4. Croisier, J. L.; Ganteaume, S.: Binet, J.; Genty, M., & Ferret, J. M. (2008). Strength imbalances and prevention of hamstring injury in professional soccer players a prospective study. *The American journal of sports medicine*, *36*(8), 1469-14.

5. Emery, C. A., & Meeuwisse, W. H. (2010). The effectiveness of a neuromuscular prevention strategy to reduce injuries in youth soccer: a cluster-randomised controlled trial. *British Journal of Sports Medicine*, *44*(8), 555-562.

6. FIFA. Fédération Internationale de Football Association. (2007). Big Count 2006: 270 million people active in football. www.fifa.com/aboutfifa/organisation/media/news/newsid=529882/index.html.

7. Fuller CW; Ekstrand J; Junge A; Andersen TE; Bahr R; Dvorak J; Hagglund M; McCrory P; & Meeuwisse, W. H. (2006). Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. *Scandinavian journal of medicine & science in sports*, *16*(2), 83-92.

8. Gabbe BJ; Branson R; Bennell KL. (2006). A pilot randomised controlled trial of eccentric exercise to prevent hamstring injuries in community–level Australian Football. J Sci Med Sport.9:103–9.

9. Gilchrist J; Mandelbaum BR; Melancon H; Ryan G. W: Silvers, H. J.; Griffin, L. Y.; ... & Dvorak, J.. (2008). A randomized controlled trial to prevent noncontact anterior cruciate ligament injury in female collegiate soccer players. Am J Sports Med.36:1476–83.

10. Hägglund M; Waldén M; Bahr R; Ekstrand J. (2005). Methods for epidemiological study of injuries to professional football players—developing the UEFA model. Br J Sports Med. 39:340-6. doi: 10.1136/bjsm.2006.026609

11. Holmich P; Larsen K; Krogsgaard K; Gluud C. (2009). Exercise program for prevention of groin pain in football players: a cluster randomized trial. Scand J Med Sci Sports. ePub ahead of print. PMID: 19883386.

12. Kirkendall DT; Junge A; and Dvorak J. (2010). Prevention of Football Injuries. Asian J Sports Med. 1(2): 81–92.

13. Mechelen W; Hlobil H; Kemper H. (1992). Incidence, severity, aetiology and prevention of sports injuries. *Sports Medicine*.*14*:82–99.

14. Orchard J; Best TM. (2002). The management of muscle strain injuries: an early return versus the risk of recurrence. Clin J Sport Med.12:3-5.

15. Tyler TF; Nicholas SJ; Campbell RJ; Donellan, S; & McHugh, M. P. (2002). The effectiveness of a preseason exercise program to prevent adductor muscle strains in professional ice hockey players. Am J Sports Med. 30:680–683.

16. Waldén M; Atroshi I; Magnusson H; Wagner P; & Hägglund M. (2012). Prevention of acute knee injuries in adolescent female football players: cluster randomised controlled trial. BMJ 2012;344:e3042. doi: http://dx.doi.org/10.1136/bmj.e3042