The immediate effects of acupuncture on the kickboxer postural balance: an exploratory randomised trial

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Abstract

Improving postural balance in kickboxers could enhance fighting performance and help to avoid injuries. To the best of our knowledge, there are no scientific data available on whether acupuncture could enhance balance and coordination in sportsmen. As stimulation of acupoint S34 could enhance gait and jumping power in athletes, we were interested whether it could also play a positive role in enhancing postural balance in kickboxers, after maximum exercise.

We developed an experimental, randomized single controlled study design and checked feasibility in a preliminary group of 10 Kickboxers. The individuals (n=10) were randomized in two groups: Experimental group and (EG, n=5) and Control Group (CG, n=5). After the written consent, 10 healthy athletes with basic technical knowledge of the techniques to be used (white belt level) and with a steadily trained kickboxing for at least 6 month prior to the test, were included. Athletes with relevant lesions, consumption of performance enhancing supplements in the week prior to the test, were excluded.

After the evaluation of player postural balance (platforms Bertec FP4060-15-2000) and the orthostatic position (12 Qualisys oqus cameras), as a baseline (T0) phase, all athletes performed a program of maximum effort during 60 seconds. Then the individuals of the EG received acupuncture treatment by stimulation of S34 point, with leopard spot technique while individuals of CG did not. After 2 minutes all the individuals were re-evaluated.

The main parameter was postural balance. There was a marginally significant results on the postural balance on CG (p= 0.068) into the area, distance and CoP migration velocity. On CG the results were always higher than in EG. Being these values inversely proportional in all situations there was loss of postural balance. Second parameter evaluated was workout per week: the number of workouts per week has a high negative correlation (r = -0.801, p <0.01). The increase of the number of workouts per week is significantly associated with decreased in area of the center of pressure, which results in gain of postural balance.

Curiously, we can conclude that acupuncture on S34 point was positive on the velocity and acceleration of player movements in similar work, while in the present work it is not effective for postural balance. So, further studies should be conducted with a major sample, and analysis of possible other relevant parameters.

Keywords: Acupuncture; Postural Balance; Platform forces; Kickboxers

Introduction

Balance is a maintenance process of gravity center projection within the body support base area that requires constant adjustment due to muscle activity and joint position (Alonso et al 2008; Riemann & Guskiewicz 2000). In the sport practice of martial arts balance is the key to a good offense and a good defense (Alonso et al., 2008). Postural control depends on a complex interaction between the nervous system, sensory and musculoskeletal (Carvalho, 2008). The balance maintenance requires sensory detection of body movement, the integration of sensory information to the central nervous system (CNS) and the appropriate driving response. The central nervous system has the function of coordinating the various joints, muscles and regulating sensory information from the somatosensory system, the visual system and the vestibular system, to maintain balance and postural orientation during standing position, walking or running among other tasks, biomechanical constraints and cadences of displacement / movement (Camargo & Fregonesi 2010; Sousa & Pastre, 2006).

In this context, this study is of particular importance because it will contribute to a better understanding of postural control mechanisms of Kickboxing and Muay Thai athletes, concerning an improve in the welfare of these athletes and their performance, preventing the appearance of lesions and also improve the quality of life. When there is an imbal-
Methods

Study Design - To achieve the proposed objectives, we develop a study type of prospective randomized experimental with a control. Study was composed of six main phases (Fig. 1), in order to verify the effect of S34 acupuncture point on the postural equilibrium level of kickboxers, in hard surface in the bipedal position, in conditions of open and closed eyes. After approval of the intervention project, the information was disseminated mainly in Kickboxing and Muay Thai Club where was explained the study and its objectives.

All work took place at the Biomechanics Laboratory of the University of Porto, where anthropometric measurements were taken such as: body weight, height, foot size.

After applying the pre-test, data was collected by forces platform Bertec FP 4060-15-2000, the signals are processed by a computer (PC) using the Acknowledge Program (ACK) and Matlab, and subsequently analyzed using SPSS / PC 18.0.

Selection and characterization of the sample - For this study we used a sample of 10 athletes of kickboxing, volunteered and healthy. Were selected for the study athletes that within the group of participants available fulfilled the inclusion criteria previously defined. This was a convenience sample (Patton, 1990), i.e. the group of participants was selected to meet the objectives of the study. The available experimental population consisted of kickboxing athletes who are part of a kickboxing club in the northern region, aged between 20 and 32 years old whose sociodemographic and anthropometric characteristics presented helped obtain sample homogeneity. Each element of the sample was distributed randomly by the "coin toss", into two groups: experimental group (EG) and control (CG).

In this context, the main objective of this work is to create a preliminary trial in order to evaluate the effects of the point Stomach 34 – *Monticulus Septi*, on the postural balance of kickboxing athletes after a maximal effort (ME) exercise. A small scale pilot test (n=10) was conducted and will be presented as a proof of concept.

Biomechanical studies are used to improve the body function and reduce injuries, providing a quantitative way to measure the interaction between the human body and the environment (McNitt-Gray, 1999).

Health professionals who accompany martial arts athletes should be aware of the benefits, risks and major injuries that can occur in their practice, as well as its prevention (Bezerra, 2009). They should consider that their practice can be recommended and adapted to any age, since it has numerous physical and psychological benefits, taking into account the needs of each individual. This style of fighting and defense is a form of exercise that can help in various social contexts such as obesity, sedentary lifestyle, aging and violence (Woodward, 2009).

In Portugal, there is no known of publications of any study similar to this research, so this gain greater relevance in evaluating the effects of acupuncture balance programs in Kickboxing athletes. In this context, it is a challenge for professionals who do research and intervention in this area, supporting scientifically future intervention activities in education / training of athletes.

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and closed condition on a firm surface. The signals from the force plate were recorded by Qualisys Track Manager program (QTM) with a frequency acquisition 1000Hz, and processed by a computer (PC) using the Acknowledge Program (ACK) and Matlab, and later analyzed using SPSS / PC 18.0. Measurements taken by the platforms provide relevant information about the area, migration velocity of the pressure center (CoP), among others. Each athlete is instructed to position himself as shown in the figure (Fig. 2).

The modified Test CTSIB (MCTS) identifies with bipedal support the differences of the contributions of the three sensory systems in the postural control: somatosensory, visual and vestibular (Mann et al., 2011). The test assesses for evidence of 40 sec, the speed of oscillation of the center of gravity on a firm surface - with eyes open and eyes closed - and register under the Qualysis Track Manager model (Fig 3).

**Experimental Protocol** - The pre-test was performed by the researcher at first assessment, before starting the procedure. All individuals selected and included in groups (EG and CG) responded to the sociodemographic questionnaire that was conducted anonymously and confidentially, after they completed the informed consent statement. Individuals of both groups (EG and CG) were then weighed, barefoot, without socks. At this time were also measured foot and height.

After the registration of all the variables of sociodemographic questionnaire, the athlete was placed in the Bertec FP4060-15-2000 forces platform in order to evaluate the postural balance, in conditions of open and closed eyes.

**Maximum effort exercise program** – After that athletes were encouraged to reach their maximum effort. This was divided into three main moments involving warm-up exercises and specific movements of arms and legs.

**Intervention Acupuncture** – It was accomplished, just after applying exercise program. Athletes of the control group sat in a chair and rested for 2 minutes. The elements of experimental group were subjected to the application of the "Leopard Spot Technique" (LST) on the acupuncture point S34 Monticulos Septi (Liangqiu) (Fig. 4). All elements of the sample were reassessed in the Bertec FP4060-15-2000 force platform for balance with open and closed eyes, and bipedal position on a firm surface. The elements of the control group were not subjected to any intervention, just rested for two minutes. Finally, there was a reassessment of postural balance, in the same conditions (condition of open and closed eyes).

**Statistical procedures** - After applying the sociodemographic questionnaires and data collection for the treatment of information obtained by the force platform, were encoded in Qualysis Software and later entered into a database for statistical analysis using SPSS 18.0 (Statistical Package for Social Sciences). A descriptive statistical analysis was done for each variable under study and used a non-parametric correlation analysis of Spearman.

To analyze statistically significant differences between the experimental group and the control group was used the nonparametric test for independent samples of Mann-Whitney. For all statistical procedures, the accepted level of significance was p ≤ 0.05. For this purpose, we used the statistical program SPSS, version 18.0 (Statistical Package for Social Sciences).

**Results**

All elements of the sample are Kickboxing and Muay Thai athletes, who participated in various competitions and are associated with respective Portuguese Federation. The sociodemographic and anthropometric characteristics of athletes were pondered and recorded. Thus, the experimental group had a mean age of 27.20 ± 4.43 years, body mass of 66.56 ± 10.77 kg, height of 170.80 ± 7.62 cm and a foot measure of 25.44 ± 1.60 cm.

The data obtained in this study indicate to the fact that the puncture point in S34 lead to decreased postural stability, on the experimental group (Fig.5). Although there is only marginally significant evi-
ence, we can say that there was more pronounced loss of postural balance in the experimental group once the values of the CoP area and migration speed increased.

Postural balance being inversely proportional to the area, distance and speed of the CoP migration, we can say that there was a marginally significant result in all situations. These results suggest, however, that the selected acupuncture point does not appear to be effective for postural balance. The results of the pre and post maximum effort exercise phase in the group with acupuncture treatment, demonstrate the existence of marginally significant differences (p = 0.068 z = 1.826) relative to several variables of these parameters, on condition of open and closed eyes (Fig 6).

Subsequent to the effort exercise program, the results are always higher in the area, distance and migration speed of CoP. As demonstrated by several studies in which postural balance decreases after the maximum effort on task achievement also our results are in accordance with the research already done. These marginally significant differences were particularly found in the open eyes condition (p = 0.068 and z = 1.826) relative to several variables of these parameters, on condition of open and closed eyes (Fig 6).

In summary, we can say that there is a significant and high relationship to the overall speed in the anteroposterior direction between the condition of eyes open and eyes closed. For its part, has not found a significant relationship to the global area and the medial-lateral global speed between the condition of open and closed eyes.

Discussion
The selection of S 34 point is because translates the *slamic point* of the stomach conduct, which means it is a point able to activate the Qi if for some reason it is congested or blocked (Porkert et al 1995; Hempen & Chow 2006). According to Greten (2010), besides the large analgesic effect to the knee joint which lies proximal, also have a very important role in analgesia throughout the stomach conduct. It is a point traditionally used in muscle weakness and neurological alterations at the level of the lower limbs (Hauer et al., 2011). Research refers it should be used in the reduction of microcirculation.

For research, the selection of this points its related to different aspects: the conduct path passes...
through some areas that belong to the sensory system such as vision, which play an important role at the level of postural balance. On the other hand, as regards the study of Cardoso (2014), the point is effective in terms of gait and vertical jump in young athletes, so we launched the challenge to realize its effectiveness in terms of postural balance in kick-boxers. Besides that, it is anatomically located in specific dermatome, the femoral nerve, responsible for the innervation of the anterior muscles of the thigh which are extremely important to enable the strategies of "ankle and hip" maintenance of postural balance.

However, this research indicates a decrease in postural stability for both the condition: open and closed eyes. These changes detected in the eyes closed condition seem to reveal greater postural sway values in the anteroposterior axis. Postural control changes significantly when visual information is suppressed or when the support base is smaller (Mann et al, 2011).

When the difficulty of the task increases, studies show there is greater body imbalance. In conditions where the information of the feet / ankles and visual information is suppressed, individuals rely on vestibular signals to control the balance of their body (Mann et al, 2011).

The results of this study, although with an increase in the area and displacement speed of the center of pressure, indicate a decrease in postural balance for closed eyes conditions confirming that found in previous studies that the vision and the presence of an unstable surface affect postural balance (Paulus et al 1984.; Pozzo et al 1995). This evidence reinforces the importance of visual and somatosensory information in postural control (Horak et al 1997).

Our results highlight the importance of visual information regarding the somatosensory information to Kickboxing and Muay Thai athletes. The analysis also questions the possible influence of the increase in body mass, in turn, can increase the force vector of gravity, making the body balanced. There is yet another variable that can influence the postural balance, but not considered in this study, which is the possible difference in muscle strength in the lower limbs, as verified by Bezerra (2009) in the elderly.

In our study, the assessment of postural balance used the speed of anteroposterior and medial-lateral oscillation. This represents an added value of our study, as the literature has shown that the analysis in the area and displacement speed of the center of pressure, indicate a decrease in postural balance in the lower limbs, as verified by Bezerra (2009) in the elderly.

In summary, the convenience sample selected compromises external validity, so we cannot generalize the conclusions to all Kickboxing and Muay Thai athletes. The sample was also considerably reduced, since in the stage required for the application program only 10 athletes have integrated the study due to exclusion criteria and reduced execution time set for data collection.

**Conclusion**

The principal aim of this study was to examine the therapeutic effect of acupuncture at the level of postural balance in Kickboxing and Muay Thai athletes, after a program of maximum effort exercises. The point of acupuncture S34, caused no significant improvement in the comparative analysis between the experimental group and the control group, taking into account the objectives initially proposed.

In fact, the results showed that at the end of the program, postural balance in Kickboxing and Muay Thai athletes decreased due to rising values of the area and the migration velocity of CoP, representing marginally significant difference from the beginning of the program (p<0.0685). So we can say that in this study there was a tendency to negatively affect the level of postural balance, after applying on the S34 point the "Leopard Spot Technique".

On the contrary, according to the foregoing objective and in accordance with the results obtained can be noted that there is a correlation, highly significant (p<0.01) between the number of workouts per week, and postural balance in kickboxers. This means that increasing the number of workouts per week significantly increases postural balance.

**Acknowledgements**

Authors acknowledge all the work team of the Applied Physiology Laboratory - ICBAS UP, for logistic, technical and revision support.

**References**


