Hypotensive effects in hypertenses after judo class

ABSTRACT: The hypotensive effects after exercise was investigated in several physical activities. However up to now in literature, it was not verified in Judo training in hypertensive subjects. This way, the aim of the present study was to verify the hypotensive effects after Judo class, during 60 minutes. Twelve hypertensive Judos players, none of them medicated, during alternated three days were evaluated. In the first visit to the lab, they did anthropometrics evaluation and the maximal cardiopulmonary test. In the second day, a Judo class was taken to reproduce the real training. In the last day, the training session was taking during 60 minutes and the measurement of the blood pressure was taken during 60 minutes in 10 minutes cycle. The data of blood pressure were analyzed by ANOVA of repeated measures (p<0.05). Non significant differences were found in blood pressure in rest. However the blood pressure assumes a tendency to decrease. So, the Judo class tends to decrease the blood pressure, but not with significance.

Keywords: hypertensive, judo players, physical training, hypotensive effects.
INTRODUCTION

Although the hypotensive effect in the after-effort BP has been mainly attributed to a decrease of the vascular resistance, the fundamental cause of such a decrease still not elucidated. It is very unlikely that the after-effort hypotensive effect is resulted of the thermoregulation or changes in the sanguine volume. Although some data suggest decreases in the activity of the efferent nerve after the effort, contradictory results are found in humans and in laboratory rats. Maybe the main related facts to that subject of the activity of the efferent nerve is the baroreceptor and specific hormones, but future investigations still necessary. Significant evidences in studies accomplished with rodents suggest hat levels of central serotonin can influence in the hypotensive effect, but recent studies in humans do not support those evidences in animal models. Other local factors seem to mediate the hypotensive effect, among them the circulating hormones. The measuring of hormones with potentials vesseldilators as the adrenaline, adenosine, potassium and atrial natriuretic peptide were moderated of increasing or maintain unaffected during the hypotensive effect. Natriuretic vesselconstrictor agents as the rennin, angiotensine II and anti-diuretic hormone were increased, decreased or unaffected after the effort. Evidences that the hypotensive effect can last for 17 hours after the exercise. On that time each one of those substances would presumably return to the resting values.

The possibility of none of those substances are fundamental in the hypotensive effect is presumably real. The alterations in the nitric oxide have been responsible by a hypotensor effect. Contradictory results found between the mechanisms originated in the brain and cardiovascular centers of control still obscure.

The arterial hypertension is classified as the main cardiovascular disease in the industrialized nations. Its chronic exhibition is associated to the lesion of the objective-organ, being considered one of the main risk factors for the coronary arterial disease, encephalic vascular accident, heart inadequacy, peripheral arterial disease and chronic renal inadequacy. In Brazil, in 1998, the prevalence of arterial hypertension in the adults’ population was between 15% and 20%. The physical exercises appear as an option of great relevance in the (BP) prevention and non-pharmacological treatment of the blood pressure. For the hypertenses, exist evidences that the aerobic exercises are effective in the reduction of the BP in resting, constituting a relevant form of non-pharmacological intervention. In opposition, other researches failed in basing such preposition, not observing significant differences in the BP in normotenses and hypertenses after a session of aerobic training. The effects caused by the strength training in the post-effort BP are less understood and few experiments compared their effects, evidencing like this results that are conflicting sometimes.

In the literature however, activities exist where still the hypotension effect of a training session was not verified on the BP of normтенses and hypertense individuals. Among such activities, it is noticed a gap in what says respect to the modalities of fights or sporting combats, activities that are also offered for the general public. Being taken into account that the Judo modality, even for non-athletes individuals involve muscular strength, strength resistance, potency, isometric strength, flexibility and aerobic resistance, is very clear the importance of the control and magnitude of the intensity and volume of a training session.

Maybe because the difficulty of monitoring such intensity, it becomes difficult a better understanding of the hemodynamic answers in the practice of this activity, but due to its importance in the sport field, and the beneficial effects of the aerobic exercise and the strength training on the BP, becomes the objective of this
experiment, to verify the hypotensive after-exercise effect on the BP in hypertenses individuals, apprentices of Judo, submitted to a session training of 60 minutes.

**MATERIALS AND METHODS**

**Sample**

Participated in the study 12 men, hypertenses and trained (black belt), with ages between 22 and 30 years (± 6.4), body weight between 101 and 130 Kg (± 17.3), height between 172 and 181 cm (± 6.2), systolic blood pressure (SBP) varying between 128 and 149 mmHg (± 10), and diastolic the blood pressure (DBP) between 83 and 104 mmHg (± 10). As exclusion criteria, was considered the use of ergogenic resources, osteoarticular problems that total or partially impeded the exercises execution, medication that affected the BP, caffeine or alcohol consumption and physical activity in the data collection day. All the subjects were voluntary and signed consent term, according to the resolution 196/96 of National Council of Health with experiments with humans.

**Data Collection**

The data collection was accomplished in three alternate days. In the first visit to the laboratory, the anthropometric measures and the maximum cardiopulmonary effort test were accomplished. In the second day, a Judo training session was accomplished for the familiarization with the training procedure. In the last day, the training session was also accomplished in 60 minutes with the gauging of the after-effort BP for 60 minutes in 10 minutes cycles, totaling six measures.

**Test of effort**

The test was accomplished in travolator, through protocol of Balke-Ware. The speed of the travolator and the increments in the inclination degree were established in agreement with the test protocol. In ideal conditions, the increments in the work rhythm were compared with the resting.

Illustration 1. Measures of the after-effort systolic blood pressure compared with the resting.

<table>
<thead>
<tr>
<th>Repouso</th>
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<td><strong>120</strong></td>
<td><strong>125</strong></td>
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<td><strong>140</strong></td>
<td><strong>145</strong></td>
<td><strong>150</strong></td>
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</table>

**Training protocol in the Judo**

The training session in the Judo was divided in four phases and monitored HR through the MZ1 Polar frequencymeter (Finland), so that the individual maintained a variation between 60 and 90% of HRmax. (obtained during the test of maximum effort) in the several phases of the class. The class was divided in four phases with the following characteristics: General warm-up, specific warm-up, main part and return to the calm.

**Phase 1 (general warmup)**

The class began with general warm-up, where the students traveled in a circle with 15 meters diameter, which was done in the proportion of one lap walking for two running. The incentives during the race were varied in the following way: Knees to the chest (15 sec.), heels in the hands (15 sec.); lateral displacement (30 sec.); arm flexing and extension (20 sec.); abdominal with anterior torso flexing (20 sec.). Between the incentives, an interval of 45 seconds was given and the total time of this activity was of five minutes. The interval for the next activity was of two minutes. This phase had seven minutes of total time.

**Phase 2 (specific warm-up)**

The specific warm-up was accomplished in a traditional way with the activities of Ukemis (falls), where the appraised moved away from each other and executed Ushiro Ukemi (backward reduction), under the pedagogic progression guided in Judo, in the three levels. Afterwards Yoko Ukemi (lateral reduction), in the three levels. Therefore after Mae Ukemi (front reduction), also inside of the same pedagogic evolution. After that phase the apprentices made Zempo Kaiten Ukemi (reduction with rolling on the shoulders), Ushiro Ukemi, Yoko Ukemi and Mae Ukemi in displacement. Concluding the specific warm-up with Tendoku Renshyu (shadow training), with Ashi Waza movements (foot or leg techniques), Te Waza (hand or arm techniques) and Koshi Waza (hip techniques), alternate with varied movements of Ukemi. The total time of this activity consisted of 15 minutes, with one minute of interval every five minutes of incentives. The total time of this phase was of 18 minutes.

**Phase 3 (main part)**

This phase began with stopped Uchikomi (repetition training), with series of 10 repetitions, only using techniques of Ashi Waza. The

**Illustration 2 - Measures of the after-effort diastolic blood pressure compared with the resting.**

<table>
<thead>
<tr>
<th>Repouso</th>
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<th>2°</th>
<th>3°</th>
<th>4°</th>
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<tbody>
<tr>
<td><strong>80</strong></td>
<td><strong>85</strong></td>
<td><strong>90</strong></td>
<td><strong>95</strong></td>
<td><strong>100</strong></td>
<td><strong>105</strong></td>
<td><strong>110</strong></td>
</tr>
</tbody>
</table>
duration of that activity was of three minutes. The interval for the next phase was of one minute of resting.

There was change of pairs and occurs the same work, this time with techniques of Te Waza, with the same methodology, time of incentive and interval. Uchikomi of Koshi Waza techniques followed the same beginnings for Te Waza and Ashi Waza.

After this activity we accomplished three minutes of activities. In this stage we executed Uchikomi in movement, alternately, with two repetitions, for one minute of stimulation. Three repetitions in Uchikomi in movement, for two minutes of stimulation, alternating Tori. At last we made five repetitions, in the same exercise, with three minutes of incentive, changing Tori, and at the end of each serie of five repetitions. At each change of the number of repetitions we accomplished a minute of active resting. After this task we did two minutes of interval.

To conclude this phase, took place the training of Kakarigeiko, where just one of the apprentices can freely attack and the other tried to defend inside of the technical beginnings of the Judo: Tai Sabaki (turns and dodges) and Jigotai (defense). This work had the duration of two minutes of incentive being one minute for each apprentice to be Tori, for one minute of interval, repeating the task, with duration of six minutes. The total Time of this phase was of 30 minutes.

Phase 4 (return to the calm)

The last phase of the class happened with the accomplishment of Yakusokugeiko (alternate training projecting the companion without resistance using the displacement on Dojô-Shintai), only of De Ashi Harai, in casual way for three minutes. For two tested minutes they walked the Dojô arranging their Judogui and we contained the class. The total time of this phase was of five minutes.

The variations of the movements and work forms were applied to favor the same work volume for each individual, when observed the load-repetition relationship. In all of the cases, the subjects were stimulated to not accomplish Valsalva maneuver.

Monitoring of the blood pressure

Before beginning the protocol of the training session in Judo, the subjects stay lying on the floor for approximately 10 minutes, and only after that rest the BP was checked. Immediately after the end of the Judo training session, the BP was checked for 60 minutes in 10 minutes cycles, in a total of six measures in a room with controlled atmosphere. The BP was checked through the auscultatory method (Tycos – Adult Size CE 0050). An experienced appraiser accomplished the resting measures, and the reliability of the measure was previously checked, before the accomplishment of the study. For the resting measure, the subject positioned the relaxed left arm in a plane surface at the shoulder height. The fixation of the cuff in the arm happened with approximately 2.5 cm of distance between their inferior extremity and the antecubital space. After the inflated cuff, the emptying process began in a reason of 2 mmHg for second to distinguish the first and fifth noise of Korotkoff, corresponding to the systolic and diastolic values, respectively. In each individual, the data were collected in the same schedules.

Statistical analysis

The data obtained in the 60 minutes of the BP were treated by ANOVA of repeated measures, following by the post-hoc of Scheffe verification, considering as significance level $p < 0.05$. The Statistics 5,5 (Statsoft, USA) program was used for the calculations.

RESULTS

The results of the analyzed variables can be observed in the Illustrations 1 and 2. In both sessions, the values of the measured SBP and DBP after the end of the exercises were lower than the before-exercise. However were not found significant differences in any appraised moment ($p > 0.05$). In relation to the variation in the percentile reduction in the after-effort SBP and in the DBP in relation to the rest, are demonstrated in the table 1.

Table 1. Behavior in the percentile reduction of the SBP and DBP in the period after the execution of a training session in Judo.

<table>
<thead>
<tr>
<th>Moment</th>
<th>Systolic Blood Pressure</th>
<th>Diastolic Blood Pressure</th>
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<tbody>
<tr>
<td>10 minutes</td>
<td>7.8%</td>
<td>9.3%</td>
</tr>
<tr>
<td>20 minutes</td>
<td>4.5%</td>
<td>5.6%</td>
</tr>
<tr>
<td>30 minutes</td>
<td>8.6%</td>
<td>2.1%</td>
</tr>
<tr>
<td>40 minutes</td>
<td>6.9%</td>
<td>2.1%</td>
</tr>
<tr>
<td>50 minutes</td>
<td>6.9%</td>
<td>2.1%</td>
</tr>
<tr>
<td>60 minutes</td>
<td>6.5%</td>
<td>2%</td>
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</table>

DISCUSSION

The results obtained in the present study did not demonstrate significant reductions of the BP in relationship with resting after a Judo session. However, it is noticed a tendency of reduction of the after-effort SBP and DBP. That reduction can be explained by the barorreflex mechanism associated to the sanguine perfusion in the area that is obstructed during the effort. It is characteristic in the Judo training a great isometry of superior and inferior limbs, mainly in training situations with the opponent, that consequently, promotes an attempt of complete postural stabilization.

As for the behavior of the BP after the physical exercise, most of the studies leaned over about the investigation of the hypotensor effect after the aerobic work. In relation to this activity type, it seems that the after-exercise hypotension could be influenced by the involved muscular mass, but there would not be influence of the intensity or of the work volume. In relation to the strength training, studies were also addressed to the investigation of the after-exercise hypotension. However, conflicting information are in relation to the behavior of the after-effort BP, as reduction, increase or any significant alteration. When the two exercises are combined (aerobic and strength), the available data in the literature are scarce.

In the Judo, the fighter should present an efficient postural control so that it allows the application of an efficient technique, because the modality is based on the opponent’s displacement and unbalance. In other words, during the training the judoka should use muscular and articular incentives to adapt to the different posture modifications for the application of the Judo techniques. The strength of manual and lumbar prehension, for instance, are extremely important for the domain of the judoka on the opponent.
So, the cardiopulmonary and neuromuscular systems are highly demanded in a training session in a simultaneous way. Maybe due to the specific characteristics of the Judo, we found a reduction of the after-effort SBP and DBP, even without considering that reduction statistically significant.

There was not the intention of investigating the responsible mechanisms for the after-effort hypotension. However, although some mechanisms are not conclusive, they are told as possible collaborators for that hypotension, the reduction of the total systemic sanguine flow and of the resistance offered by the peripheral blood vessels. Like this, a reduction of the heart debit could be verified, that would be related to reductions of the ejection volume, that were associated to a modification of the myocardial contractility for is time. The alterations in the peripheral vascular resistance can be consequence of the decrease of the peripheral sympathetic nervous activity, of the reduction of circulating catecholamines, of the metabolites accumulation, heat dissipation, reduction of the constrictor answer for humeral and hormonal factors, of the modulation of the baroreflex sensitivity and for the competitive action of the endorphins with the alpha 1-adrenergic receivers.

In that way, as the sample of the present study it is characterized as hypertense, it was possible to observe a reduction (even if non significant) of the SBP and DBP after the exercise.

In the present study, in spite of observing a tendency to the effect hypotensive in the SBP and DBP when compared to the resting measures, significant differences were not verified. For a discussion concerning the absence of a significant hypotensive effect, it is necessary that some factors are considered. The first factor concerns the possible mistakes in the measure. Measures obtained by the auscultatory method tend to underestimate the results of the BP in 30%, however, this is the viable and usual method in the verification of the BP values. However, it is important that the individual responsible for the gauging has experience, because difficulties to distinguish the noises of Korotkoff can cause mistakes. External sounds and arms movements, for instance, can bring difficulties for the distinction of these noises, causing mistakes in the measure. However, we tried to minimize any measure mistake, besides accomplishing the reproducibility of the appraiser’s measure.

The exercises volume is another factor to be considered. In this study, the accomplishment of the training, in some situations, might not have been an appropriate volume for the obtaining of a hypotensive effect. The effect of the fatigue in some moments provided a reduction in the number of movement executions at each new series. That might have influenced in the obtained results and corroborate with he evidenced in the literature, on the fatigue effect in a sequence of exercises.

In conclusion, the results of the present study suggest that a Judo training session was capable to promote reductions in the after-effort SBP and DBP, although not in a significant way. More intense sessions and with larger volume could promote a hypotensive effect and maybe influenced in is duration after the end of the activity. Other studies should be accomplished to compare such results and to extend them to other exercises, including the control of potentially intervening variables, as muscular mass, execution speed, execution order and simultaneous aerobic and strength training.

BIBLIOGRAPHICAL REFERENCES