THE EFFECTS OF ACUTE INHALED SALBUTAMOL ON POWER OUTPUT AND BLOOD LACTATE CONCENTRATION IN NONASTHMATIC ELITE KUNG FU ATHLETES

HAMID ARAZI1, NAVID LOTFI2, HOSEIN ROSTAMKHANI3

Abstract

Objective: The purpose of this study was to investigate the effects of inhaled Salbutamol on power output and blood lactate concentration in kung fu athletes. Methods: Seven elite Iranian kung fu athletes (age: 18.28±0.69 yr; height: 184.00±1.73 cm; weight: 69.84±7.78 kg; BMI: 23.25±1.45 kg.m⁻²) with no history of asthma were participated in this study. Subjects performed a RAST test with and without salbutamol ingestion (400 μg) in a random, double blind, crossover design. Blood samples were collected at before test and at the end of the test. An independent t test was used to evaluate the differences in subjects characteristics between groups (p<0.05). Results and Conclusion: There were no difference in peak power, mean power, fatigue index and blood lactate concentration with Salbutamol compared with placebo (p>0.05). In conclusion, administering a single inhaled (400 μg) of the β₂-adrenergic agonist Salbutamol to healthy, elite anaerobic trained male athletes has no ergogenic effect. Further studies are necessary to clarify the mechanisms involved.

Key words: Salbutamol, Anaerobic performance, RAST test, Ergogenic effect.
performed during the 30-second test, percent fatigue, and time to peak power. J.F. Signorile, T.A. Kaplan, B. Applegate, A.C. Perry (1992) studied the effects of acute inhalation of the bronchodilator, albuterol on power output and reported significant ergogenic effect of the bronchodilator on short-term power output independent of impact on respiratory smooth muscle, with no effect on cardiac response.

Anaerobic power is important in anaerobic sports such as kung fu and wrestling. Having high level of anaerobic power helps to these athletes for perform explosive techniques. Lactate increased during the sport has a negative effect on enzymes function and glycolysis process in energy production. Materials that can be used to increase power production and reduce lactate concentration can be improved performance in anaerobic sports. In often studied have been investigated the effects of Salbutamol intake on endurance performance and few study have been done on anaerobic power. Although in these studies subjects weren’t of anaerobic sports (K. Collomp, B. Le Panse, H. Portier, 2005, B.C. Sporer, A.W. Sheel, D.C. McKenzie, 2008, I.B. Stewart, J.M. Labreche, D.C. McKenzie, 2002, J.F. Signorile, T.A. Kaplan, B. Applegate, A.C. Perry, 1992). Also, because of prevalence use of β2-agonists such as Salbutamol in many athlete (such as Kung fu athlete) without knowledge of real effects of this drugs, the purpose of this study was to investigate the effects of acute inhaled Salbutamol on power output and blood lactate concentration in nonasthmatic elite kung fu athletes.

Methods
Subjects
Seven kung fu athletes with no history of asthma were recruited from the Kurdistan clubs and served as subjects in this study. They all had at least 5 years training experience and were top kung fu athletes of Iran competitors in national competitions. None were smokers and none had a history of atopy or of asthma or other cardio respiratory disorders. Before participating, subjects’ parents were informed of the potential risks and gave their written informed consent to participate their children in this study, which was consistent with the human subject policy of the Guilan research center.

Testing procedures
Crossover design was used in this study. Approximately 10 minutes before the testing, the subjects took either 400 μg inhaled administered Salbutamol or placebo (no active medication) (I.B. Stewart, J.M. Labreche, D.C. McKenzie, 2002). Anaerobic power was measured by the RAST test. The Running-based Anaerobic Sprint Test (RAST) was developed at the University of Wolverhampton (United Kingdom) to test an athlete's anaerobic performance. RAST is similar to the Wingate Anaerobic 30 cycle Test (WANT) in that it provides measurements of power and fatigue index. This test was chosen primarily due to its validity and reliability in relation to the Wingate test and also, because this test requires minimal equipment and training of the assessors and because of its specialty for field based anaerobic activities that are of a repetitive nature. It is easy to perform, provides scores that are easily reproduced and can be used to successfully estimate anaerobic capacity (E. Zacharogiannis, G. Paradisis, S. Tziortzis, 2004). In order to carry out a correct and precise testing process, the subjects stood 70 cm in the back of the starting line (on each side) and the apparatus would let the timer start after the subject passed in front of the first photocell. It was also decided that if in any of the cases the subject's best record was achieved after the second repetition, the test process should be finished and the subject was allowed to have another opportunity to participate in the test. To avoid these unwanted cases, subjects were asked to do each repetition at maximum power and avoid dividing energy between the six repetitions. Also, in order to increase the subjects' motivation, the record of each repetition was announced loudly and there were special rewards for three individuals who could achieve the best record, in addition to the payment in consideration of all the participants (E. Zacharogiannis, G. Paradisis, S. Tziortzis, 2004). Blood samples were collected from preferred hand mid-fingertips two times (1) immediately prior to the RAST test (pre-lac), (2) five minutes after the RAST test (Slac) (K.H. Letafatkar, M.H. Alizadeh, M.R. Kordi, 2009). For the purpose of estimating blood lactate concentration using a lactate analyzer (Lactate Scout-SensLab-Germany).

Statistical methods
All descriptive data are expressed as means ± SD. An independent t test was used to evaluate the differences in subjects characteristics between groups (p<0.05). Statistical analysis was conducted using SPSS 16.0 for Windows.

Results
Subjects’ data and body composition are shown in Table 1. Results are shown in Table 2 and Table 3. None of the subjects experienced side-effects of any kind. (table 1)

Regarding the RAST test (Table 2), there were no statistically significant changes between Salbutamol and placebo in peak power (P = 0.30), mean power (P = 0.79) and fatigue index (P=0.96). Lactate plasma concentration of the subjects, as well as power parameters were also unchanged (P = 0.64) (Table 2).

Discussion and Conclusion
This is the first study to report the acute effects on performance in elite athletes of anaerobic sports without asthma after a single, inhaled administered therapeutic dose of Salbutamol.


Theoretically, it is unlikely that the bronchodilatory action of Salbutamol and other β₂-agonists has an ergogenic effect in healthy non-athletes, because bronchoconstriction is not a performance limiting factor (K.F. Andersen, I.L. Kanstrup, 2009).

The differences of mean power, peak power between groups after administration of Salbutamol was not significant. This result is in agreement with S.L. McDowell, S.J. Fleck, W.W. Storms (1997) who reported that there were no significant differences (p > 0.05) between the placebo and salmeterol trials for peak power output, total work performed during the 30-second test, percent fatigue, and time to peak power.

This result also, is in agreement with I.B. Stewart, J.M. Labreche, D.C. Mckenzie, (2002). But this result does not correspond with K. Collomp, B. Le Panse, H. Portier (2005) who reported that Salbutamol intake at a therapeutic dosage seemed to improve peak and mean power output in short-term supramaximal exercise.

The present study also does not corresponds with the results of M.A. van Baak, L.H. Mayer, R.E. Kempinski F. Hartgens (2000), K. Collomp, R. Candau, F. Lasne, Z. Labsy, C. Préfaut, De Ceaurriz J (2000) and K.F. Andersen, I.L. Kanstrup (2009) which suggested that Salbutamol appears to be an effective ergogenic aid in nonathletic individuals. This result maybe is because of test’s protocol, subject’s age (young vs. adult), subjects’ experience (elite vs. novice) and nature of subjects’ sports (anaerobic vs. aerobic sports). Also Signorile, JF, Kaplan TA, B. Applegate, A.C. Perry (1992) reported a significant improvement in peak power in recreational athletes (positive result of an acute inhaled).


The high level of rest blood lactate concentration in subjects (15-19 mmol/l) is due to exposed them in competition season (2 - 12 mmol/l in other studies). Transient increase of lactate levels (lactatemia) with or without metabolic acidosis has been seldom reported as a complication of β-adrenergic agents administered during an asthma attack or for preterm labor therapy (G. Stratikos, J. Kalomenidis, C. Routsi, S. Papiris, C. Roussos, 2003). G. Rodrigo and C. Rodrigo (2005) reported that high lactate concentrations can develop during the first hours of inhaled beta agonist treatment. Although, this increase is may be due to subjects’ trying to generate higher power. But, on the other hand with increase anaerobic power of subjects, lactate production decreases. However, we did not find any statistically significant changes in blood lactate concentration.This result does not correspond with other studies, who have found increased blood lactate concentration after administration of Salbutamol during exercise (G. Rodrigo and C. Rodrigo 2005). This result is due to that subjects in these studies weren’t elite athletes. This result is in agreement with K.F. Andersen, I.L. Kanstrup (2009) who showed no statistically significant differences between the two testing conditions. After he RAST test, lactate had little increased. This may be because the lower increase of lactate in elite and trained subject. In conclusion, administering a single inhaled (400 µg) of the β₂-adrenergic agonist Salbutamol to healthy, elite anaerobic trained male athletes has no ergogenic effect. Further studies are necessary to clarify the mechanisms involved.
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