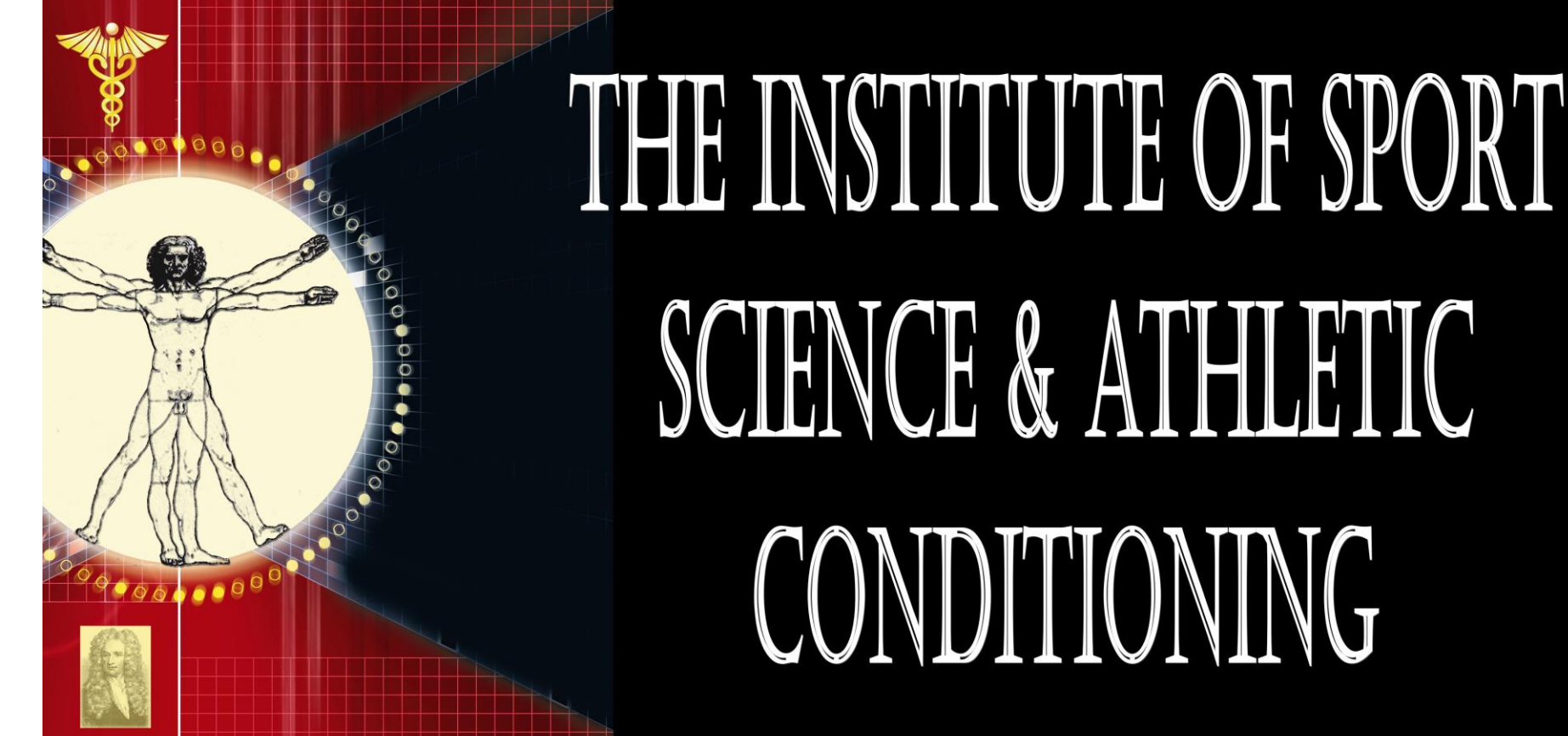




Correlation between Body Composition and Biomechanical Measurements of Performance for Mixed Martial Arts Athletes – A Pilot Study

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Abstract

Mixed Martial Arts is a weight-dependent sport, and its athletes often attempt to maintain a body weight that is relatively close to their fighting class. As a result of this and their type of training, their body fat percentages remain relatively low. They must, however, also be able to retain a relatively high level of performance in order to maintain their competitiveness in the sport.

This pilot study examined Force Production and Anaerobic Tolerance correlated to Body Composition in these athletes. Training consisted on average of two hours per day, five days per week of moderate to high intensity exercise. Nutrition protocol was also documented. Tests conducted consisted of a deadlift until failure, a 300 yard shuttle run, and Caliper/circumference measurements.

A correlation analysis determined a positive correlation between Force Production, Anaerobic Tolerance, and Body Fat Percentage.

The results of this pilot study demonstrate the need for a study that investigates how these biomechanical measures may be improved upon, while at the same time, maintaining a body fat percentage advantageous to the athletes.

Background

Mixed Martial Arts is a weight-category dependent sport, and its athletes often attempt to maintain a body weight that is relatively close to their fighting class. However, they frequently experience moderate to high levels of training intensity, long term lack of recovery, and a habitual state of nutritional deficit as part of their training, fight prep, and competition.

As a result, their body fat percentages remain relatively low (6-13%); however, they must also be able to retain a relatively high level of certain biomechanical capacities in order to maintain their competitiveness in the sport. If they are not capable of accomplishing both variables successfully, a marked decrease in their performance is likely.



Methods

This pilot study examined how two biomechanical measurements of performance (Force Production and Anaerobic Tolerance) correlated to Body Composition in experienced male MMA athletes.

Eight experienced (greater than three years of training) male MMA fighters (average age: 27.75 years) were recruited for the study.

Each of the participants' training regimens consisted on average of two hours per day, five days per week of moderate to high intensity exercise, and included the following sport-specific related skills:

- Muai Thai
- Brazilian Ju Jitsu
- MMA sparring
- Strength and conditioning training

Nutrition protocol for each participant included the following general parameters:

- 50-60% of calories from CHO
- 0.75-1 gram protein per lb of body weight
- 20-25% of calories from lipid
- Adequate hydration of at least 1 gallon of water per day.

All participants completed each of the following three tests:

- Deadlift of 150 lbs. until failure, or within 60 seconds
- 300 yard shuttle run
- Caliper/circumference measurements

A Vernier force plate was employed during the deadlift to measure Force Production. The force plate collected data at the frequency of 500 samples/sec, at an interval of 0.002 sec/sample

The shuttle run was timed to account for Anaerobic Tolerance. Two cones were set 25 yards apart, and the participants ran between them for a total of six up and back trips. Two investigators timed each participant, and the lesser of the two times was recorded.

Circumference measurements were taken using a Gulick measuring tape. Measurements were taken at the chest around the nipple line, the abdomen at the umbilicus and thigh at the largest visual point.

Body composition was determined using Lange calipers and the Jackson-Pollock 7 site method. The 7 sites used were chest, triceps, subscapular, mid axillary, abdomen, suprailiac and mid thigh. Each site was measured on the right side of the body and 3 measurements were taken at each site, with the average being recorded.

The skin fold measurements were then used in the Jackson-Pollock equation to determine body composition. Weight was taken on the day of the test prior to any activity on a mechanical beam scale.

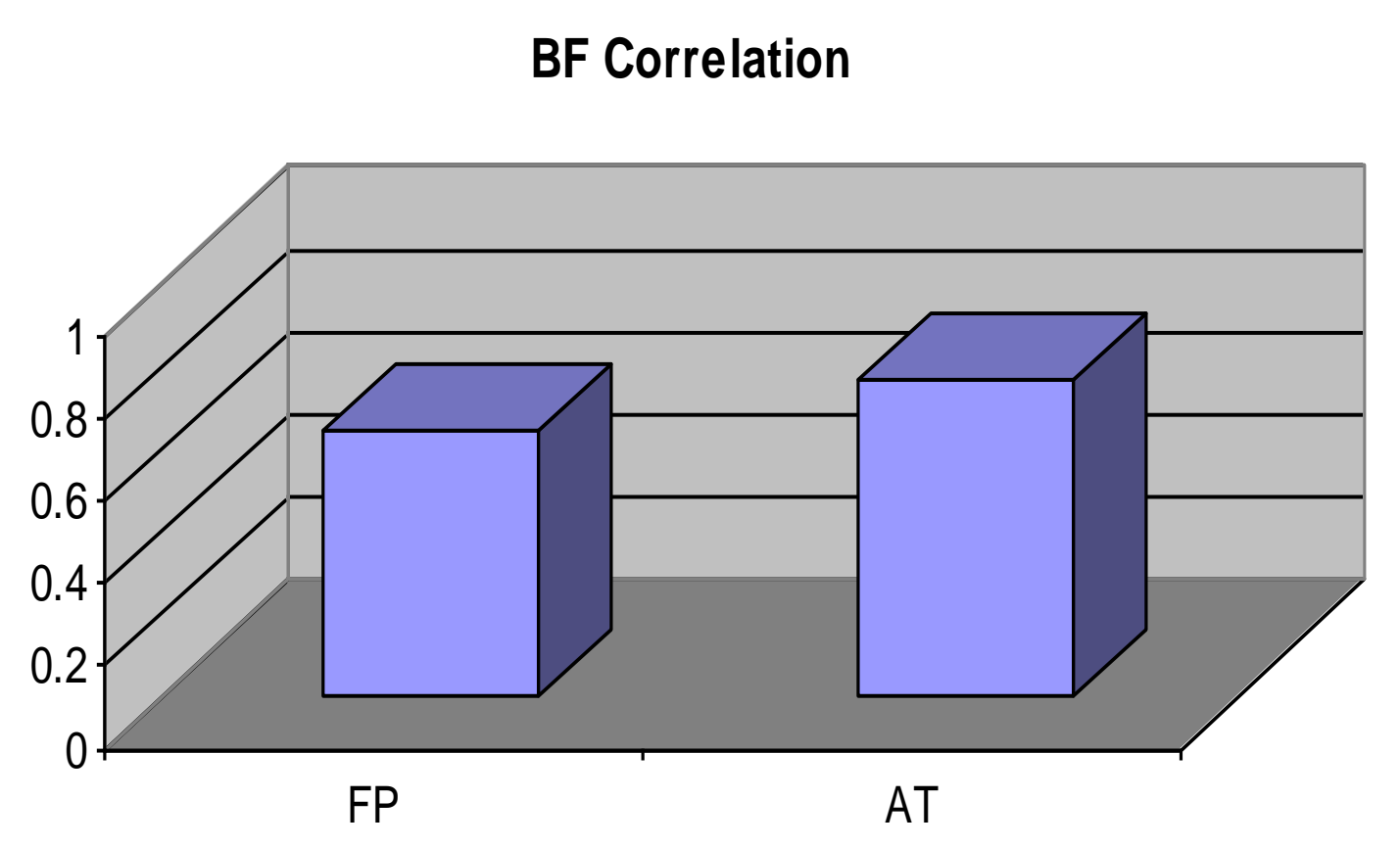
Results

A correlation analysis, assessing the relationship between two Biomechanical Measures and Body Fat Percentage, determined a positive correlation ($R^2 = 0.65$) between Force Production and Body Fat Percentage.

In addition, an even stronger positive correlation ($R^2 = 0.77$) existed between Anaerobic Tolerance and Body Fat percentage.

Force Production	Body Fat
2366	11.32
2173	19.48
2418	11.05
1709	7.21
2356	18.56
1640	6.1
<i>Newtons</i>	<i>Percent</i>

Anaerobic Tolerance	Body Fat
61.56	11.32
75.03	19.48
60.97	11.05
65.07	7.21
72.54	18.56
65.34	6.1
<i>Seconds</i>	<i>Percent</i>

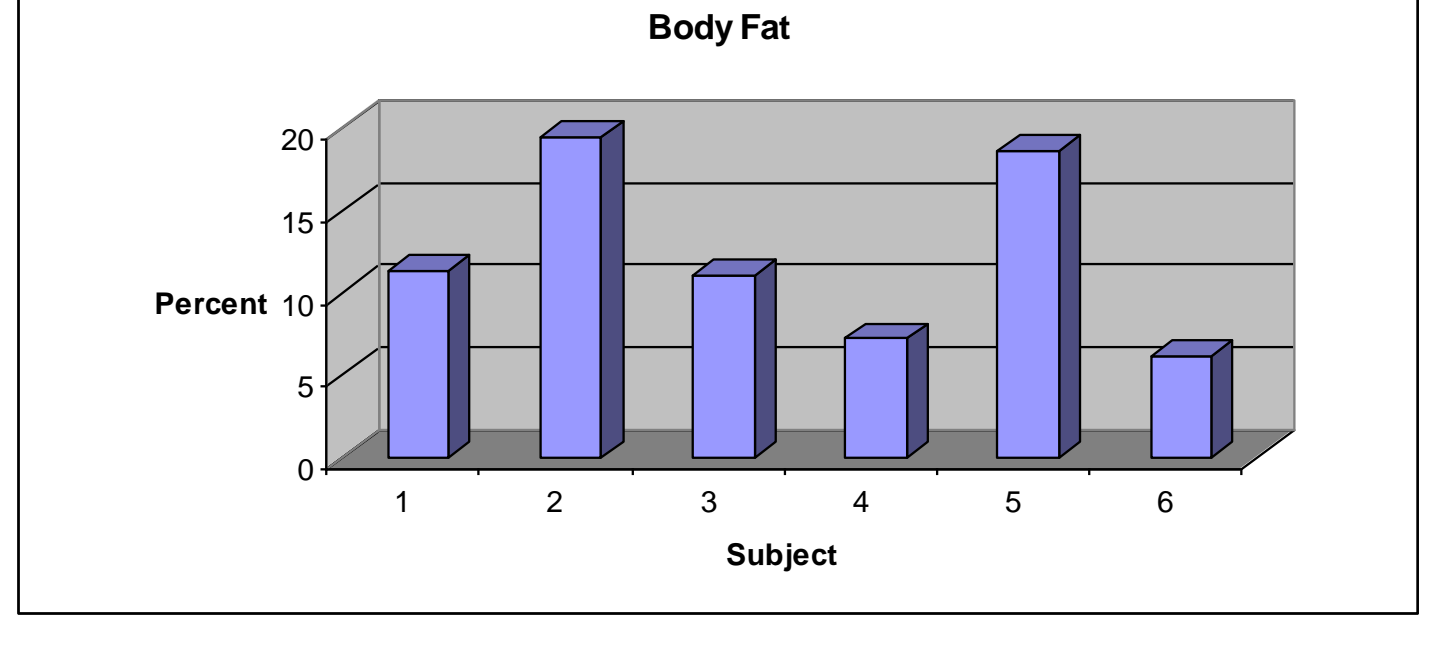
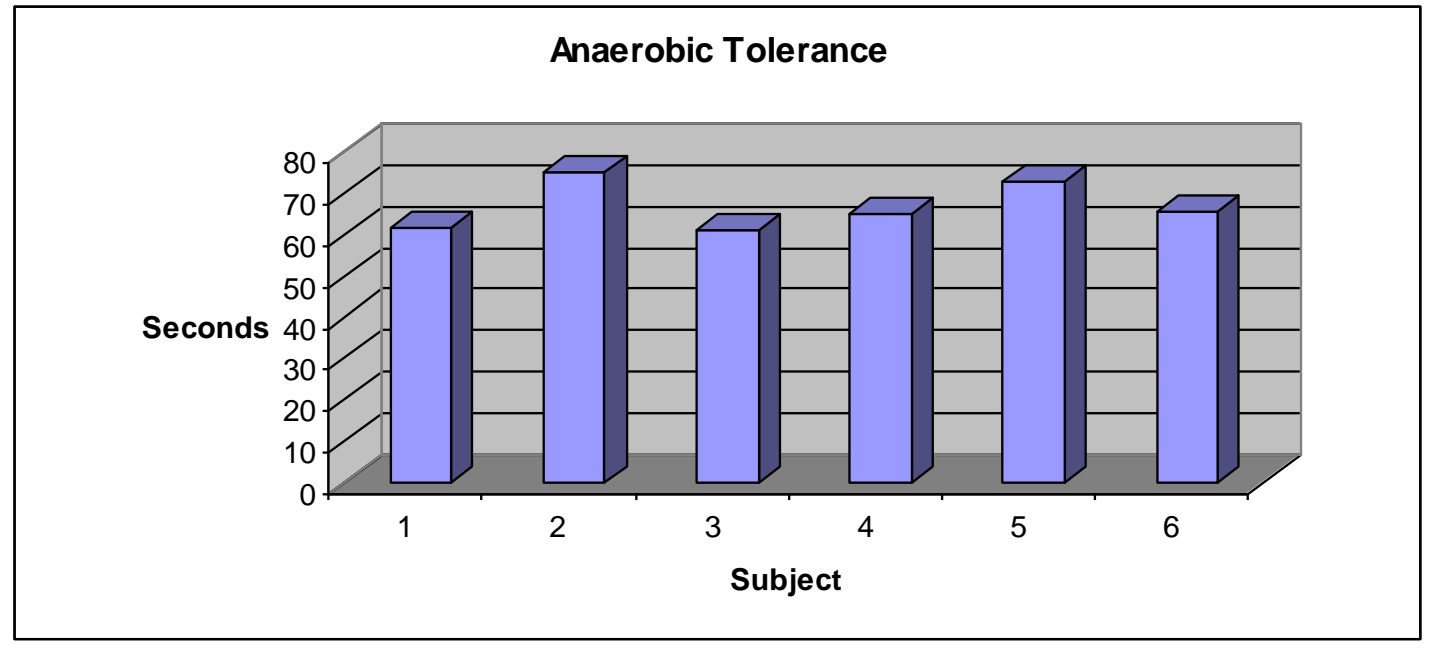
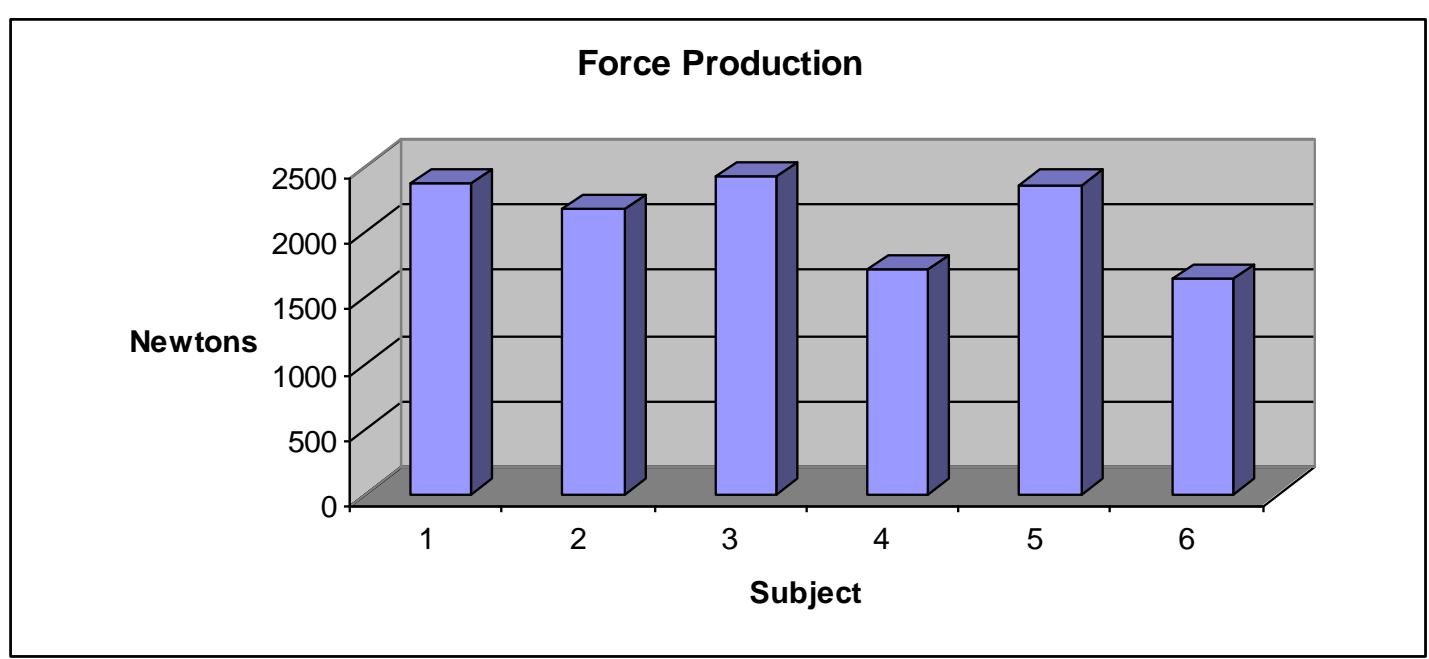


Conclusions

This pilot study found that certain biomechanical measures for performance, in particular, Force Production and Anaerobic Tolerance, are consistently correlated with a body fat between 6 and 13 percent for experienced, male MMA athletes.

As these variables are closely related to the performance of these athletes, the results of this pilot study demonstrate the need for a study that investigates how these biomechanical measures, and others, may be improved upon, while at the same time, maintaining a body fat percentage advantageous to the athletes.

Data



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