EFFECTS OF HYDRATION ON BODY FAT COMPOSITION

USING TWO METHODS OF MEASUREMENT

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INTRODUCTION

Body fat percentage is an important measurement of a person's health risk. There are many different methods of measuring body fat percentage as well as a number of variables that can potentially affect the outcome of a body composition test. One common factor that can influence the outcome of a body composition test is the person's hydration status (2). The purpose of this experiment is to determine the effect drinking one liter of water has on body composition measurements using two different tools, the BOD POD and bioelectrical impedance analysis scale.

Bioelectrical Impedance Analysis (BIA) is a small portable device that is used to assess a person's weight and percent body fat. The person stands on a small scale and an electrical current of about 50kHz passes up through their body to measure resistance. Bioelectrical impedance is the most useful form of body composition assessment for field research. The BOD POD is an air displacement plethysmography tool that calculates body composition by measuring the amount of air displacement. Air displacement plethysmography is an alternative form of measurement to hydrostatic weighing, which can be expensive and intimidating to participants. Using a series of calibrations, the BOD POD can assess and make small changes in pressure to determine a person's body composition (2).

METHODS

Four female subjects between the ages of 21 and 24 were tested. Their heights were between 63 inches and 69 inches. Prior to testing, each subject was fitted with a sports bra, spandex shorts, and a swim cap that covered all of their hair. All jewelry and any other objects on the body were removed. The independent variable being manipulated was the amount of water being consumed before the body composition tests. The dependent variable was body composition (percent body fat).

The control experiment measured the subject's body composition after they had not eaten or drunk anything for at least four hours. They were first tested using the BOD POD. Before starting the test the room was secured and the BOD POD was calibrated. The subject was seated comfortably in the BOD POD and told to sit quietly without moving. Two tests were performed and the subject's body composition was determined. Percent body fat, fat weight, lean weight, and predicted lung volume were recorded. The subject was then tested using the BIA scale. The subject entered their height and age into the bioelectrical impedance scale using the "normal" setting and followed the directions to step on and off the scale. Their body composition in terms of percent body fat and body weight was calculated and recorded. The scale was cleared and the subject re-entered their height and age using the "athletic" setting and body composition was measured and recorded again. The subjects were tested again on another day after a four hour fast. This time each subject drank 1 liter of water within one hour of being measured. The BOD POD and bioelectrical impedance tests were completed again using the same procedure.

RESULTS

The data shows that average body fat percentage increased when subjects drank a liter of water before being measured. One subject experience a decrease in body fat percentage in the BIA test after drinking water.

BIA Scale: Body fat percentages in the control study using bioelectrical impedance ranged from 16.2% to 42.7% on the normal setting and from 12.5% to 40.8% on the athletic setting (Table 1). Body fat measurements in the experimental study using bioelectrical impedance ranged from 17.7% to 44.6% on the normal setting and from 13.7% to 47.3% the athletic setting (Table 2). In the control, the average body fat percentage was 28.1% for the normal setting and 24.78% for the athletic setting (Table 3). In the experimental group, the average body fat percentage was 28.55% on the normal setting and 26.48 on the athletic setting (Table 4). It should be noted that one subject's body fat percentage increased by a small amount.

BOD POD: Body fat measurements of the subjects in the BOD POD control group ranged from 17.3% to 46% (Table 7) and the average was 30.1% (Table 5). Body fat measurements in the BOD POD experimental group ranged from 19.8% to 45.8% (Table 7) and the average was 31.28% (Table 6). All of the subjects body fat percentages increased after drinking the water except for one subject whose body fat percentage decreased by 0.2%.

DISCUSSION

The results show that drinking a liter of water immediately before having body composition measured by either the BOD POD or bioelectrical impedance increased the person's weight and body fat percentage. However, the increase in body fat percentage is very small when the group averages are compared. This may be inaccurate since the sample size was very small and there were extremes between the lowest body fat percentage and the highest body fat

percentage in the subjects. The only significant change in body fat percentage numbers are the large discrepancies found between the athletic and normal settings for bioelectrical impedance. Although the differences were small in body fat percentages, it is consistent with other studies that have found a statistically significant increase in body fat percentage. This could result in a person being incorrectly classified in the wrong health stratification.

In a study by Heiss et al., body fat was measured using the BOD POD and bioelectrical impedance before and after drinking a liter of water. Subjects had their body fat measured using both methods after an overnight fast and then again within 10 minutes of drinking a liter of water. The results from the study concluded that there was a statistically significant increase in body fat percentage after the subjects drank a liter of water compared to the control group (1).

The results from this experiment are consistent with the results from the Heiss et al study. In conclusion, it is important before utilizing either of these body composition methods to carefully instruct the participant about following the identified fast before being measured. Hydration status or consumption of water can have a statistically significant impact on a person's body composition reading.

WORKS CITED

1. Heiss, C. et al. 2009. Effect of a 1 liter fluid load on body composition measured by air displacement plethysmography and bioelectrical impedance. *Journal of Exercise Physiology Online, 12*(2) April 2009.

2. Powers, Scott K. 2009. *Exercise physiology theory and application to fitness and performance*. New York, NY: McGraw Hill.