**SPECIAL REPORT**

# BODY COMPOSITION ANALYSIS; A SURGE IN DEMAND FOR SPORTS REHABILITATION

**ABSTRACT**

This special report aims to highlight the role and practice of Body Composition Analysis in sports rehabilitation to enhance athletic performance by studying its various aspects such as fat mass, lean mass, and water content in the body.

This report identified Inbody 770 as the ideal gadget for Body Composition Analysis. Fat mass analysis revealed that Body Mass Index is not an appropriate tool to determine the levels of obesity as it does not differentiate between fat mass and muscle mass, rather categorises a healthy muscular individual as obese. Furthermore, Body Composition Analysis enables to investigate the proportions of muscle mass and fat mass in a specific region as well as perform comparison analysis to identify the region of weakness and potential risk of injury. Water analysis helps to identify the cause of edema and proportions of intracellular and extracellular fluids.

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## INTRODUCTION

The term body composition refers to the amount and distribution of fat, muscle and other constituents; and associated with clinical and laboratory outcomes, normal individuals as well as in medical and surgical conditions like malignancy, cardiovascular disorders and post-operative conditions[1-6]. However, the understanding related to its significance and impact is scarcely present among the masses[7]. Therefore, the aim of this report is to highlight the impact and importance of Body Composition Analysis.

### Body Composition Analysis
The human body is composed of four main constituents namely; Body Water, Proteins Mass, Minerals and Muscles Mass. Body Composition Analysis provides detailed information related to these mentioned body constituents with various aspects and features. Moreover, a variety of terminologies are used in order to improvise data related to human body constituents such as total body water, soft lean mass, fat free mass, weight etc.

### Body Composition Analysis Equipment
The ideal equipment for measuring Body Composition is Inbody 770. It may produce Body composition analysis report in approximately 1 minute. The report is usually printed on an A4 size sheet and recorded with reference to ID, height, age and gender.

### Basic Terminologies
### Total Body Water
As we all know, we have two types of fluid in the body i.e. intracellular water and Extracellular water. First one is inside our cells while the latter is outside our cells. For the normal healthy population, the ratio between ICW and EXW is 62 and 38[8]. This ratio is for the normal healthy population. For edema patients or elderly population, this ratio is imbalanced and we can get the ratio by Body Composition Analyzer 770.

### Soft Lean Mass
By adding protein over total body water, we have Soft Lean Mass also known as muscle. Soft Lean Mass consists of total body water and protein. Most people will think that our muscle is a chunk of protein but actually our muscle has protein as well as water.

### Fat Lean Mass
Fat free mass can be obtained by adding minerals. It's everything except fat. So fat free mass contains total body water, protein and minerals.

## MATERIALS AND METHOD

### Muscle Fat Analysis
There are three parameters of Fat analysis of weight, Skeleton Muscle Mass (SMM) and Body Fat Mass (BFM). This can be found in the Inbody Result Sheet. Moreover, it also enables to draw a line that connects the tips of each bar that transform into shapes such as C shape, I shape and D shape that indicate **Cautious, Ideal and Developed** respectively. 'Cautious' specify low muscle and high fat mass that could be associated either with sarcopenia or skinny obese bodies. Contrarily, 'developed' identifies high muscle concentration than fat that is related to the athletic people presenting with muscular body type. This helps the practitioner to determine our patient/client body pattern as shown in the figure.

### Obesity Analysis
Nowadays, Body Mass Index (BMI) is widely accepted and practiced as the measure of obesity. However, recent researches demonstrated that BMI is not based upon 2 parameters i.e. body weight and height and is not reliable. In addition to this, BMI fails to differentiate between the higher fat mass and muscle mass. This difference is also profoundly demonstrated by Inbody 770 through calculating body fat percentage as shown in *Figure 1*.
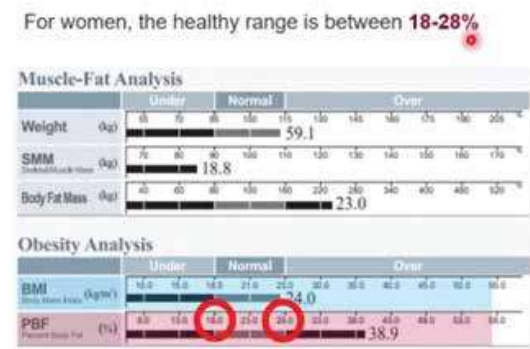


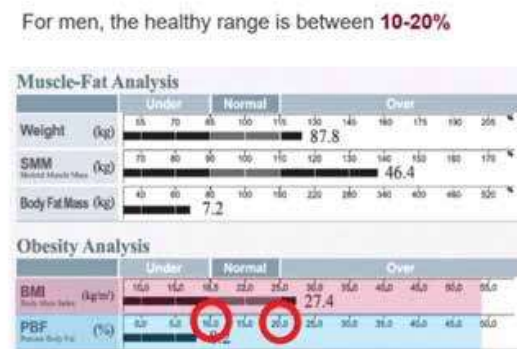Figure 1: Shows fat mass analysis



Figure 2: Shows Muscles mass analysis

Another important aspect is the amount of visceral fat and subcutaneous fat. This ratio can be studied under Inbody 770 in graphical form. According to the researches, presence of visceral fat above 100 cm increases the risk of Diabetes, hypertension and cardiovascular diseases.

**Muscle Mass Analysis**

It provides muscle mass percentile as well as the Muscle Mass distribution in two bars - Upper Bar and Lower Bar. This helps to identify if muscle mass is adequate enough to support body weight 100% muscle mass is enough to support body weight.
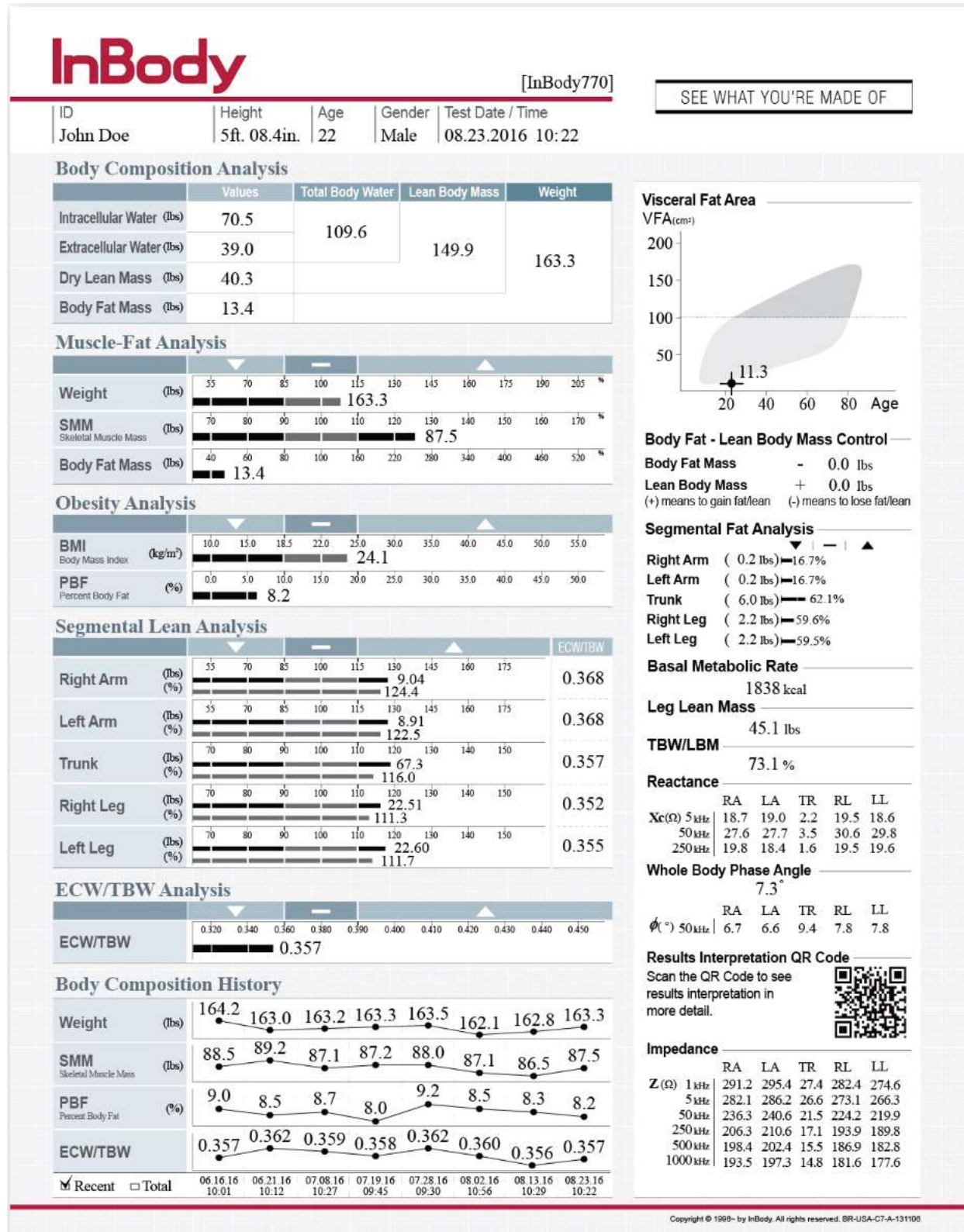


**Figure 3: Water Analysis**

However, below 100% is required to develop more muscles for current weight. Moreover, normal ranges for arms are 80 to 120 per cent while for legs these ranges estimate up to 90 to 110 per cent. Normally, our legs are more developed compared to the arms. Therefore, lack of muscles in legs may lead to knee or ankle related injuries. The muscle analysis of a real patient with diabetes showed that he lacks muscle mass in the lower body parts as shown in the figure[9].

Actually, muscles are a major site of glucose storage. Therefore, glucose stored in muscles and lower extremity has more muscle mass. However, if a person is having less muscle mass in lower limbs, the capacity of glucose storage and utility will decrease resulting in higher blood glucose levels. Hence, this was the reason his results showed to have more subcutaneous as well as visceral fat. Furthermore, muscles imbalances are also noticed such as; slight Imbalance of 1-2 bar difference between arms and legs, 6-10% difference between arms and slight imbalance of 3-5 % between legs. Eventually, this also helps to predict the potential risk of injury in any specific limb.

**Water Analysis**
Water analysis helps to evaluate the content and amount of water stored in the human body as well as its distribution into intracellular and extracellular fluid contents. Therefore, this system enables us to provide a direction to frame provisional diagnosis for various conditions such as edema, inflammation or muscle soreness etc. and also helps to provide insight of different stages of injury such as before injury, injury stage and recovery stage as in the figure below.

## DISCUSSION

The importance of body composition analysis has been discussed above. This is now evident that body composition analysis can produce a drastic change in the field of sports rehabilitation by means of better assessment, examination, analysis, prognosis and selection of treatment outcome. Moreover, the ability to predict potential risk of muscular injury as areas of weakness in muscle, ligament, tendons and bone; may tremendously change the approach of practice into more exclusive, target and scientific methods. However, the practical implication of this approach is still very limited and practitioners are scarcely aware of these developments. A meta-analysis conducted recently, indicated significance of body composition analysis as a clinically useful tool for esophageal cancer[10]. Another study conducted in 2017 specifically discussed the validity of a software body composition analysis[11]. There is an inevitable need to conduct more studies in order to find valid applications for various conditions.

## CONCLUSION

This report shows the evidence that Body Composition Analysis may be used as a diagnostic as well as prognostic modality for the field of sports rehabilitation to enhance athletic performance and to prevent potential risk of injury and dehydration.

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