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A Comparative Study of Body Composition Assessment Techniques: DXA and InBody 270

Research Brief

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Abstract

Introduction: The purpose of this study was to compare two common laboratory methods of body composition assessment: dual-energy X-ray absorptiometry (DXA) and the InBody® 270 Body Composition Analyzer.
Methods: Eighty-eight subjects (43 female, 45 male) volunteered for this study. Participants were tested in a controlled laboratory environment (i.e., 3-hour fast, no prior exercise, testing between 1100 and 1700 hours) first on the InBody® 270 followed by the DXA. A paired t-test was used to assess differences between the groups. Statistical significance was established at a p-value < 0.05.
Results: There were statistically significant differences between the DXA and InBody 270 for percent body fat, fat mass and fat-free mass. The DXA had significantly greater fat mass and percent body fat whereas fat-free mass was lower versus the InBody 270.
Conclusion: The Inbody 270 under-predicts fat mass and percent body fat; conversely, it over-predicts fat-free mass.

Key Words: *body composition, assessment, dxa, inbody, fat mass, fat-free mass, lean body mass, exercise*

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Introduction

There are various methods of assessing body composition.[1,2] Common imaging techniques that utilize direct analysis are DXA, magnetic resonance imaging, and computed X-ray tomography. Indirect methods consist of analyzing biological interrelationships between various measurements and components to estimate body composition and tissue distribution.[3] The most commonly used indirect body composition assessment methods are anthropometry and BIA. Comparatively, indirect methods are less precise than direct methods; therefore, it is noted that indirect analysis has larger predictive errors.[4] The advantage of the DXA is that it provides bone mass as well as regional body composition data[5] thus providing a way to assess abdominal obesity.[6] However, hydration status of an individual is a confounding variable given that dehydration leads to an underestimation of fat-free mass thus affecting both DXA and BIA analyses[7]. These two methods have been accepted as accurate and reliable methods of analyzing body composition as previous research on the subject has shown no significant difference between the two methods.[8] Therefore, the purpose of this study was to further determine if differences existed between the DXA and InBody 270. Using a larger sample size, this investigation is a follow-up to our previous one.[8]

Methods

Participants

Eighty-eight research participants (44 female, 44 male) visited the laboratory for body composition assessment. Nova Southeastern University's Institutional Review Board approved all human subjects' procedures. Written informed consent was obtained from each participant prior to participation. Participants had an average age of 23.1±7.0 years, an average height of 171.0±9.9 cm, and an average weight of 71±15.6 kg.

Protocol

All participants were instructed to arrive at Nova Southeastern University's Exercise and Sport Science laboratory by the scheduled start time, ensure that a 3-hour fast was observed prior to arrival, and that no exercise was performed prior to testing. At the start of each testing day, standardized quality control calibration procedures for the DXA were performed on a phantom spine. All equipment was cleaned with disinfecting wipes before and after each use. Participants were instructed to remove all metal jewelry, empty their pockets, and remove both their shoes and socks. Participants were instructed to stand with their backs and heels against the wall, where a measuring tape was located. Height was recorded in centimeters. Participants were then asked to approach the InBody 270, stand on the platform, align the soles of their feet with the metal electrodes, and stand still while their weight was measured. After entering their personal profile, which included their height, weight, age, and gender, the InBody test began. Participants were instructed to grab the handles, place their thumb on the oval electrodes, and keep their arms straight and away from their body. The InBody test lasted approximately 30 seconds, after which the results were automatically printed. Participants were then asked to step off the InBody 270 and lay down supine on the DXA. They were positioned so that they were in the middle of the table and that their limbs were with the borders delineated on the scanning table. Participants were instructed to bring their feet and legs together, relax their body, and to remain as still as possible until the scan was completed. Once participants were positioned correctly, their demographic information was entered into the DXA program, and they were asked if they had fractured any bones. After this, the DXA scan commenced and lasted approximately seven minutes.

Statistical Analysis

Data collected was analyzed via a paired t-test. Data with a p-value <0.05 were considered statistically significant. All data are presented as mean±SD.

Results

The DXA reported significantly greater fat mass and percent body fat than the InBody 270. It was also found that the DXA showed significantly less fat-free mass than the InBody 270 (Table 1 and Figures 1-3).

Table 1. Body Composition Comparison

	Percent Body Fat	Fat-free mass (kg)	Fat mass (kg)
DXA	27.7±7.5	51.1±12.5	19.7±7.3
InBody 270	24.6±9.0	53.7±13.0	17.8±8.2

Data are expressed as the Mean±SD. All values are significantly (p<0.0001) different between the DXA and InBody.

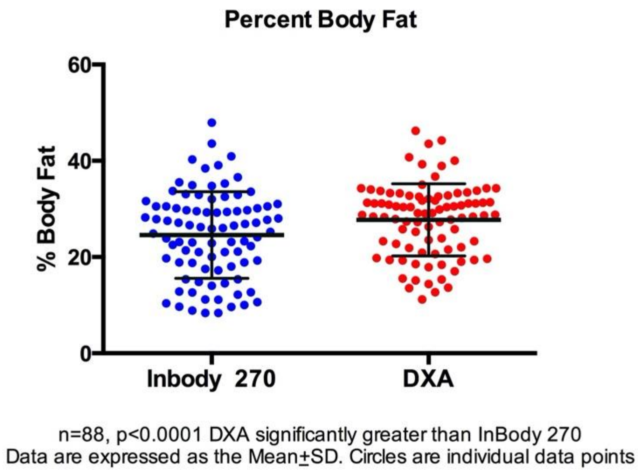

Figure 1. Percent Body Fat

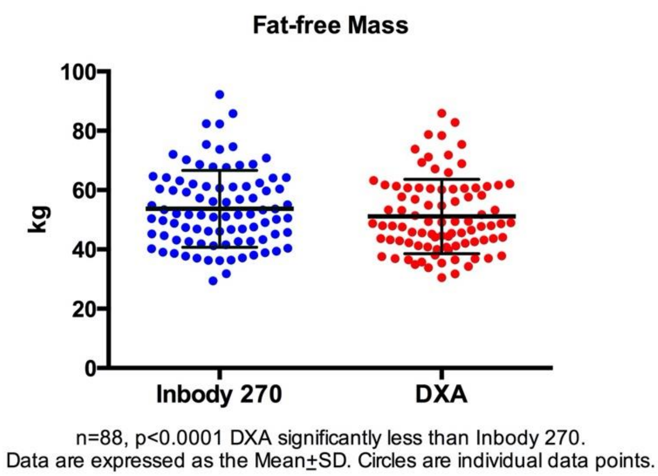

Figure 2. Fat-free Mass

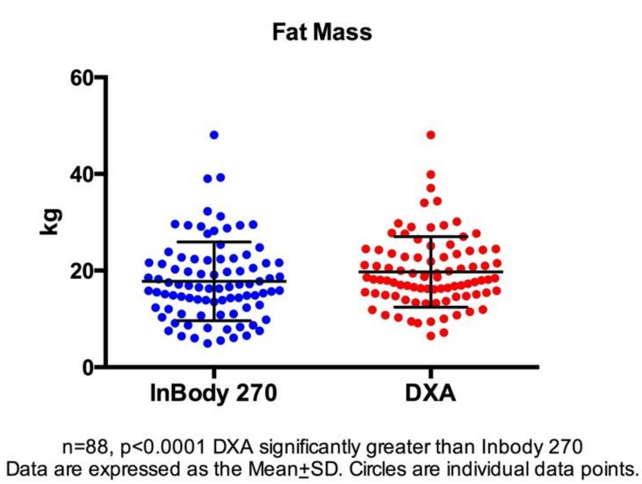

Figure 3. Fat Mass

Discussion

In the present study, it was found that the DXA and InBody 270 produce significantly different results when analyzing percent body fat, fat-free mass, and fat mass. The InBody 270 underreports percent body fat and fat mass, while it overreports fat-free mass. The discrepancies found in the underreporting of percent body fat and overreporting of fat-free mass by the InBody 270 may be due to the fact that an individual's hydration status plays a major role in how much resistance is imposed on the alternating current traveling through the body's tissues. Potential limitations of the DXA may be accessibility, cost, and a maximum threshold on a subject's height whereas the InBody 270 represents a much quicker and more convenient method of assessing body composition. Although both the DXA and InBody 270 are acceptable methods of assessing body composition, the findings presented in this study provide evidence to show that the DXA shows much less variability. Furthermore, the current findings expand on previous research which showed that the DXA and InBody 270 produce similar results with no statistically significant differences.[8] The aforementioned study may have been limited by a smaller sample size.

Conclusions

In this study, the differences between the DXA and InBody 270 were explored; the InBody 270 under-reports fat mass and percent body fat while over-reporting fat-free mass.

Media-Friendly Summary

The DXA and InBody 270 produce significantly different body composition values in regard to percent body fat, fat-free mass, and fat mass. However, both are acceptable methods of body composition assessment.

Author Contributions: JA conceptualized, designed and co-wrote the manuscript. JG co-wrote the manuscript and engaged in data collection. RM, PC, HW, CW, AB, AN, AP, JB, CP and JT assisted with data collection.

Conflicts of Interest: The authors declare no conflict of interest.

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