VALID ASSESSMENT OF BODY COMPOSITION IN PEDIATRIC POPULATIONS REQUIRE MULTI-COMPARTMENT MODELING TECHNIQUES. TRADITIONALLY, MANY MULTI-COMPARTMENT MODELS UTILIZED HYDROSTATIC WEIGHING DERIVED BODY DENSITY (DB) MEASURES, WHICH REQUIRE ACCURATE RESIDUAL LUNG VOLUMES (RV; L) MEASUREMENTS.

PURPOSE: THE PURPOSE OF THIS STUDY WAS TO COMPARE TWO SYSTEMS TO DETERMINE RV IN CHILDREN AND TO DETERMINE THE IMPACT OF THE DIFFERENT RV MEASUREMENTS ON DB AND PERCENT FAT (%Fat) USING AGE AND SEX APPROPRIATE 2-COMPARTMENT MODEL BODY COMPOSITION EQUATIONS. METHODS: THE SUBJECTS INCLUDED 17 PREPUBESCENT (TANNER MATURATIONAL STAGE ≤ 2) CHILDREN AGES 7-11 YRS. EACH SUBJECT COMPLETED RV MEASUREMENTS USING A SENSORMEDICS VMAX 229 SERIES (SENSORMEDICS HEALTH CARE CORP., YORBA LINDA, CA; S-RV) AND AN EXERTECH BODY DENSITY MEASUREMENT SYSTEM, (EXERTECH, DRESCH, MN; E-RV) DURING A SINGLE TESTING SESSION. RESULTS: PAIRED MEAN GROUP (x ± SE), COEFFICIENT OF DETERMINATION (r²), AND TOTAL ERROR (TE) ANALYSES WERE USED TO DETERMINE IF THERE WERE SIGNIFICANT DIFFERENCES IN RV, DB, AND %Fat MEASUREMENTS OBTAINED USING THE TWO SYSTEMS. NO SIGNIFICANT DIFFERENCES WERE FOUND BETWEEN S-RV (0.55 ± 0.06 L) AND E-RV (0.55 ± 0.04 L); S-DB (1.0072 ± 0.0045 g/cc) AND E-DB (1.0069 ± 0.0046 g/cc); AND S-%Fat (37.1 ± 2.3 %) AND E-%Fat (37.1 ± 2.4 %) (TABLE 2). CONCLUSIONS: IN PREPUBESCENT CHILDREN, THE TWO SYSTEMS COMPARED PRODUCED SIMILAR RV MEASUREMENTS AND DID NOT SIGNIFICANTLY IMPACT DB OR %Fat MEASUREMENTS.

INTRODUCTION

Estimating the RV of children introduces large random error and therefore measures of RV must be obtained to increase the accuracy of body composition assessments that require RV in this population. The system used to obtain RV measures in children needs to be accurate, reliable, and must be able to be accomplished rapidly and be easy enough for a child to complete the required procedures.

PURPOSE

The purpose of this study was to compare two systems to determine RV in children, and to determine the impact RV measurements have on Db and percent body fat using age and sex appropriate 2-compartment model body composition equations.

METHODS

I. Subjects

24 prepubescent (Tanner Maturational Stage ≤ 2) children ages 7-11 years old

Boys = 12
Girls = 12

II. Residual Lung Volume Measuring Systems (Figure 1 and 2)

SENSORMEDICS VMAX 229 (Figure 1)

Viasays Health Care Corp., Yorba Linda, CA

Subjects performed 2-3 trials of the N₂ washout technique

The mean of the trials was used for subsequent analysis

VMAX software version 05 was used

EXERTECH RESIDUAL LUNG VOLUME SYSTEM (Figure 2)

Exertech, Dresbach, MN

Subjects performed 2-3 trials of the O₂ dilution technique

The mean of the trials was used for subsequent analysis

DOS program created by the manufacture used

Statview (SAS Institute, Inc., Cary, NC.) a computer based program, was used for all analyses

RESULTS

No significant differences were found between S-RV (0.59 ± 0.04 L) and E-RV (0.59 ± 0.04 L); S-Db (1.0072 ± 0.0045 g/cc) and E-Db (1.0069 ± 0.0046 g/cc); and S-%Fat (37.1 ± 2.3 %) and E-%Fat (37.1 ± 2.4 %) (Table 2).

There were significant (p < 0.01) coefficient of determination, found for the RV (r² = 0.41), Db (r² = 0.97) and %Fat (r² = 0.97) measurements.

The total errors (TE; standard errors about the line of identity) were 0.04 L, 0.0118 g/cc, and 0.4% for the RV, Db, and %Fat, respectively.

Bland-Altman Plotting further demonstrated that the differences in S-RV and E-RV; S-Db and E-Db; and S-%Fat and E-%Fat measures all fell within the 95th percent confidence intervals.

CONCLUSIONS

The results demonstrated that the Sensormedics and Exertech systems produced similar results in the group of prepubescent children tested.