DETERMINATION OF LOW ENERGY AVAILABILITY BY DUAL X-RAY ABSORPTIOMETRY VERSUS AIR DISPLACEMENT PLETHYSMOGRAPHY IN COLLEGIATE ATHLETES

Devon Trieschock, Meghan K. Magee, Andrew R. Jagim, Jennifer B. Fields, Margaret T. Jones, FNSCA

PRESENTER:
Devon Trieschock

BACKGROUND

- Low energy availability (LEA) can lead to decrements in athlete health and sport performance.
- Determination of fat free mass (FFM) is necessary to calculate energy availability (EA).
- Different instruments may provide varied measurements of FFM, leading to differences in calculated EA values.
- Limited data exists on how instrumentation selection to determine FFM may influence EA status in collegiate team sport athletes.

PURPOSE

- To examine differences in EA values based upon selection of body composition instrumentation selection.

METHODS

- National Collegiate Athletic Association Division I men (n=10) basketball athletes participated in study.
- FFM was measured using air displacement plethysmography (ADP) and dual x-ray absorptiometry (DXA).
- DXA and ADP testing occurred no more than 48 hours apart for all athletes.
- Athletes refrained from exercise, eating, and drinking for at least 2 hours prior to ADP testing.
- Jewelry was removed, and Lycra swim caps and spandex were worn during ADP testing.
- For ADP testing, thoracic gas volume was estimated using manufacturer guidelines, and the Brozek equation was used.
- Athletes wore clothing with no metal and removed all jewelry prior to DXA testing.

KEY FINDINGS

Determination of LEA status may change depending upon the selected measurement instrument.

Table 1. Athlete Characteristics

Assessment	Team Average
Height (cm)	196.1 ± 9.6
Weight (kg)	91.7 ± 12.5
Average Energy Intake (kcal)	3340.2 ± 489.7
Average Energy Expenditure (kcal)	1268.6 ± 228.1
FFM kg (DXA)	77.2 ± 9.9
FFM kg (ADP)	82.5 ± 10.6*
DXA Energy Availability (kcal/FFM kg)	27.0 ± 6.5
ADP Energy Availability (kcal/FFM kg)	25.1 ± 5.6*

Values are represented as mean ± standard deviation
*Denotes significant difference when compared to DXA (p<0.001)
FFM: Fat Free Mass; DXA: Dual X-Ray Absorptiometry; ADP: Air Displacement Plethysmography

METHODS (CONT'D)

- Dietary analysis software was used to determine energy intake from photos of all food and beverages consumed over 4 consecutive days.
- Heart rate monitors worn during practices were used to determine exercise energy expenditure over the same 4 consecutive day period by using a proprietary algorithm from the software program.
- Energy Status was determined by:
  - $\frac{\text{(Energy Intake (kcal) – Exercise Energy Expenditure (kcal))}}{\text{Fat Free Mass (kg)}}$
- Threshold of <30 kcal/kg used to determine LEA.
- Paired sample t-tests determined differences between instrumentation in determining EA values.
- Significance was set to $p \leq 0.05$.

RESULTS

- FFM measurements differed between DXA and ADP ($p<0.001$) with ADP overestimating FFM (table 1).
- There was a significant difference in EA values when determined by DXA and ADP ($p<0.001$), where ADP yielded lower EA.
- DXA estimated 7 athletes with LEA.
- ADP estimated 9 athletes with LEA.

CONCLUSIONS

- Determination of LEA status may change depending upon selected measurement instrument.

PRACTICAL APPLICATIONS

- It is recommended to choose valid and reliable instrumentation to ensure accurate energy status, remain consistent with selected instrumentation, and use caution when comparing values across different instruments.