

Title: The Relationship Of Energy Status And Lipid Profiles Among Eumenorrhic Adolescent Female Athletes

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Introduction:

The Relative Energy Deficiency in Sport (REDs) model proposes cardiovascular health impairments secondary to low energy availability. Female athletes with amenorrhea, often related to low energy availability, demonstrate endothelial dysfunction and dyslipidemia. Whether energy status, independent of amenorrhea, is associated with lipid profiles is unknown.

Purpose:

Determine the association between energy status and serum lipid markers among eumenorrhic adolescent female athletes.

Methods:

Participants were included from a larger study examining differences between amenorrhoeic and eumenorrhic athletes. Eumenorrhic athletes underwent 3 months of self-reported menstrual cycle tracking, one month of at-home urinary ovulation testing, and blood hormonal testing within 7 days of a menstrual period to confirm eumenorrhic status. They also completed a total body DXA scan and indirect calorimetry testing to measure resting metabolic rate (RMR). Energy status was determined from the ratio of measured to predicted RMR. Serum lipid markers (HDLc, LDLc, triglycerides, total cholesterol) were obtained at the time of the blood hormonal testing. A linear regression model was used to assess the relationship between energy status and lipid markers, adjusting for body mass index (BMI).

Results:

22 eumenorrhic female athletes successfully completed the menstrual status confirmation assessment. Table 1 outlines participant characteristics. After adjusting for BMI, energy status was not significantly associated with HDLc ($p=0.77$), LDLc ($p=0.90$), triglycerides ($p=0.28$), or total cholesterol ($p=0.76$).

Conclusion:

Energy status in eumenorrhic athletes was not significantly associated with lipid markers, suggesting that energy status independent of menstrual status is not associated with lipid profiles. Enhanced understanding of the negative cardiovascular implications of REDs is key for early prevention of cardiovascular disease.

Table 1. Participant characteristics. Data are presented as mean (SD) for continuous variables and number within group (corresponding %) for categorical variables.

Demographics		
Age (years)		15.6 (1.3)
Height (cm)		163.7 (6.2)
Weight (kg)		55.6 (8.8)
BMI		21.2 (3.4)
Race	White	18 (82%)
	More than one race	4 (18%)
Ethnicity: Hispanic or Latino		5 (23%)
Primary sport	Soccer	11 (53%)
	Basketball	1 (5%)
	Cross country	2 (10%)
	Track & field	2 (20%)
	Swimming	1 (5%)
	Dance	3 (14%)
	Horseback riding	1 (5%)
Anovulatory		5 (23%)
Energy status		1.13 (0.11)
Lipid profiles		
HDLc		51 (9.9)
LCLc		90 (29.9)
Triglycerides		82 (35.7)
Total cholesterol		143 (28.7)