

HORMONAL ADAPTATIONS TO COMPETITION PREPARATION IN MALE AND FEMALE PHYSIQUE ATHLETES

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INTRO

- Physique competitors use severe caloric restriction to reduce body fat before the competition. We previously showed decreased serum leptin and T3 concentrations during competition preparation¹, but other extensive endocrine function changes may also occur.

PURPOSE

- To examine hormonal responses to competition preparation in male and female physique competitors

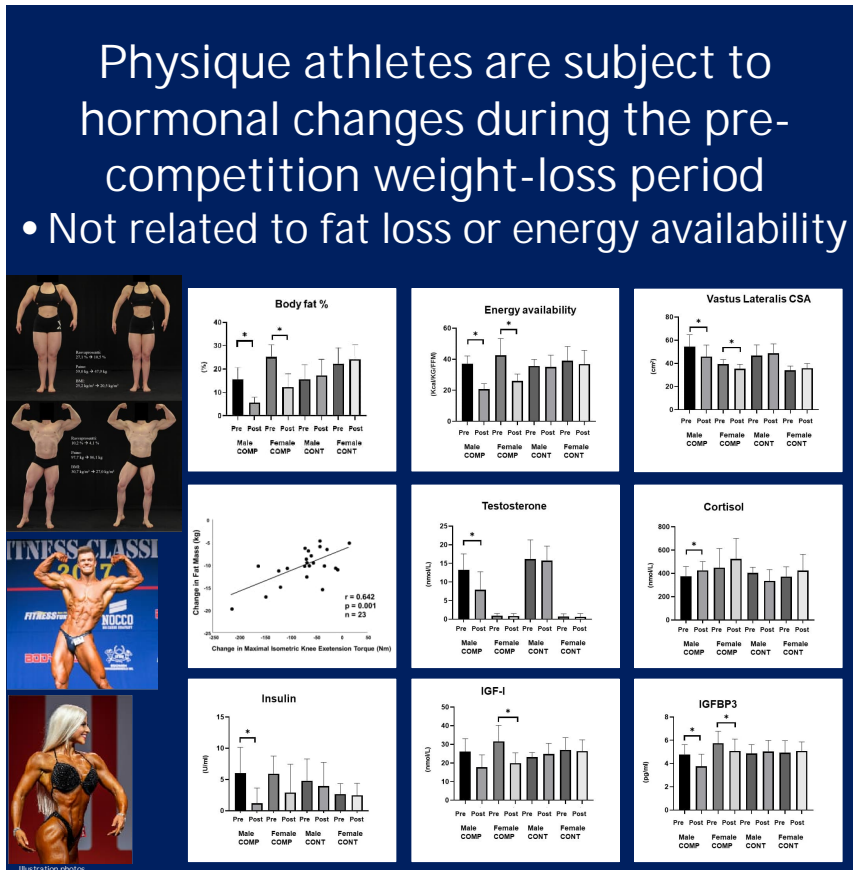
METHODS

Subjects:

- 45 physique athletes, 29±5 years
 - competitors (COMP, male n=13, female n=10) prepared 20±4 weeks for the national championships
 - control group (CONT, male n=10, female n=12) did not compete

Measurements:

- 23 and 2 weeks before the competition
- body fat and fat-free mass by DXA
- vastus lateralis cross-sectional area (VL CSA) by ultrasound
- Energy availability (EA) was calculated by subtracting exercise energy expenditure (assessed by training logs) from total daily energy intake (assessed by food diaries) and dividing it by fat-free mass
- Unilateral maximal isometric knee extension torque (ISOM)
- Fasted serum total (T) and free testosterone (FT), sex hormone binding globulin (SHBG), oestradiol, follicle-stimulating hormone (FSH), insulin growth factor-I (IGF-I), IGF binding protein-3 (IGFBP-3), adrenocorticotrophic hormone (ACTH), cortisol, and insulin concentrations were measured



RESULTS

- In COMP, body fat% decreased from 16±5 to 6±2 % in males and from 25±5 to 12±5 % in females (p<0.001)
- Compared to CONT groups, fat and fat-free mass, EA, and VL CSA decreased (p<0.05-0.001) in both COMP males and females
- ISOM decreased in COMP females (p<0.001), and ISOM per VL CSA in COMP males (p<0.05) compared to CONT groups
- Changes in ISOM were associated with changes in FM in COMP groups (r = 0.642, p<0.001, n=23)
- In COMP males, serum T, FT, IGFBP-3, and insulin decreased (p<0.05-0.001), and SHBG, oestradiol, and cortisol increased (p<0.05-0.001) compared to CONT males
- In COMP females, IGF-1 and IGFBP-3 decreased (p<0.01-0.001) compared to CONT females.

CONCLUSION

- As expected, drastic fat mass and energy availability decreases occurred in COMP
- Also, fat-free mass and muscle size of knee extensors decreased¹
- In COMP, a decrease in fat mass was associated with muscle strength decrements. Speculatively, reduced body size and overall fatigue, rather than muscle atrophy, may impair muscle strength during weight loss in physique competitors.
- In males, sex hormones, insulin, IGFBP-3, and cortisol responded to the caloric restriction, while in females, only IGF-I and IGFBP 3 showed downregulation
- The hormonal changes observed in male COMP may be due to a reduction in body fat % to very low levels
- Overall, adaptive changes in present hormones to weight loss appeared not extensive and were unrelated to the changes in body composition or energy availability

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Reference: ¹⁾ Isola et al. Appl Physiol Nutr Metab. 1:48(4):307-320, 2023