Prevalence, consequences, and prevention of relative energy deficiency in sport in Finnish Elite Male Athletes (NoREDS-study)

Ihalainen Johanna[1], Valtonen Maarit[2], Mjøsund Katja[1,3]

[1] Faculty of Sport and Health Sciences, University of Jyväskylä, Finland
[2] Finnish Institute of high performance Sport KIHU, Jyväskylä, Finland
[3] Urhea National Olympic Training Centre, Helsinki, Finland

Background:

Healthy diet, regular exercise and physical activity have extensive health benefits. Low energy availability (LEA) is a common challenge for the health and performance of up to 60% of athletes. Relative energy deficiency (RED-S) describes the potential negative health and performance outcomes of LEA. RED-S in female athletes have been studied quite broadly, however there is very little data on male athletes. **The aim of this study is to investigate the prevalence and incidence of LEA and symptoms of RED-S in Finnish male endurance athletes.**

Subjects and Methods:

50 highly trained male endurance athletes

- Energy availability by food log1
- VO2max incremental test
- Measurement and RED-S criteria2
- Fat percentage DXA (Fat%<5%)
- Body mass index (BMI<18.5)
- Bone health DXA (L1-L4 Z-score <-1)
- Resting metabolic rate (RMR_{ratio}<0.90)
- Selected blood markers (T3, TES, LDL, COR)

Results:

Of the 50 athletes, 29 (58%) had either 0 or 1 RED-S criteria present, 13 athletes (26%) presented with two criteria, four athletes (8%) with three criteria, and two athlete (4%) with four criteria, one athlete (2%) with five criteria, and one athlete (2%) with six criteria (Figure 1)

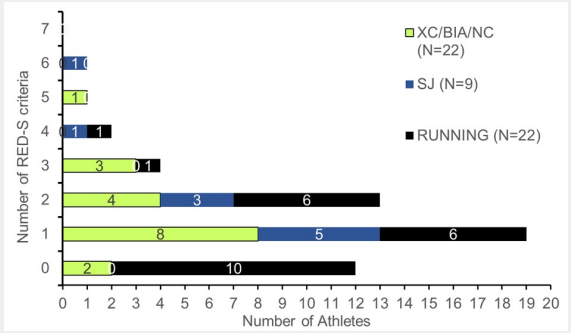

Figure 1. Number of RED-S criteria.

Mean EA (37.0 ± 9.1 kcal·kgFFM^{-1}·d^{-1}) and CHO intake (5.1 ± 1.6 g·kg^{-1}·d^{-1}) were at suboptimal level. The mean $VO2_{max}$ was 70.4 ± 6.4 mL/kg/min.

The number of the RED-S criteria in athletes was associated with testosterone (r=-0.547; p<0.001), T3 (r= -0,531; p<0.001), RMRratio (r= -0,314; p=0.035), fat percentage (r= -0,457, p<0.001), L1-L4 Z-score (r=0.386, p<0.024), as well as with carbohydrate intake (-0,603, p=0.005, N=18). Maximal aerobic capacity measured as VO2max was associated only with fat percentage (r= -0,482; p<0.007).

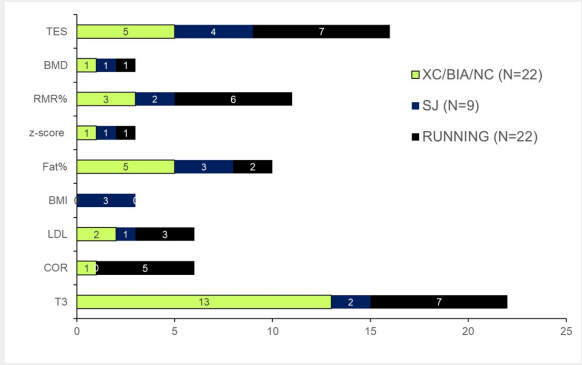

Figure 2. The cumulatively represented RED-S criteria in different groups.

CONCLUSIONS

In conclusion, this study found that multiple RED-S markers also exist in high-level male athletes in weight-sensitive sports with high energy requirements such as biathlon and XC skiing. This study highlights the importance of regular screening of male elite athletes, to ensure detection of RED-S. Even if the compliance to food diaries was poor, in addition to the laboratory measurements especially the estimation of the carbohydrate intake should be highlighted.

PRACTICAL APPLICATIONS

- Even if low fat percentage was the only measure that was associated with performance, suboptimal energy availability and carbohydrate intake may compromise athletes´ health.
- Findings of multiple RED-S markers in males highlight the importance of enhanced high-quality nutrition education on endurance athletes.

REFERENCES

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