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### Original Research

## Nutrition Concepts for Elite Distance Runners Based on Macronutrient and Energy Expenditure

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### Abstract

**Context:** Elite distance runners (EDR) must optimize their nutrition to maintain their demanding training schedules.

**Objective:** To develop a nutrition concept for EDR based on energy and macronutrient expenditures.

**Design:** This theoretical study provides calculations for macronutrient and energy expenditures of EDR. Anthropometric and metabolic characteristics of EDR were assumed based on average real EDR.

**Setting:** University of Kiel.

**Patients Or Other Participants:** Three prototypic types of male EDR described in the literature as type I (TI; body mass = 72 kg, respiratory quotient = 0.9 at rest, fast-twitch muscle fibers = 60% to 70%), type II (TII; body mass = 67 kg, respiratory quotient = 0.82 at rest, fast-twitch muscle fibers = 50%), and type III (TIII; body mass = 60 kg, respiratory quotient = 0.75 at rest, fast-twitch muscle fibers = 30% to 40%).

**Main Outcome Measure(s):** We calculated the macronutrient and energy expenditures of the 3 types of EDR according to body mass, respiratory quotient, and percentage of fast-twitch muscle fibers.

**Results:** We found that the average energy expenditure was 3750 kcal · d<sup>-1</sup> for TI runners, 3463 kcal · d<sup>-1</sup> for TII runners, and 3079 kcal · d<sup>-1</sup> for TIII runners. The carbohydrate (CHO) expenditure reached an average value of 10.0 g · kg<sup>-1</sup> · d<sup>-1</sup> for TI runners, 8.0 g · kg<sup>-1</sup> · d<sup>-1</sup> for TII runners, and 4.7 g · kg<sup>-1</sup> · d<sup>-1</sup> for TIII runners. When the EDR accomplished running sessions at a pace ≥100% of maximum

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oxygen consumption, all types of runners had a CHO demand of about  $10 \text{ g} \cdot \text{kg}^{-1} \cdot \text{d}^{-1}$ . The T1 and TII runners need a CHO intake of  $8 \text{ to } 10 \text{ g} \cdot \text{kg}^{-1} \cdot \text{d}^{-1}$ . For the TIII runners, a CHO intake  $>6 \text{ g} \cdot \text{kg}^{-1} \cdot \text{d}^{-1}$  is necessary during anaerobic training sessions.

**Conclusions:** Nutrition concepts must be differentiated for EDR according to metabolic and anthropometric characteristics of the runners and their special training emphases.

**Keywords:** [diet](#), [endurance](#), [sports](#)

Sandra Schröder, MSc, and Alexandra Fischer, PhD, contributed to conception and design; acquisition and analysis and interpretation of the data; and drafting, critical revision, and final approval of the article. Christina Vock, MSc, contributed to analysis and interpretation of the data and critical revision and final approval of the article. Mike Böhme, MSc, Constance Schmelzer, MSc, Myriam Döpner, MSc, Olaf Hülsmann, PhD, and Frank Döring, Prof, PhD, contributed to conception and design; acquisition and analysis and interpretation of the data; and drafting, critical revision, and final approval of the article.

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