

Body Composition Drives Marathon Performance: A Comprehensive Research Synopsis

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Abstract:

This comprehensive study investigates the relationship between specific body composition parameters and marathon running performance in a cohort of 247 runners. Utilizing dual-energy X-ray absorptiometry (DXA) and bioelectrical impedance analysis (BIA), we quantified body fat percentage, lean muscle mass, and regional fat distribution. Performance metrics were collected across three major marathons over 24 months. Results demonstrate a strong negative correlation between body fat percentage and marathon performance ($r = -0.78$, $p < 0.001$), with each 1% decrease in body fat associated with approximately 2.3-minute improvement in finish time. Lean muscle mass ratio showed significant positive correlation with performance ($r = 0.65$, $p < 0.001$), particularly in the final 12km. The findings establish evidence-based body composition targets for different performance tiers and provide practical implications for runners, coaches, and sports scientists seeking to optimize marathon performance through targeted body composition management.