

研究報告

# 異なる滑走テクニックでローラースキー滑走した際のエナジェティクス

## Energetics of roller skiing with different skiing techniques

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### Abstract

The purpose of the present study was to investigate energetics of roller skiing with diagonal stride and double poling at various speeds and compare the developments of energetic parameters across speeds between skiing techniques. Two dimensional kinematics and oxygen uptake were determined in two male collegiate cross-country ski athletes who performed roller skiing at the paced speeds using diagonal stride and double poling on a level track. Total mechanical work rate comprising internal and external work, net energy expenditure rate, and net efficiency were calculated from the experimental data. Total mechanical work rate increased linearly and net energy expenditure rate increased exponentially with increasing speed in individual skiing techniques; nevertheless, the developments of the parameters across speeds differed somewhat between the athletes. These would be attributed to the difference in the motions of roller skiing, the proficiency in skiing techniques, and the metabolic capacity in involved musculature. Net efficiency increased with increasing speed, reached a maximal value, before slowly decreasing, which indicates that the optimal speeds exist at which net efficiency can be maximally enhanced in both skiing techniques. This finding suggests that roller skiing at each optimal speed in the race would improve racing performance.

**キーワード** ダイアゴナルストライド, ダブルポール, 総仕事率, エネルギー消費率, 機械的効率

diagonal stride, double poling, total mechanical work rate, net energy expenditure rate, mechanical efficiency

### 1. はじめに

クロスカントリースキーやローラースキーのクラシカル競技では、選手はコース状況やレース展開によって、ダブルポール (DP; 図1a) やダイアゴナルストライド (DS; 図1b) などの滑走テクニックを使い分けて滑走している。Stöggle et al. (2006) は、近年従来のディス

タンス種目に加えて1 km程度のコースで争うスプリント種目が導入されたことや、マテリアルが改良されたことによってレースが高速化したことから、レース戦略としてDPが多用されるようになったと述べている。先行研究 (Rundell and Bacharach, 1995; Staib et al., 2000; Mahood et al., 2001) では、ローラースキーでDPを用いて滑走

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