SWACSM Abstract

Influence of Air Resistance on Ground Reaction Forces During Treadmill Running

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ABSTRACT

INTRODUCTION: Running is fundamentally driven by forces applied to the ground, eliciting ground reaction forces (GRFs) which accelerate the runner. These GRFs are divided into vertical, anteroposterior, and mediolateral components. As running speed alters, so do the patterns of these forces. By juxtaposing these GRF patterns with metabolic data, we can discern how movement patterns adapt across different running conditions. One of the key distinctions between treadmill and overground running is the influence of air resistance. **METHODS**: The study involved twenty-four active male runners experienced in achieving a sub-17-minute-5km or equivalent performance. The main objective was to examine the influence of air resistance on running biomechanics. Participants underwent two data collection sessions. During the sessions, various parameters such as height, weight were recorded, and the influence of different air resistance conditions on their running mechanics was studied. **RESULTS**: Braking Impulse, Propulsive Impulse, Horizontal Impulse, and Mean Force all demonstrated significant effects with respect to the wind conditions. Specifically, the effect of condition was significant for propulsive impulse and braking impulse, horizontal impulse, and mean force. These variables showed differences across the various wind conditions tested. **CONCLUSION**: We investigated the biomechanical effects of horizontal impeding forces on runners. Our results highlight how these forces alter running mechanics. With increased resistance, runners showed marked changes in propulsive and braking impulses, indicating adjustments in their gait. Aspects like ground time and stride length remained consistent, while horizontal forces primarily affected anterior-posterior running mechanics.