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9 Aerodynamic and thermoregulatory characteristics of running apparel

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The aerodynamic drag associated with three types of commercially available running apparel (SS: nylon singlet and shorts; **L: l**ycra/nylon bodysuit and **RS:** nylon rainsuit) and two bodysuits of newly developed stretchable, water vapour permeable fabrics (T and K) was measured in a wind tunnel on a human mannequin at four velocities (4.7, 7.1, 8.8 and 9.7 m.sec-l). Commercially available running apparel provided consistently higher drag than the T and K bodysuits. Under ail conditions the high sheen and tight fit of the K fabric allowed drag reductions of between 17.5 and 7.4% at running speeds. At sprint speeds a hood over the hair was responsible for 6 of the 7.4% reduction in drag noted with the K suit. **If** is estimated that reductions in drag ***of*** this size provide real time savings of between 1.05% in the marathon to 2.75% in the 100m dash. Afield trial of the K suit with 16 male subjects (mean age: ***22*** yr) revealed a significant ($p<.025$) decrease in 100m running time amounting to a time saving of 1.17% at a velocity of 7.43 m.sec-'. The thermoregulatory properties of the ***SS,*** L and K suits and a suit of stretchable, membrane porous fabric (B) were investigated at environmental temperatures of 0^{o}Co and 25^{o}C subsequent to the aerodynamic study. Six male, middle distance runners performed 30 minute runs on a treadmill at a pace requiring approximately 75% of maximum oxygen uptake against afan generated wind of 4.2 rn.sec^{-1}. Oxygen uptake kinetics, heart rate, sweating rate. core and skin temperature and perceived exertion were recorded. At 29°C, the K suit retained 23.5 and the **6** suit 9.1 times as much sweat as SS apparel ($pc.05$). Both suits were intolerable to running beyond 22 and 25 minutes, respectively ($pc.05$) at the designated speed. At O°C, subject tolerance for ail apparels exceeded the criterion time. In the cool (O°C) condition the comparatively high air permeability of the **L** suit resulted in a significantly lower core temperature increase **($p<.05$),** compared with the other apparels. Even in cool conditions, the **I(** suit retained significantly more sweat than the other apparels ($pc.05$) however subjects favoured the K suit over the **B** suit due to its lighter weight and greater stretchability. This research suggests that aerodynamic clothing may impact significantly upon running performance. In order to maintain efficient thermoregulation during extended wear in the hotter environment, future running suits should be developed from stretchable materials which have better vapour permeability.

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